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SOCIEDADE ASTRONÔMICA BRASILEIRA

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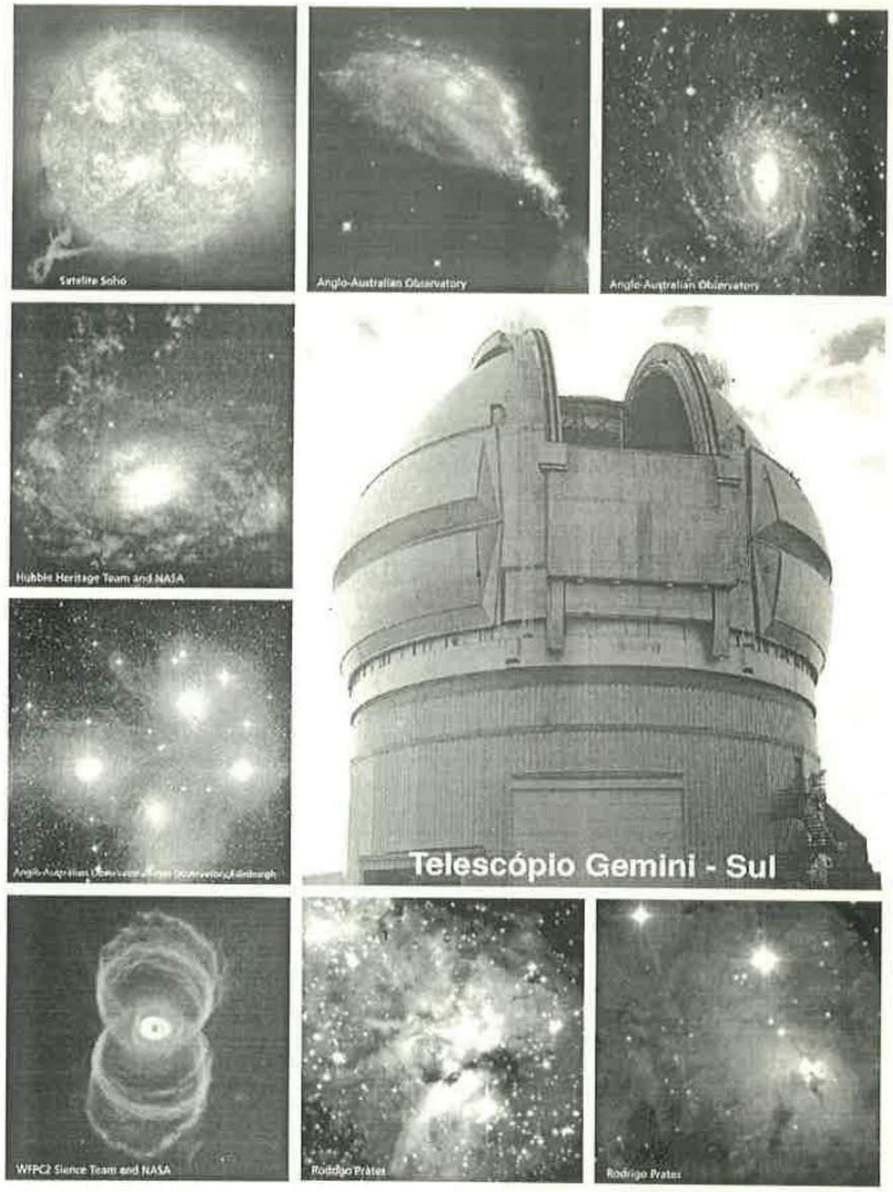

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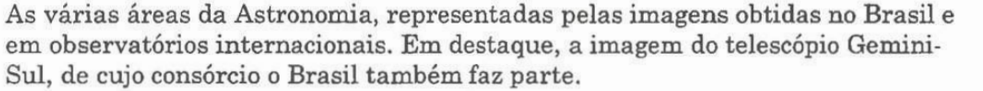
A CAPA



As várias áreas da Astronomia, representadas pelas imagens obtidas no Brasil e em observatórios internacionais. Em destaque, a imagem do telescópio Gemini-Sul, de cujo consórcio o Brasil também faz parte.

SAB

EDITORIAL

Carta do Presidente

Prezados Colegas,

A nossa XXVIII Reunião Anual será realizada na cidade de Florianópolis, SC. Um dos objetivos de se realizar esse evento nessa cidade foi prestigiar um grupo de pesquisa em Astronomia que se estabeleceu na UFSC; também, foi uma forma de reconhecer a visão dessa instituição em abrir uma linha de pesquisa em Astronomia. Certamente, é uma decisão mais do que acertada investir na pesquisa em Astronomia, que, por seu caráter multidisciplinar, fomenta tanto a pesquisa básica quanto a tecnológica. A Astronomia ainda precisa crescer muito no Brasil, principalmente com a implementação de grupos de pesquisa no maior número possível de universidades públicas e privadas, de forma a proporcionar que a ciência brasileira seja cada mais forte e possa contribuir para a melhoria da educação de nossos jovens e promover o desenvolvimento global de nossa sociedade. Assim, a realização de nossa reunião prestigiando a UFSC é um marco emblemático para a Astronomia Brasileira. Esperamos que num futuro próximo haja reuniões da SAB em localidades que hoje sequer cogitamos!

Com essa reunião em Florianópolis, temos a certeza de que está em marcha um crescimento da Astronomia no Brasil. No entanto, a manutenção desse crescimento passa necessariamente pela participação ativa dos sócios da SAB na análise dos problemas que envolvem a política científica no nosso País e,

conseqüentemente, as instituições de pesquisa brasileiras. O espírito crítico da comunidade tem que se mostrar efetivo não apenas nas discussões de assuntos que podem ser facilmente resolvidos. Há assuntos muito mais importantes que precisam de uma atenção maior e constante dos sócios. As vidas de instituições como o CNPq, universidades e institutos de pesquisa precisam ser continuamente acompanhadas para evitar que instabilidades impeçam o desenvolvimento da ciência no nosso País. A Astronomia deve crescer em todas as suas fronteiras e não apenas em áreas bem determinadas e dominadas.

Um grande abraço a todos,

Thyrso Villela Neto
Presidente da SAB

PROGRAMA

SÁBADO - 03 DE AGOSTO

15:00-19:00 Registro

19:00-20:00 Coquetel de boas-vindas

20:00-21:00 Palestra Inaugural: "Retrospecto dos últimos 50 anos da Astronomia Observacional do Brasil"
Paulo Marques dos Santos (IAG/USP)

21:00 Jantar

DOMINGO - 04 DE AGOSTO

08:00-09:00 Registro

09:00-10:00 Palestra de Revisão: "Aglomerados de Galáxias"
Laerte Sodré Jr. (IAG/USP)

10:00-11:30 **Sessão de Painéis I e Café**
Áreas: Ensino e História, Estrelas, Física do Sol, Instrumentação, Relatividade e Gravitação

Sessões Paralelas

1. Extragaláctica (Salão Ilha do Arvoredo, 1º andar)

11:30-11:45 The low-luminosity end of the starburst-AGN connection: liners and transition objects
Roberto Cid Fernandes Jr.

11:45-12:00 Barred galaxies without disks?
Dimitri Gadotti

12:00-12:15 Recent evolution of the accretion disk of NGC 1097
Thaisa Storchi-Bergmann

12:15-12:30 Structural components and dust content of the central Kpc of NGC 7626
Miriani Pastoriza

12:30-12:45 Localization and observation of GRB010921 by the Hete satellite
João Braga

2. Sistema Solar (Salão Azul A, 2º andar)

11:30-11:45 Where do the Kuiper belt objects with high inclination orbits come from?
Rodney da Silva Gomes

11:45-12:00 Characterization of a meteorite found in Rio do Pires, Bahia, Brazil
Maria Elizabeth Zucolotto

12:00-12:15 Ring particle dynamics in coorbital satellite systems
Priscila Alves da Silva

12:15-12:30 On the relationship between visual magnitudes and gas and dust production rates in target comets to space missions
Amaury A. de Almeida

12:30-12:45 A search for unstable asteroids in the 3:1 resonance neighborhood
Sueli Guillens

13:00-15:00 Almoço

Sessões Paralelas

1. Estrelas (Salão Ilha do Arvoredo, 1º andar)

15:00-15:15 Metallicity gradient in the galactic disk: abundances of OB stars
Simone Daflon

15:15-15:30 Spectral evolution of Nova Velorum 1999
Anselmo Augusto

15:30-15:45 Spectroscopic analysis of massive stars in transition
Francisco Xavier de Araújo

15:45-16:00 Mid-infrared observations of NGC 3576 IRS 1
Cássio Barbosa

16:00-16:15 Convective envelope deepening, activity, lithium and rotation of late-type stars
José Dias do Nascimento Jr.

16:15-16:30 Alpha & heavy elements abundances of nearby bulgelike dwarf stars
Luciana Pompéia

16:30-16:45 The stellar variability influence on circumstellar dust shells
Sérgio Pilling

2. Plasmas e Altas Energias e Cosmologia (Salão Azul A, 2º andar)

15:00-15:15 Phase transitions in neutron stars and gravitational ave emission
Cezar Vasconcellos

15:15-15:30 Colliding winds in massive binary stellar systems and dust formation: an application to Eta Carinae

Diego Falceta-Gonçalves

15:30-15:45 Charged ultra-high energy cosmic rays and their implications for the magnetic field topology of the galaxy
Gustavo Medina-Tanco

15:45-16:00 Simultaneous radio/X-ray observations of Sco X-1
Flávio D'Amico

16:00-16:15 Dispersive doppler effect in astrophysical outflows
Ericson Lopez

16:15-16:30 The shape of the universe via CMBR maps
Armando Bernui

16:30-16:45 Some observational consequences of brane world cosmologies
Jailson Alcaniz

16:45-18:00 **Sessão de Painéis II e Café**
Áreas: Extragaláctica, Física do Sol, A Galáxia e as Nuvens de Magalhães, Mecânica Celeste, Meio Interestelar

18:00-19:30 Mesa Redonda GEMINI
Coordenador: Albert Bruch (LNA)

SEGUNDA - 5 DE AGOSTO

09:00-10:00 Palestra de Revisão: "Os estágios finais das estrelas"
S.O. Kepler (IF/UFRGS)

10:00-11:30 **Sessão de Painéis III e Café**
Áreas: Cosmologia, Ensino e História, Estrelas, Extragaláctica

Sessões Paralelas

1. Meio Interestelar, Estrelas & A Galáxia e as Nuvens de Magalhães
(Salão Ilha do Arvoredo, 1º andar)

11:30-11:45 Giant Herbig-Haro flows: 3D simulations of the prototype HH34
Elisabete M de Gouveia Dal Pino

11:45-12:00 The non-stationary variability of AA Tau
Silvia Alencar

12:00-12:15 Orbital period changes in three short-period SU Ursae Majoris stars
Raymundo Baptista

12:15-12:30 On the nature of a secondary main sequence turn-off in the rich LMC cluster NGC 1868

Basilio Santiago

12:30-12:45 Analysis of colour-magnitude diagrams of rich LMC clusters
Leandro Kerber

2. Física do Sol & Instrumentação (Salão Azul A, 2º andar)

11:30-11:45 Stochastic electron acceleration in solar flares
Adriana Silva

11:45-12:00 On the origin of the rapid submillimeter spikes
Carlos Giménez de Castro

12:00-12:15 Solar brightness distribution using tomographic restored beams
Joaquim Costa

12:15-12:30 An achromatic version of the HG-mask coronagraph of the Observatorio Nacional - RJ
Pierre Bourget

12:30-12:45 First observations with the Itapetinga digital correlator
César Strauss

13:00-15:00 Almoço

Sessões Paralelas

1. Extragaláctica & Relatividade e Gravitação (Salão Ilha do Arvoredo, 1º andar)

15:00-15:15 The relation between Sérsic laws along the major and minor axies of elliptical galaxies
Horácio Dottori

15:15-15:30 Gravitacional lensing in the most massive clusters
Eduardo Cypriano

15:30-15:45 Luminosity evolution of powerful double radio sources
Joel Carvalho

15:45-16:00 The study of globular clusters systems in compact group
Cristiano da Rocha

16:00-16:15 Limits to primordial black holes from the holographic principle
Jorge Horvath

2. Astrometria & Mecânica Celeste (Salão Azul A, 2º andar)

15:00-15:15 Evidence of non-coincidence between radio and optical positions of ICRF sources
Alexandre Andrei

15:15-15:30 Ground-based astrometry with the ASPHO: optical-radio reference systems connection
Vera Martin

15:30-15:45 A joint project between USNO and Brazil - the astrometry of ICRF sources
Marcelo Assafin

15:45-16:00 Effects of the inclination and short period terms over a simplified model for the 3:1 asteroidal resonance
Sueli Guillens

16:00-16:15 Autonomous artificial satellite orbit determination in real-time using single frequency gps measurements
Ana Paula Chiaradia

16:15-17:30 **Sessão de Painéis IV e Café**
Áreas: Cosmologia, Estrelas, A Galáxia e as Nuvens de Magalhães, Instrumentação, Plasmas e Altas Energias, Sistema Solar

17:30-18:15 **Discussão de Painéis (Sessão I)**
Áreas: Ensino e História, Estrelas, Física do Sol, Instrumentação, Relatividade e Gravitação

18:15-19:00 **Discussão de Painéis (Sessão II)**
Áreas: Extragaláctica, Física do Sol, A Galáxia e as Nuvens de Magalhães, Mecânica Celeste, Meio Interestelar

19:00-21:30 Jantar

21:30-22:30 Mesa Redonda sobre Astronomia Espacial
Coordenador: Thyrso Villela (INPE)

TERÇA - 6 DE AGOSTO

09:00-10:00 Palestra de Revisão:"Os grandes desafios da Astrofísica"
Reuven Opher (IAG/USP)

10:00-11:30 **Sessão de Painéis V e Café**
Áreas: Astrometria, Estrelas, Extragaláctica, Plasmas e Altas Energias, Sistema Solar

11:30-12:15 **Discussão de Painéis (Sessão III)**
Áreas: Cosmologia, Ensino e História, Estrelas, Extragaláctica

Sessões Paralelas

1. Instrumentação (Salão Ilha do Arvoredo, 1º andar)

12:15-12:30 The COROT satellite and brazilian participation
Eduardo Janot-Pacheco

12:30-12:45 The parameter estimation method in a T Tauri disk model
Annibal Hetem Jr.

2. Ensino e História (Salão Azul A, 2º andar)

12:15-12:30 Evolution of the undergraduate research mentoring in astronomy at Valongo Observatory of the Federal University of Rio de Janeiro (UFRJ)
Lilia Prado

12:30-12:45 Brazilian indigenous astronomical system
Germano Afonso

13:00-15:00 Almoço

15:00-15:45 **Discussão de Painéis (Sessão IV)**
Áreas: Cosmologia, Estrelas, A Galáxia e as Nuvens de Magalhães, Instrumentação, Plasmas e Altas Energias, Sistema Solar

15:45-16:30 **Discussão de Painéis (Sessão V)**
Áreas: Astrometria, Estrelas, Extragaláctica, Plasmas e Altas Energias, Sistema Solar

16:30-17:00 Café

17:00-19:30 Assembléias Extraordinária, Ordinária e Eleição da nova Diretoria

QUARTA - 7 DE AGOSTO

10:00-11:00 Mesa Redonda SOAR
Coordenador: S.O. Kepler (IF/UFRGS)

11:00-11:30 Encerramento

PALESTRAS PARA O PÚBLICO EM GERAL
CENTRO DE CONVIVÊNCIA - CAMPUS DA UFSC

DOMINGO, 04 DE AGOSTO

12:00 "Aglomerados Globulares - o que podemos aprender com eles?"
Basilio Santiago

20:30 (Título a definir)
João E. Steiner

SEGUNDA, 05 DE AGOSTO

12:00 "Buracos Negros - realidade ou ficção?"
Thaisa Storchi-Bergmann

20:30 "Vida no contexto cósmico"
Augusto Damineli

TERÇA-FEIRA, 06 DE AGOSTO

12:00 "Os pilares da criação"
José Renan De Medeiros

QUADRO DE HORÁRIOS

Sábado, 3 de Agosto

15:00-19:00 Registro

19:00-20:00 Coquetel de boas-vindas

20:00-21:00 Palestra Inaugural: "Retrospecto dos últimos 50 anos da Astronomia Observacional do Brasil"
Paulo Marques dos Santos (IAG/USP)

21:00 Jantar

MANHÃ

	04/ago (domingo)	05/ago (segunda)	06/ago (terça)	07/ago (quarta)
08:00 09:00	Registro			
09:00 10:00	Palestra de Revisão	Palestra de Revisão	Palestra de Revisão	
10:00 10:30	Painéis I & Café	Painéis III & Café	Painéis V & Café	Mesa Redonda SOAR
10:30 11:00				
11:00 11:30				Encerramento
11:30 12:15	Sessões Paralelas	Sessões Paralelas	Discussão de Painéis III	
12:15 12:45			Sessões Paralelas	
13:00 15:00	Almoço	Almoço	Almoço	

TARDE

	04/ago (domingo)	05/ago (segunda)	06/ago (terça)	07/ago (quarta)
15:00 15:45	Sessões Paralelas	Sessões Paralelas	Discussão de Painéis IV	
15:45 16:00			Discussão de Painéis V	
16:00 16:15				
16:15 16:30		Painéis IV & Café		
16:30 16:45			Café	
16:45 17:00	Painéis II & Café			
17:00 17:15			Assembléias & Eleição	
17:15 17:30				
17:30 18:00		Discussão de Painéis I		
18:00 18:15	Mesa Redonda GEMINI			
18:15 18:30		Discussão de Painéis II		
18:30 19:00				
19:00 19:30		Jantar		
19:30 21:30	Jantar		Jantar	
21:30 22:30		Mesa Redonda sobre Astronomia Epacial		

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COMUNICAÇÕES ORAIS

ASTROMETRIA

EVIDENCE OF NON-COINCIDENCE BETWEEN RADIO AND OPTICAL POSITIONS OF ICRF SOURCES

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Many of the International Celestial Reference Frame (ICRF) sources are not pointlike, as shown by the 2GHz and 8GHz radio maps. The size scale reaches up to a few tens of milli-arcseconds for extended sources. Also, although the optical image is not resolved, its center of emission is not necessarily coincident with the radio centroid. Here we search for indication of such non-coincidence. For that, we have divided the sources in two sets, extended and compact, according to the radio structure index given in the ICRF extension. The optical positions are from recent determinations (Zacharias et al., 1999) to get the highest precision and evenness of accuracy. The ICRF radio positions are of milli-arcsecond precision or better. The averages of the absolute value of the differences between the optical and radio arc lengths joining pairs of sources taken within each of the sets are found to be about 7.9 milli-arcseconds larger for the set of extended sources than for that of compact sources. This is interpreted as evidence of non-coincidence between the radio and optical centers, at least for the extended sources. Additional checks made with larger, different sets using the optical source positions from the USNO-A2.0 catalog support this conclusion.

A JOINT PROJECT BETWEEN USNO AND BRAZIL - THE ASTROMETRY OF ICRF SOURCES

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The talk will discuss the Brazil/USNO joint collaboration, involving the United States Naval Observatory (USNO) and 3 Brazilian research institutions: the Valongo Observatory (OV/UFRJ), the National Observatory (ON) and the National Laboratory for Astrophysics (LNA). From the Brazilian point of view, the project (underway since 1998) consists of systematic CCD observations of southern ICRF sources at the 1.6m Cassegrain telescope at LNA. The LNA fields add to the CCD frames of ICRF sources taken every year since 1999 at the 0.9m at CTIO in the South. Deep fields taken at KPNO cover the northern sky. The output from the deep field Astrometry of the combined southern and northern data is to be used on the final alignment of the UCAC (USNO CCD Astrograph Catalog) towards the ICRF. Primarily, though, this output will contribute to the study of the connection between optical and radio reference frames. One advantage of this combined southern/northern effort is to harmonize the data acquisition and reduction processes. Here, we discuss this methodology and the results for the reduction of 170 source positions observed at CTIO and at LNA, using as reference frame the latest version of the UCAC catalog. The analysis of positions regards three main points: a) astrometric performance of the UCAC; b) relative astrometric performance between CTIO and LNA based positions; c) optical/radio comparison. The standard deviation for the CTIO optical minus radio offsets were 30mas, with -9mas and -12mas for the R.A. and Declination offset averages. Similar values were found for the LNA comparisons. These and other results indicate a good internal precision for the CTIO and LNA observations and an outstanding astrometric performance for the UCAC catalog.

GROUND-BASED ASTROMETRY WITH THE ASPHO: OPTICAL-RADIO REFERENCE SYSTEMS CONNECTION

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The conclusion of the HIPPARCOS mission was a great success of space astrometry. But it did not make the ground-based astrometry measurements obsolete. Otherwise, it shows the importance of long series of ground-based astrometric data to increase and to improve the HIPPARCOS reference frame. An observational programme with the "Astrolabe Photoelectric" (ASPHO) was carried out for 20 years, approximately, at the Observatoire de la Côte d'Azur (OCA - long = 43º44'55".011 N ; lat = 00h27m42s.44 E), Grasse, France. In this work we analysed a set of ASPHO observations between 1993 and 1996 with 39 radio stars and from this, 12 were utilised to do the connection, given the systematic local effects between the optical and radio reference systems in the inertial reference context. It is known that precise positions and proper motions of optical counterparts of radio stars are needed in order to determine a direct link between the radio reference frame (VLBI) and the ground-based optical reference frame, based on fundamental stars. The radio stars observations have the aim to determine the local systematic differences between the optical and the radio reference frames in the construction of an inertial reference system. In this sense, we present in this work the optical positions determined by the radio stars observed, the comparisons between these optical positions which others optical positions found in the literature and also with the radio positions taken by VLBI and VLA techniques. The rotational angles that related these two reference systems were also determined. The radio stars were reduced utilising the HIPPARCOS catalogue and the preliminary results obtained related to the precision are: 21 mas in right ascension, 27 mas in declination - optical general standard deviation in position - and 1,03 mas - general standard deviation in the rotation angles. In spite of only 39 radio stars were analysed, we can conclude that the ASPHO is an instrument able to provide the positions of radio stars comparable with other optical determined positions and also comparable with radio positions given by VLBI and VLA techniques, confirming the opportunity of ASPHO programmes devoted to the connection of the optical and radio reference systems.

COSMOLOGIA

SOME OBSERVATIONAL CONSEQUENCES OF BRANE WORLD COSMOLOGIES

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The presence of dark energy in the Universe is inferred directly and indirectly from a large body of observational evidence. The simplest and most theoretically appealing possibility is the vacuum energy density (cosmological constant). However, although in agreement with current observations, such a possibility exacerbates the well known cosmological constant problem, requiring a natural explanation for its small, but non zero, value. Here we focus our attention on another dark energy candidate, that one arising from gravitational *leakage* into extra dimensions. We investigate observational constraints from current measurements of the angular size of high-z compact radio-sources on accelerated models based on this large scale modification of gravity. The predicted age of the Universe in the context of these models is briefly discussed. We argue that future observations will enable a more accurate test of these cosmologies and, possibly, to show that such models constitute a viable possibility for the dark energy problem.

THE SHAPE OF THE UNIVERSE VIA CMBR MAPS

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The problem of whether we live in a simply or a multiply connected universe is an open challenge in cosmology and is receiving increasing attention. One way to discover whether the universe has this property is through the statistical method of Cosmic Crystallography which looks for distance correlations in pair separation histograms (PSH) of complete catalogs of cosmic objects, such a catalog being a list of these objects –distributed in the whole observable universe– where each one has its spatial position determined by three coordinates (r,θ,ϕ). Performing numerical simulations one observe that distance-

correlations are revealed on these histograms as peaks or slight deviations and are present only in multiply connected spaces then evincing the sistematic –i.e. not randomness– presence of multiple images. However, the method has not been successfully applied and the reason is that complete catalogs of cosmic objects are not available due to observational constraints. However, a new an unexpected result –obtained also through numerical simulations– opens a path to find the topological properties of the universe. What we have found is that histograms of angular-correlations between pairs of cosmic objects are able to reveal topological signatures of a multiply connected 3-space. More precisely, performing the difference between the Pair Angular Separation Histogram (PASH) of objects in a mutiply connected space minus the PASH of objects in a simply connected one we obtain distinguishing signatures evincing the topological properties of the multiply connected space. In other words, catalogs with objects listed with its three coordinates (r,θ,ϕ) are not more necessary to look for topological properties of the universe, it is enough to know just its angular positions (θ,ϕ) in the sky. Since –present and future– accurate temperature maps of Cosmic Microwave Background Radiation contain exactly this type of information they turns out to be appropriate for devealing the topological properties (i.e. the shape) of the universe.

S A B

ENSINO E HISTÓRIA

BRAZILIAN INDIGENOUS ASTRONOMICAL SYSTEM

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Long before the first hominids ventured into Europe, the Middle East or Asia, the predecessors of early Homo scanned the southern skies from South Africa. Therefore, among all regions of the Earth, the Southern Hemisphere has by far the longest history of astronomical observation, even though its contribution to scientific astronomy came much later in comparison to Europe. The earliest known Southern Hemisphere astronomy are those associated with the native inhabitants of South Africa, Australia, New Zealand and South America, and it was only in the eighteenth century that scientific astronomy began to make its mark in some of these regions. In this work, we present part of the empirical knowledge of the Brazilian Indians, showing mainly how they determinate the calendar and cardinal orientation and how they associate the sky observations with the climate, the fauna and the flora of each region. Observations of the sky, which we have performed alongside the Indians of all Brazilian regions turned it possible to localize many indigenous constellations. We verify that the most important ones are located in the Milk Way and that they are constituted of individual stars and clouds, mainly dark ones, such as Coalsack.

EVOLUTION OF THE UNDERGRADUATE RESEARCH MENTORING IN ASTRONOMY AT VALONGO OBSERVATORY OF THE FEDERAL UNIVERSITY OF RIO DE JANEIRO (UFRJ)

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The Observatório do Valongo (OV) has gone through extensive changes along the nineties: infrastructure has been developed; the scientific staff qualification and the number of publications has increased; also the undergraduate curriculum was improved to agree to the present status of astronomical research. Among these changes, the number of advisors in charge of undergraduate research has

decreased due to a number of retirements as well as to the lack of available advisors away from the institution in order to acquire their Ph.D. This has brought an increase of undergraduate research under external advisorship. The aims of the undergraduate work are: the Final Project (a senior thesis requirement for obtaining the graduate degree); an oral presentation at the annual undergraduate research symposium (Jornada de Iniciação Científica - JIC) of UFRJ; posters at the annual meeting of the SAB. In this work we analyze the *effectiveness of research mentoring* considering mainly two groups: the OV staff and external undergraduate advisors. The *efficiency* of a group has been assumed as the percentage of works which have had a Final Project as culmination. The calculation for each group was done in bins of 3 years from 1984 to 1999. We conclude that the efficiency of the OV group has been growing up since 1993, which agrees with the recent maturation of the institution. This work is inserted in a comprehensive search for quality indicators in undergraduate courses of hard sciences.

S A B

ESTRELAS

THE NON-STATIONARY VARIABILITY OF AA TAU

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We studied the photometric and spectroscopic variations of the Classical T Tauri star AA Tau. We present 54 high-resolution echelle spectra taken simultaneously with UBVRI photometry over a 1 month period in November-December 1999. The AA Tau light curve had been previously shown to vary with a rather stable 8.2d period. Our observations show the system is dynamic and presented non-stationary variability both in the photometry and spectroscopy. Although our lightcurve is qualitatively similar to the previously published ones, presenting deep minima without much color change, one of the major sources of photometric and spectroscopic variability seems to have temporarily disappeared during one cycle and reappeared in the next one. The 8.2d period is only clearly recovered in the photospheric radial velocity variations, although hints of such a period exist in some photometric and spectroscopic features. The star exhibits strong emission lines that show substantial variety and variability in their profile shapes. Emission lines such as Hα and Hβ show both infall and outflow signatures and are well reproduced by magnetospheric accretion models with moderate mass accretion rates (10^{-8}-$10^{-9} M_{\odot} yr^{-1}$) and high inclinations ($i \geq 60^{\circ}$). The veiling is rather low (maximum value at 0.3) and shows variations that indicate the presence of 2 rotationally modulated hot spots corresponding to the two magnetosphere poles. The veiling does not correlate with the system's brightness but correlates well with the HeI line flux, with B-V and the V excess flux. We have indications of a time delay between the main emission lines (Hα, Hβ and HeI) and veiling, the lines formed farther away preceding the veiling changes. We propose a model of an active star with cold and bright spots surrounded by a warped disk to explain the observed photometric and spectroscopic variabilities. The accretion to the star is thought to be non-

stationary due either to an unstable and dynamic magnetic configuration or to short time accretion rate changes.

SPECTRAL EVOLUTION OF NOVA VELORUM 1999

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The study of the classical novae shells allows to diagnose with accuracy the physical conditions of the advanced phases in nova phenomenum. Nova Velorum 1999 (V382 Vel) was the brightest nova in the last 24 years being a good candidate to this study. This object probably is a neon nova wich is formed in a system where, according to theoretical models, there is an O-Ne-Mg white dwarf primary. In this work we present the spectral evolution of Nova Velorum 1999 shell during the first 3 years after the visual maximum. We verified an increase in ionization about 200 days after the outburst. In addition, 565 days after the outburst an increase in the blue continuum was observed, which is probably due to the reestablishment of the accretion disk. A shell ejection velocity of 1600 km/s and a damping time-scale of about 10 years were observed. The main results suggested that the shell is inomogeneous and non-spherical. We also estimated shell electronic temperatures and densities as well as the central source temperature. With these data we estimated lower limits to He, N, O, Ne, S, Ar and Fe numerical abundances. The results confirmed that this nova is a neon nova. The oxygen and neon abundance limits were relatively low when compared to other neon nova, but the neon abundances in this nova were high when compared with other heavy element abundances in this object. It was also found that iron is enhanced in the shell, when compared to solar value.

ORBITAL PERIOD CHANGES IN THREE SHORT-PERIOD SU URSAE MAJORIS STARS

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The observed-minus-calculated (*O-C*) diagrams of the eclipse timings of three dwarf novae of the SU UMa sub-class are presented and discussed. The (*O-C*) diagrams cover 28, 24 and 15 years, respectively for Z Cha, V2051 Oph and V4140 Sgr and show clear orbital period changes. Z Cha shows conspicuous

cyclical changes of period 27 years and amplitude 57 seconds. V2051 Oph shows multi-period cyclical changes on time scales of 4 and 8 years and with amplitudes of 10-15 seconds. The (*O-C*) diagram of V4140 Sgr shows less convincing evidence but can also be explained in terms of cyclical period changes on time scales of a few years. The best explanation for these observations is that of a solar-type magnetic activity cycle in the secondary star modulating its radius, and consequently the mass transfer rate and the orbital separation on time scales of years. These results support the recent findings of Ak, Ozkan & Mattei that the quiescent magnitudes and outburst interval of a sample of dwarf novae (including many SU UMa stars) show cyclical variations produced by solar-type magnetic activity cycles. Our results also confirm that the fully-convective secondary stars of these short period binaries still possess non-negligible magnetic fields. We discuss the implications of these results on the current theories to explain the observed gap in the distribution of orbital periods in cataclysmic variables.

MID-INFRARED OBSERVATIONS OF NGC 3576 IRS 1

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We present the results of high-resolution mid-infrared observations of the source NGC 3576 IRS 1. Near diffraction-limited images were taken at the Gemini South Observatory through OSCIR's filters N (10.8 μm), 7.9, 9.8, 12.5 and 18 μm. The source IRS1 could be resolved into 3 sources for the first time at mid-infrared wavelengths. For each source we constructed the SED from 1.25 to 18 μm, as well as the color temperature and the spatial distribution of the dust in the region. The SEDs were compared to different sets of SEDs obtained for intermediate-mass stars. The SEDs for IRS 1 are very similiar to those stars assumed to have a circunstelar disk, suggesting the same interpretation. The optical depth of the silicate absorption feature at 9.8 μm is estimated also.

METALLICITY GRADIENT IN THE GALACTIC DISK: ABUNDANCES OF OB STARS

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We present non-LTE abundances of carbon, nitrogen, oxygen, magnesium, aluminum, silicon and sulfur, derived for a sample of 70 O9-B2 main sequence

stars members of OB associations, open clusters and H II regions of the Galactic disk. A unique methodology was applied throughout the sample to proceed the chemical analysis, in order to produce a homogeneous set of abundance data. Only with such a database it is possible to analyze the distribution of the abundances in the Galactic disk. The methodology adopted in this study is based on the fitting of theoretical line profiles to the observed spectra without the simplifications introduced by the Local Thermodinamical Equilibrium. The adoption of more realistic calculations of the atomic level populations yields absolute abundances that are more correct. At the same time, the fitting of synthetic profiles permits the chemical analysis of stars with high projected rotational velocities, which is very frequent among B star. The distribuition of the chemical abundances are analyzed in terms of radial gradients in the Galactic disk, within 4.4-12.9 kpc from the center of the Galaxy, with the Sun at $R_{\odot}$=7.6 kpc. The derived gradients are between -0.031 *dex kpc*$^{-1}$, as for oxygen, and -0.049 *dex kpc*$^{-1}$, as for silicon. The oxygen gradient is flatter that those presented by the most recent studies about the radial gradients of stellar abundances.

SPECTROSCOPIC ANALYSIS OF MASSIVE STARS IN TRANSITION

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The possible evolutionary connection of different types of massive stars is not clear. For instance, the relations between Of and WN9/Ofpe stars, B[e] Supergiants (B[e]Sg) and Luminous Blue Variables (LBV), Red and Yellow Supergiants (RSG and BSG), WN and WC stars. The existence of few objects in these classes is a problem. This problem becomes bigger for transition evolutionary phases, due to the even smaller number of members. In this contribution we concentrate on a few key objects that are believed to be in such transition phases. We have performed spectroscopic studies using FEROS, Coud/'e and Cassegrain spectra obtained in the 1.52m ESO telescope and in the 1.6m LNA telescope. The analysis of the data have been done employing a non-LTE radiation transfer code apropriate for emission lines formed in a rapidly expanding wind. Recently concluded works will be presented: (1) Physical parameters of the LBV candidate HR Carinae; (2) The nature of the peculiar B Supergiant HD 327083; (3) Description of the "Eta Carinae-like" spectra of SS73 11; (4) A spectral atlas of the pre-WN candidate HD 326823. We conclude that a physical analysis of particular objects may contribute to clarify the relation between different types of stars.

CONVECTIVE ENVELOPE DEEPENING, ACTIVITY, LITHIUM AND ROTATION OF LATE-TYPE STARS

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In the present work we investigate the physical processes that underline the lithium abundance, activity, and rotational discontinuities along the subgiant branch, specifically the influence of the convective envelope deepening along this phase. For this purpose we determine the evolutionary status and individual masses of our stars by using the HIPPARCOS (ESA 1997) parallaxes and by comparing the observational Hertzsprung-Russell diagram with evolutionary tracks computed with the Toulouse-Geneva code (do Nascimento *et al.* 2000 A&A 357, 93). We quantify from the models the deepening of the convective envelope at this phase and we compare with rotation, lithium and chromospheric activity evolution along the subgiant branch. Our results shed new light on the convective envelope influence on lithium, rotation and chromospheric activity discontinuities in the evolved stars.

THE STELLAR VARIABILITY INFLUENCE ON CIRCUMSTELLAR DUST SHELLS

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Asymptotic Giant Branch stars present high instabilities, which drastically change their inner structures as well as photospheric chemical abundance. These instabilities induce the ejection of the outer layer of the photosphere, increasing its density and grain condensation possibility. At this phase the star loses mass copiously as a consequence of stellar wind driven by the radiative pressure on dust grains. The low velocity wind and high density are typical in these circumstellar dust shells. In this work, we have calculated models that describe the radiative transfer in circumstellar dust shells of AGB stars. The models were calculated in two different luminosity phases in order to analyze infrared spectra of four Oxygen-rich Mira-type stars. The code used is described in Lorenz-Martins & Pompéia (2000) and the models were fitted to IRAS-LRS and ISO-SWS01 spectra. The main results have shown that at maximum luminosity phase, parameters such as optical depth and grain size decreases while the inner radius of the dust envelope increase. These results show that physical conditions in dust envelope of Mira variable stars can change drastically during luminosity phases.

ALPHA & HEAVY ELEMENTS ABUNDANCES OF NEARBY BULGELIKE DWARF STARS

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A sample of nearby bulgelike dwarf stars, with special kinematical properties and probable origin near the bulge, is studied. Ages derived by using isochrones give 10-11 Gyr for these stars and metallicities range -0.80 = [Fe/H] = +0.40 dex. We calculate stellar parameters from spectroscopic data, and chemical abundances of alpha, r and s -process elements are derived by using spectrum synthesis. We found that alpha-elements ratios relative to iron behave in different ways depending on the element. Ca, Si and Ti decline smoothly for increasing metallicities, and follow the disk pattern with greater similarity to stars of small galactocentric distances. Similar pattern is found for Ca and Si relative to bulge stars of McWilliam & Rich (1994) and Rich & McWilliam (2000). Mg and O, the main products predicted for massive supernovae (Timmes et al. 1995) and also the r–process element Eu, are overabundant relative to disk stars, with a steep decline in [Fe/H] -0.3. s-elements abundance ratios show no apparent trend with metallicity, with roughly solar values. References: McWilliam, A., Rich, R. M. 1994, ApJS, 91, 749 Rich, M., McWilliam, A. 2000, Proc. SPIE Vol. 4005, p. 150-161, Discoveries and Research Prospects from 8- to 10-Meter-Class Telescopes, ed. Jacqueline Bergeron Timmes, F. X., Woosley, S. E., Weaver, T.A. 1995, ApJS 98, 617

EXTRAGALÁCTICA

LOCALIZATION AND OBSERVATION OF GRB010921 BY THE HETE SATELLITE

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The HETE satellite was successfully launched into equatorial orbit on 9 October 2000 and is the first space mission entirely devoted to the study of gamma-ray bursts (GRBs). HETE utilizes a matched suite of low energy X-ray, medium energy X-ray, and gamma-ray detectors mounted on a compact spacecraft. A unique feature of HETE is its capability for localizing GRBs with ~1-10 arcmin accuracy in real time aboard the spacecraft. GRB locations are transmitted, within seconds to minutes, directly to a dedicated network of telemetry receivers at 13 automated "Burst Alert Stations" (BAS) sited along the satellite ground track. One of these stations is located at Natal, RN. The BAS network then re-distributes the GRB locations world-wide to all interested observers via Internet

and the GRB Coordinates Network (GCN) in ≈1 s. Thus, prompt optical, IR and radio follow-up identifications can be anticipated for a large fraction of HETE GRBs. On September 21, 2001, the FREGATE γ-ray instrument on HETE detected a bright GRB. The burst was also seen by the X-detector on the WXM X-ray instrument and was therefore well-localized in the X direction; however, the burst was outside the fully-coded field-of-view of the WXM Y-detector, and therefore information on the Y direction of the burst was limited. Cross-correlation of the HETE and *Ulysses* time histories yielded an Interplanetary Network (IPN) annulus that crosses the HETE error strip at a ~45 degree angle. The intersection of the HETE error strip and the IPN annulus produces a diamond-shaped error region for the location of the burst having an area of 310 square arcminutes. Based on the FREGATE and WXM light curves, the duration of the burst is characterized by a t_{90} = 18.4 s in the WXM 4 – 25 keV energy range, and 23.8 s and 21.8 s in the FREGATE 6 – 40 and 32 – 400 keV energy ranges, respectively. The fluence of the burst in these same energy ranges is 4.8 10^{-6}, 5.5 10^{-6}, and 11.4 10^{-6} erg cm^{-2}, respectively. Subsequent optical and radio observations by ground-based observers have identified the afterglow of GRB010921 and determined an apparent redshift of z = 0.450.

THE LOW-LUMINOSITY END OF THE STARBURST-AGN CONNECTION: LINERS AND TRANSITION OBJECTS

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Much is said about the connection between Starbursts and AGN, but so far this connection has only been studied in the moderate to high luminosity regime of Seyfert galaxies and quasars. Our previous work has concentrated on type 2 Seyferts, where we have found a high incidence of circum-nuclear starbursts. In these composite starburst+AGN systems the starbursts account for a substantial fraction of the global energetics. Little, however, is known about starbursts around less luminous (but more numerous!) AGN such as LINERs and Transition Objects. Does the Starburst-AGN connection traced by Seyferts extend to the low-luminosity end of the activity scale? This question can be rephrased in the jargon of Low Luminosity AGN (LLAGN) studies. LLAGN are subdivided into LINERs and Transition Objects (TOs). The latter are defined as systems whose emission line ratios straddle the AGN and HII-region loci on diagnostic diagrams, which

indirectly suggests the presence of a starburst component. Is that so? Do TOs harbour circum-nuclear starbursts? Could they be scaled down versions of the composite starburst + AGN systems found in Seyfert galaxies? In order to answer this question we have carried out a spectroscopic survey of 44 LINERs and TOs using the N.O.T 2.5m and Kitt Peak 2.1m telescopes. The spectra cover the 3500–5400 Å range with a resolution of 2.5 Å and S/N >30. This range contains a number of *stellar* features which provide a *direct* diagnostic of the presence of starbursts, such as the high order Balmer lines (typical of old starbursts, ~10^8 yr) and the WR bump (<10^7 yr). Other stellar lines, such as CaII K and the G band are also useful to characterize the stellar content. In particular, they have proved instrumental in identifying composite starburst+AGN composites by means of empirical population synthesis techniques developed by our group. Here we report preliminary results of the analysis of these data. So far our main results are: (1) High order Balmer lines have been detected in many LINERs and TO's. (2) These same lines were also detected in a couple of low-luminosity Seyfert 1's! (3) The empirical population synthesis analysis separates the sample onto two blocks: those with and those without circum-nuclear starbursts. All indications are that Transition Objects are indeed composite systems and thus that the Starburst-AGN connection is not restricted to luminous galaxies.

GRAVITACIONAL LENSING IN THE MOST MASSIVE CLUSTERS

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We have studied the mass content and distribution in a sample of 32 X-ray luminous galaxy clusters using the weak-lensing technique. Mass maps were obtained using a non-parametric reconstruction procedure and the mass inside a given radius was estimated using the single isothermal sphere model to fit the weak shear data. We find that there is a good correlation between mass and X-ray luminosity or temperature. We also find that the cluster A2163, one of the most X-ray luminous cluster known, is a clear outlier in these relations. The mass to luminosity relation found for the whole sample is M/L ~ 300h (solar unities).

THE STUDY OF GLOBULAR CLUSTERS SYSTEMS IN COMPACT GROUP

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Globular cluster systems are tracers of main star formation episodes suffered by their host galaxies. The study of globular cluster systems around galaxies in small groups is a blank on this subject literature and the results of this work are a first effort to fulfill this blank. We have studied globular cluster systems around elliptical galaxies in Hickson compact groups using multi–band deep high quality images from Keck, VLT and CFHT. Analyzing the luminosity functions, specific frequencies, color and spatial distributions, we could determine the properties of the globular cluster systems of those galaxies and their relation with the small groups environment. Using the properties of the globular cluster systems we are able to trace the star formation histories of our subsample of the Hickson catalog. We have found poor populations, concentrated toward the center of the galaxies, with bimodal color distributions.

THE RELATION BETWEEN SÉRSIC LAWS ALONG THE MAJOR AND MINOR AXES OF ELLIPTICAL GALAXIES

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In this paper we present a mathematical transformation that explains the difference found between Sérsic laws fitted along major and minor axes of elliptical galaxies, a long-standing photometrical puzzle. This transformation appears naturally when isophotes can be suitably fitted by ellipses whose major axis are aligned and follow a determined, although very general, eccentricity law. The transformation acts on the major axis brightness distribution furnishing that of the minor axis. For constant eccentricity, only the coefficient of $R^{1/n}$ is changed, while for distance dependent eccentricity the transformation is given by the Lerch Φ transcendental function. We discuss eight galaxies ranging from E0 to E6, three of them with similar Sersic law along minor and major axes, four with $n_{maj} \geq n_{min}$ and one with $n_{min} \geq n_{maj}$.

BARRED GALAXIES WITHOUT DISKS?

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After more than 30 years of research on the origin and evolution of bars in galaxies, they still stand as an enigma in astrophysics. The most widely accepted mechanism for bar formation is not able to explain, for instance, how lenticular (S0) galaxies can host bars, since S0's are considered as dynamically hot systems, a hostile environment to their presence. Looking for a better understanding of this phenomenon, we have applied a structural analysis algorithm to optical and infrared images of 2 face-on barred S0's, namely, NGC 4608 and NGC 5701. The results indicate that these galaxies do not have disks, or at least, if they exist, they are not the usual large-scale Freeman disks. Two alternatives to explain why we see barred galaxies without disks are discussed. Firstly, using n-body simulations, we consider the effects of a non-spherical massive halo in the dynamical evolution of a spheroid, and show that as a result a bar can be formed. Secondly, the secular evolution of the bar could have been strong enough to destroy a pre-existent disk. We discuss these two alternatives considering present theories of bar formation and evolution.

STRUCTURAL COMPONENTS AND DUST CONTENT OF THE CENTRAL KPC OF NGC 7626

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The goal of this work is to study the core formation and structural properties in early-type galaxies. To this end, we have selected the luminous (M_B=-22) elliptical galaxy NGC 7626 located at the center of Pegasus I cluster. This galaxy has two strong radio jets and strong X-ray emission. The photometric properties and dust distribution of the central (R<12") region of NGC7626 have been determined using high resolution V, I (HST), K' (Gemini) and K_s (LCO) images. The luminosity profiles inner to R=218 pc are neither a power-law or core type profile. A central warped dust disk of major diameter of 200pc and sharp dust arcs at R=1 Kpc and R=0.5 Kpc are found. Outside R=10" the luminosity distribution follows the $R^{1/4}$ law and the colors V-I and J-K do not seem to be affected by dust.

LUMINOSITY EVOLUTION OF POWERFUL DOUBLE RADIO SOURCES

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An important tool to understand how the radio luminosity and radio source size vary over its lifetime is the power-diameter (P-D) diagram. We have investigated the luminosity evolution of double radio sources within the framework of three different self-similar models for the source expansion. We calculate the inferred radio luminosity of the source assuming that the energy density of the relativistic particles is equal to the hydrodynamic pressure. The magnetic field was calculated in two ways: Assuming equipartition of energy between relativistic particles and fields and magnetic flux conservation inside the cocoon. Radiation losses were taken into account and two different models (Kardashev-Pacholczyk and "continuous injection") used to calculate the change in the radio spectrum. We have considered that the bulk of the radio emission comes either from the source head or from the whole cocoon. The radio power is plotted as a function of source size (P-D diagram) and compared with the observed power-size distribution. We have also made use of a detailed analytical model of double radio source expansion based on an extensive analysis of numerical hydrodynamic simulations to investigate its luminosity evolution. The evolutionary tracks were plotted in a P-D diagram and compared with the predictions of self-similar models.

RECENT EVOLUTION OF THE ACCRETION DISK OF NGC 1097

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We discuss the recent evolution of the broad double-peaked Hα profile from the LINER/Seyfert 1 nucleus of NGC 1097. While in the first years of observations the main variation was in the relative intensity of the blue and red peaks, in the last 5 years we have also observed an increasing separation between the two peaks, at the same time as the integrated flux in the broad line has decreased. In addition, in the last 3 yrs of observations, the central wavelength of the double-peaked line has shifted to bluer wavelengths. Based on these observations, we propose a scenario in which the source of ionization is getting dimmer, with its ionizing radiation reaching successively smaller distances in the disk, and thus regions of higher velocity, producing the increasing separation in the two peaks. The shift in the central wavelength of the double-peaked profile observed in the last three years of observations suggests the onset of a wind with velocity about -500 km s^{-1} by the end of 1998. It is the first time that such evolution is observed, giving additional suppport for the accretion disk as the origin of the double-peaked profile.

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SOLAR BRIGHTNESS DISTRIBUTION USING TOMOGRAPHIC RESTORED BEAMS

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Moderate spatial resolution (arc min) of 22 and 48 GHz beam pattern of the Itapetinga radio telescope smear out most of the faint brightness structures of the solar maps. Also, the artificial limb darkening caused by the solar disk to sky transition convolved with the beam pattern prevents the limb brightness distribution to be directly observed. To enhance the contrast of these brightness structures on the solar disk and to remove the limb darkening we developed a beam pattern restoration using computed tomography that can be applied directly on the solar map under analysis. We emphasize the importance to restore the beam shape from the analyzed map because large antenna dishes may produce beam pattern variations as a function of the elevation angle as already measured at Itapetinga. This gain variation affects more 48 GHz than 22 GHz. Although de-convolution can be used to remove the beam pattern brightness degradation, the high brightness gradient on the solar limb may cause the appearance of brightness artifacts. Contrast enhancement obtained by subtraction of a brightness distribution from a homogeneous disk after convolution with the restored beam pattern resulted in a better method of analysis. We present here the first application of this methodology in a solar map obtained by 250 radial scans in 22 and 48 GHz showing good correlation of faint structures such as faculae observed in a H-a image from Big Bear Solar Observatory. A 15-30% limb brightening was also observed at both frequencies. Many filaments were observed mainly in 48 GHz maps due to the better spatial resolution.

ON THE ORIGIN OF THE RAPID SUBMILLIMETER SPIKES

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The Solar Submillimeter Telescope (SST) has shown that during Solar activity, rapid submillimeter spikes with duration from 100 ms to 1 second occur and their physical origin is still not very clear. We present in this work an statistical analysis of these spikes during active region tracking observations. In the last 20 years there is an abundant literature showing that solar bursts show neither spatial nor temporal main scale. This was interpreted in the light of the Avalanche Model. In the frame of this model we carried out the study of the waiting time distribution (WTD), that is, the distribution of the time interval between events observed with the SST. These results represent a new test for the Avalanche Model since the SST is the only telescope observing the Sun at submillimeter frequencies. We find that the WTD of the rapid submillimeter spikes is not fitted by a simple exponential law as the stationary Avalanche Model suggests. The rate of spikes, instead, is well fitted by an exponential law. Both results support that these spikes have an origin in a non-stationary avalanche process.

STOCHASTIC ELECTRON ACCELERATION IN SOLAR FLARES

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A large fraction of the energy released in a solar flare goes into particle acceleration. A better understanding of the flaring process is only possible once the particle acceleration and transport mechanisms are known. Several mechanisms have been proposed in the literature for particle acceleration, in this work we concentrate on stochastic acceleration or second-order Fermi processes. The flare emission, observed in X-rays and radio frequencies, is produced by these accelerated particles. In particular, the non-thermal electrons produce hard X-ray via bremsstrahlung when they interact with the lower chromospheric material. We have analyzed the hard X-ray emission and spectra of 118 solar flares observed by BATSE, on board the Compton Gamma-Ray Observatory. The observations can be divided into three types according to the temporal evolution of their spectral index, namely, (1) hard-soft-soft, (2) soft-hard-soft, and (3) soft-hard-harder, with a continuous transition between them. The difference between the flares of each type seem to be due to the number of accelerated electrons and the density in the magnetic loops. On one extreme, the flares with softer spectra (HSS) are the most impulsive ones, with basically no trapping of particles, probably due to the low density of the magnetic loop. In this case, the particles precipitate almost immediately, with the more energetic ones arriving before the lower energy ones. On the other hand, the flares with harder spectrum (SHH) tend to last longer (duration longer than 1 minute), during which a large number of electrons are accelerated. However, a large number of these are trapped in the magnetic looptops, causing their spectrum to harden due to Coulomb collisions. For these flares, a delay between the higher energy emission (from high energy electrons) with respect to the lower energy counterpart is observed. In these flares, multiple injections of particles are commonly detected. In order to explain the observations, we have used a software code which calculates the spectra of accelerated particles by stochastic mechanisms, taking into account transport effects along magnetic loops.

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ANALYSIS OF COLOUR-MAGNITUDE DIAGRAMS OF RICH LMC CLUSTERS

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We present the analysis of deep colour-magnitude diagrams (CMDs) of six rich LMC clusters. The data are part of the HST GO7307 project, entitled "Formation and Evolution of Rich Star Clusters in the LMC", and were obtained with HST/WFPC2 in the F555W (~*V*) e F814W (~*I*) filters, reaching m_{555}~25. The cluster sample is composed by NGC1805 and NGC1818 (τ<100 Myr), NGC1831 and NGC1868 (300<τ<900 Myr), and NGC2209 and H14 (τ>1000 Myr). We discuss and apply a method of correcting the cluster CMDs for sampling incompleteness and field star contamination. Efficient use of the CMD data was made by means of direct comparisons of the observed to model CMDs. The CMD modeling process yields a synthetic Main Sequence (MS), where the model input parameters are age (τ), metallicity (*Z*), present day mass function (PDMF) slope (α), fraction of unresolved binaries, distance modulus and extinction (*E*(*B*-*V*)). The photometric uncertainties were empirically determined from the data and incorporated into the models as well. Statistical techniques are presented and applied as an objective method to assess the compatibility between model and data CMDs. By modelling the CMDs in the central cluster region we infer the metallicity (*Z*), the intrinsic distance modulus ($(m\text{-}M)_0$), the reddening value (E(B-V)) and the PDMF slope (α) for each cluster. We also determine the age for the clusters with τ>300 Myr. The analysis of the positional dependence of α in the richest clusters, by means of CMD modelling in concentric regions, shows the effects of mass segregation in these systems.

ON THE NATURE OF A SECONDARY MAIN SEQUENCE TURN-OFF IN THE RICH LMC CLUSTER NGC 1868

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Evidence for a second main-sequence turn-off in a deep colour-magnitude diagram of NGC 1868 is presented. The data were obtained with HST/WFPC2 and reach down to $m_{555}\simeq25$. Besides the usual $\tau\simeq0.8\,Gyr$ turn-off found in previous analyses, another possible turn-off is seen at $m_{555}\simeq21$ ($M_V\simeq2.5$), which is consistent with an age of $\tau\simeq3\,Gyrs$. This CMD feature stands out clearly especially when contaminating field LMC stars are statistically removed. The background subtracted CMD also visibly displays a red subgiant branch extending about 1.5 mag below the younger turn-off and the clump of red giants. The significance of the secondary turn-off in NGC 1868 was confirmed with Monte-Carlo simulations and bootstrapping techniques. Star-counts in selected regions in the cluster CMD indicate a mass ratio of old population/young population in the range 5% M_{old}/M_{young} 12%, depending on the mass function slope. The existence of such a subpopulation in NGC 1868 is significant even in the presence of uncertainties in background subtraction. The possibility that the secondary turn-off is associated with the field star population was examined by searching for similar features in CMDs of field stars. Statistically significant excesses of stars redwards of the main-sequence were found in all such fields in the range 20 m_{555} 22. These however are much broader features that do not resemble the main-sequence termination of a single population. We also discuss other alternative explanations for the feature at $m_{555}\simeq21$, such as unresolved binarism, peculiar stars or CMD discontinuities associated with the Böhm-Vitense gap.

S A B

INSTRUMENTAÇÃO

AN ACHROMATIC VERSION OF THE HG-MASK CORONAGRAPH OF THE OBSERVATORIO NACIONAL - RJ

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The observation of faint astronomical objects very close to bright sources is limited by scattered light. Whereas a Lyot coronagraph can reduce the amount of light scattered from the bright object and prevent the saturation of the detector (Lyot, 1939), the remaining scattered light still needs to be reduced for an efficient detection of objects close to bright sources. The scattering process is a consequence of the entire optical path: atmospheric turbulence, diffraction by the telescope aperture, and surface roughness of optical elements (Roddier and Roddier 1997). The Lyot coronagraph reimage the telescopic focal plane onto the CCD. On the focal plane of the telescope the occulting disk masks the central core and the first three or four rings in the Airy diffraction pattern of the bright source. Without adaptive optics, the Earth atmosphere induces scattered light in the wings of the seeing disk, and its variation depends on the atmospheric turbulence. An Hg-mask coronagraph permits the optimization of the occultation (Bourget et al 2001). In order to minimize the atmospheric turbulence and to realize an automatic centering of the coronagraph we present a new system of tip-tilt correction. The new version of the Hg-mask coronagraph of Rio de Janeiro National Observatory is presented, with a new achromatic optical design. The results of the preliminary tests will be presented.

THE PARAMETER ESTIMATION METHOD IN A T TAURI DISK MODEL

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We have applied a simple model to explain the circumstellar structure of T Tauri stars (TTS) by a χ^2 fitting of the observed Spectral Energy Distribution (SED) to evaluate the disk and/or envelope contribution to the total luminosity of the

system. The main goal of our project is to compare the circumstellar emission to other indicators of the evolutive status of pre-main sequence stars. The assumed structure considers two dust components and the main fitting parameters are: disk and envelope radius, optical depth and angle of view. A unique best fit is found depending on the number of data points related to the number of free parameters. If the parameters are weakly constrained in the model, the same set of data points can be fitted by a number of parameter sets. In the present work, we discuss the ambiguities of parameterized dust disk models for young stellar objects, as suggested by Thamm et al. (1994). We describe the method to estimate the permissible range of parameters by considering volumes of confidence levels. The χ^2 values are mapped in a projection of the parameter space and the confidence levels are identified. Some results of calculating and plotting out such confidence limits are presented for of a selected TTS sample. The main conclusion of this study is that the problem of multiple solutions in the SED fit can be solved by a statistical treatment of the parameter sets and verifying the discrepancies among them when compared with a common solution.

THE COROT SATELLITE AND BRAZILIAN PARTICIPATION

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The COROT satellite (COnvection, ROtation and Planetary Transit) is part of the small mission programs of French space agency CNES. Other European countries will participate on the mission in an equally shared scheme. The satellite will be launched in early 2005 and has two scientific goals: to perform stellar seismology and to search for extrasolar planets. In both cases, the aim will be to detect phenomena or objects that have never been observed, and in this sense the launch of COROT will be a world premiere. Both these rather distinct objectives in the same mission can be performed because they use the same technique of very high precision stellar photometry (one hundred times better than what can be achieved from the best observatories on Earth), and continuous observations of the same part of the sky over very long periods (at least 150 days). This is impossible from Earth, since the Earth's rotation around the Sun only allows us to observe the same part of the sky for 2 to 3 months and only at night. Stars pulsate non-radially and the frequencies of these oscillations depend on the physics of the cavity (that is, the stellar structure) where they develop. Moreover, the frequencies observed on the stellar surface can be used to infer the physical properties of the stellar interior through data inversions, in the same way as geophysicists study the Earth's structure by analyzing earthquakes. Non-radial oscillations (nro) have been discovered in the Sun in the early seventies. The great number of existing oscillation modes and the fact that the Sun's disk can be

resolved yielded spectacular results concerning the Sun structure and even its Helium abundance. With COROT we expect to gather oscillatory data mainly on F-G-K, Delta Sct, Ap, Be and WD stars, that will be of unprecedented value to test our stellar structure and evolution models. One of the ambitious goals of COROT will be the study of transport and mixing phenomena inside the stars (COnvection and ROtation). For over 5 years now, we have known of several dozen planets gravitating around stars other than the Sun. These planets, which were discovered by measuring the perturbation produced by the planet on the star's motion, are all large planets comparable to Jupiter, often located much closer to the their star. One question remains: are there smaller extrasolar planets similar to the Earth? COROT will be able to answer this question for the first time, in cases where the line of sight is near the plane of the planet's orbit. An eclipse or a transit of the planet will then be observed due to the photometric accuracy attained by the satellite. About one hundred planetary systems are expected to be discovered by COROT along with a few dozen tellurian planets. Brazilian astronomers have unprecedented opportunity to participate in a scientific satellite since its pre-launching phase, sharing the same rights as the other European partners. We contribute already in the definition of the input catalogue since 2001 and we will take part in the final choice of targets. Also, five positions for scientists/engineers are offered to Brazilians from late 2002 to work with the software of satellite control, instrument mock-up and data reduction. Details of the procedures for our participation in the COROT mission will be exposed.

FIRST OBSERVATIONS WITH THE ITAPETINGA DIGITAL CORRELATOR

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The digital correlator is an instrument for spectroscopic observations of radio-astronomical sources. Its working principle is to estimate the auto-correlation function of the input signal. Its Fourier transform gives its power spectrum. This calculation made in digital form, contrasts with the multichannel approach, where each channel is a narrow analog filter. Other method is the acusto-optical spectrometer, where a laser is diffracted by a piezoelectric crystal. With respect to these methods, the correlator is more compact, easier to calibrate, more robust to ambient variations and easier to upgrade. It is only limited by digital technology, which is always advancing. A high-speed input window comparator was added to the already developed correlator chip, allowing measures of synthesized signals. The prototype was then taken to the Itapetinga Radio-Observatory, where a strong line source, W49, was observed at three different resolutions. For the completion of the instrument, an input filter was designed

using well-established methods and with the help of an electromagnetic simulation tool. The measurements results and the filter response are presented here. We conclude that the test results indicate that the instrument performed successfully for this stage of development.

SAB

MECÂNICA CELESTE

AUTONOMOUS ARTIFICIAL SATELLITE ORBIT DETERMINATION IN REAL-TIME USING SINGLE FREQUENCY GPS MEASUREMENTS

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A simplified and compact algorithm with low computational cost providing an accuracy around tens of meters for artificial satellite orbit determination in real-time and onboard, using the Global Positioning System (GPS), is developed in this work. The state vector, composed of the position, velocity, bias, drift, and drift rate of the GPS receiver clock, is estimated by the extended Kalman filter. The fourth order Runge-Kutta numerical integrator is used to integrate the state vector. In the equations of motion are considered only the perturbations due to the geopotential. The state error covariance matrix is propagated through the transition matrix, which is calculated in an optimized way. The single frequency GPS measurements are used as observation ones. These are corrected regarding GPS satellite and receiver clock offsets. The ionospheric effect is evaluated on these measurements by the dual frequency model to measure the impact in the accuracy. To validate this algorithm, the real data of the Topex/Poseidon satellite are used. The results are compared against the precise ephemerides orbit POE files of this satellite released by JPL/NASA. The position and velocity errors obtained vary from 15 to 20 m and from 0.014 to 0.018 m/s, respectively, with and without Selective Availability (SA).

EFFECTS OF THE INCLINATION AND SHORT PERIOD TERMS OVER A SIMPLIFIED MODEL FOR THE 3: 1 ASTEROIDAL RESONANCE

Sueli A.Guillens, Daniel Rodrigues C.Mello, Luis Gustavo de Almeida
OV/UFRJ

A simplified model for the 3: 1 resonance based on the mean elliptic planar restricted three-body has been presented by Guillens, Vieira Martins and Gomes

Silva (2002- submitted to AJ). In order to analyze the neighborhood of this resonance, the authors have introduced a representative plane, which coordinates are the semi-major axis and eccentricity. In this work the effects, due to the inclination and short period terms, over the coordinates have been studied. Asteroids with different inclination values (i>10^0) in the 3: 1 resonance neighborhood are selected. Osculating elements at a given epoch (t_0) are taken as initial conditions for the numerical integration of the simplified model. For each asteroid the first orbit intersection with the representative plane is calculated and the intersection time (t_p) is registered. The full three-body problem equations are numerically integrated over the time range (t_p-t_0). The orbital element outputs are considered as a set of initial conditions for the simplified system. Then for each asteroid various intersections are obtained and scattered points result from the integration. Variations of the coordinates are calculated by taking the difference between the coordinates of these points and those ones of the original first intersection. We have been searching a correlation between inclination, mean longitude (fast angle) and these variations. The first author thanks to FUJB.

S A B

MEIO INTERESTELAR

GIANT HERBIG-HARO FLOWS: 3D SIMULATIONS OF THE PROTOTYPE HH34

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2 - UNAM
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The optical jets associated with low-mass, young stars have long been of interest. First discovered over 15 years ago, these narrow strands of emission trace stellar winds that have been collimated in a bipolar fashion. The discrete Herbig-Haro knots along the jets are radiating shock fronts within this flow. It has been recently discovered that spatially separated Herbig-Haro objects, once considered unrelated, are linked within a chain that may extend for parsecs in either direction of the embedded protostar forming a *giant Herbig-Haro jet*. Presently, several dozen of these giant flows have been detected, but the first clearly identified giant flow was the HH 34 system in the L1641 dark cloud of Orion A. Wide-field imaging showed that about a dozen Herbig-Haro objects fall along a gentle S-curve centered on the star, and extending over 1.5 pc. Moreover, their velocities decrease smoothly and systematically with distance on either side of the star. In a recent work, de Gouveia Dal Pino (ApJ, 551, 347, 2001) has shown that this decelaration is due to momentum transfer by gas expelled sideways from the travelling HH knots. We here present fully 3D, gasdynamic simulations of precessing, overdense, radiatively cooling jets modulated with long-period (P ~ several hundred years) and large amplitude sinusoidal velocity variability at injection, with the purpose of modelling the giant HH 34 system. The simulations are able to reproduce the observed S-shape which seems to be due to jet precession, and the derived H_α emission line maps qualitatively describe the observed emission structure of HH 34. Besides, the combined effects of both sideways momentum transfer by the travelling HH knots, and precession provides the observed deceleration pattern (Masciadri, Raga, de Gouveia Dal Pino & Noriega-Crespo, A&A, 2002).

SAB

PLASMAS E ALTAS ENERGIAS

SIMULTANEOUS RADIO/X-RAY OBSERVATIONS OF SCO X-1

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We present simultaneous radio/X-ray observations of Sco X-1, the brightest persistent LMXB in the soft X-ray band and also the brightest radio source among neutron stars LMXBs. From recent VLBI observations of Sco X-1 a variable core and two (also variable) radio lobes (jets) were discovered, with lobes moving with an average speed of 0.45 c. Hard X-ray studies of Sco X-1 were presented before based on HEXTE/RXTE data, showing a variable hard X-ray tail without any correlation with mass accretion rates states. Our results are derived from observations carried out in 1999 by RXTE (soft to hard X-rays), VLA, APT and EVN (radio) and represent a unique chance for any correlation studies between the radio/X-ray emission in LMXB harbored by neutron stars. We found that the source was not observed often in the flaring branch (FB) part of the X-ray color diagram (CD), as expected from models predicting that during radio loud states the accretion rate should be not so large. We observed a hard X-ray tail (HXT) only once (UT date 12.00 to 12.11) after a peak in the radio emission of the core (UT date 11.70). This was the only HXT observed after a peak in the radio emission, suggesting that there's no correlation between the production of hard X-rays and jet emission in Sco X-1, as opposed to X-ray binaries containing black holes. This HXT detection follows the idea proposed by D'Amico et al. (ApJ 547, L147, 2001; Adv. Spa. Res. 28, 389, 2001) that the hard X-ray spectrum is as flat as the mass accretion rate increases. It also fits the idea, by the same authors, that the production of HXT in Z sources is a process triggered when the thermal brightness of the source is above a certain threshold value. Since the HXT production is not correlated with accretion rate these observations may be indicating that the production of hard X-ray tails in Sco can occur very near or at the neutron star surface. In conclusion, we can see from our results that the models used to explain the hard X-ray production from the radio jet emission in X-ray binaries containing black holes can not be used in the case of Sco X-1.

COLLIDING WINDS IN MASSIVE BINARY STELLAR SYSTEMS AND DUST FORMATION: AN APPLICATION TO ETA CARINAE

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Almost all massive binary systems present high-energy fluxes, not originated in the stars, but around them, indicating the presence of colliding winds. We analyze a model for a binary massive stellar system where the colliding winds create a shock region. We determine the changes of physical parameters in the post-shock gas. After shock, cooling by radiative losses increases density, as temperature decreases. After this cooling process, we show that this gas, cold and dense, is capable to generate dust. Our approach explains the increasing dust ring, formed during the periastron passage, observed in WR140. An application for the massive binary system of eta Carinae shows that, probably, the decline of X-rays fluxes observed in its light curve is a consequence of its high absorption in periodic dust formation events, near the periastron passage.

DISPERSIVE DOPPLER EFFECT IN ASTROPHYSICAL OUTFLOWS

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In this work, we have investigated dispersive relativistic effects on the shifted emission lines of SS433 produced in the jets at distances about 10^{13} cm from the central source, where the optical and IR emissions peak. Our previous studies have shown the explicit dependence of the plasma dispersion properties with the macroscopic global motion of the fluid. It has been found that the anisotropic character of the plasma can be altered so strongly that it changes its dispersive features, and the plasma acquires new optical properties. Usually, the observed frequency in an astrophysical source is so high compared with the plasma frequency that the dispersive properties of the medium have no influence on the Doppler shifting. However, at low frequencies, the dispersive plasma properties may become important and small corrections to the Doppler shift relation must be introduced. We have found that the dispersion properties of the relativistic plasma are dependent on the frequency of the emitted radiation, and the refractive index becomes smaller than unity at a narrow frequency range in the far-IR region ($wp<w<510^{12}$ Hz, where $wp=5.6410^{11}$ Hz is the plasma frequency).In this spectral region, the line Doppler displacement is substantially affected by plasma dispersion processes. At smaller frequencies the radiation is absorbed (as n is imaginary), at higher frequencies, the radiation is not affected by dispersive effects since n=1. As a consequence, although the observed optical and IR Doppler shift (z) modulation due to precession of the SS433 jets is well described by previous works, it has to be corrected by plasma dispersion effects in the far-IR range. The predictions of this work are relevant as they indicate that some caution must be taken when analyzing the Doppler shift of observed lines or continuum radiation, in any anisotropic relativistic sources. This may be substantially modified by the dispersive properties of the medium depending on the observed frequency. In particular, the results here obtained for SS433 may be soon checked with new observational tools presently under construction, such as the ALMA telescope, which is sensitive to far-IR emission and could potentially detect millimetre and sub-millimetre wavelengths in SS433.

CHARGED ULTRA-HIGH ENERGY COSMIC RAYS AND THEIR IMPLICATIONS FOR THE MAGNETIC FIELD TOPOLOGY OF THE GALAXY

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The AGASA collaboration has recently released a new analysis of their data above 10 EeV strongly suggesting the charged nature of ultra-high energy cosmic rays (UHECR). A one dimensional self-correlation function analysis points to the existence of small angular scale clustering in the data. Besides, some hint of rigidity constancy implying intergalactic spallation interactions of heavier nuclei. Furthermore, a two-dimensional self-correlation analysis of the data shows a whole sky consistent angular pattern in galactic coordinates. The latter can be interpreted as a particle analog of magnetic polarization in the galactic halo magnetic field. In the present work we use this data to constrain the topology and intensity of the regular component of the galactic magnetic field.

PHASE TRANSITIONS IN NEUTRON STARS AND GRAVITATIONAL WAVE EMISSION

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We review the detectability of gravitational waves generated by oscillations excited during a phase transition from hadronic matter to deconfined quark-gluon matter in the core of a neutron star. Neutron star properties were computed using a Boguta and Bodmer's based model and the MIT bag model. The maximum energy available to excite mechanical oscillations into the star is estimated by energy difference between the configurations with and without a quark-gluon matter core. On basis of the planned sensitivity of present laser interferometers (VIRGO or LIGO I) and those of the next generation (LIGO II), the maximum volume to be probed by these experiments is determined. These results are used as an indication of the potential detectability of neutron stars as sources of gravitational waves. Our results indicate that the maximum distance probed by the detectors of the first generation is well beyond M31, whereas the second generation detectors will probably see phase transition events at distances two times larger, but certainly not yet attaining the Virgo cluster.

RELATIVIDADE E GRAVITAÇÃO

LIMITS TO PRIMORDIAL BLACK HOLES FROM THE HOLOGRAPHIC PRINCIPLE

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We discuss the formation of black holes inside a finite box and in the early Universe form the point of view of the production of entropy and the bound imposed by the Holographic Principle. We show that if some form of the latter holds, it is possible to find upper bounds to the fraction of PBHs formed at a given cosmological epoch. Thus, we conjecture that there may be a fundamental reason for the small value of Ω_{pbh}, namely the large entropy needed for building a population which may ultimately suppress those primordial objects.

SISTEMA SOLAR

RING PARTICLE DYNAMICS IN COORBITAL SATELLITE SYSTEMS

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Many structures in narrow planetary rings have been claimed to be caused by hypothetical moonlets sharing the same orbit of the ring. These structures can be found in the F ring and in the Encke gap ringlets, both located close to the A ring of Saturn. Although these moonlets can not be seen in the images, their effects are present in the ring. Clumps and braids are the most common structures, which can be caused by these embedded satellites. The dynamical behavior of N coorbital satellites has been analysed by Salo and Yoder (*Astron. Astrophys.*, 1988) in order to determine the equilibrium configurations for these bodies. Their results show that for $N > 9$ satellites, all configurations are stable, however for $2 < N < 9$ satellites, stable and unstable configurations were found. In this work we have analysed the evolution for a ring particle under the effects of two and three coorbital satellites. The initial position of the satellites, with equal masses, was derived from Salo and Yoder (1988). Our results show the formation of braids when the eccentricity in the system is included. For satellites located in an unstable configuration, the particle stays confined in a horseshoe orbit for about 500 years. These results can constrain the lifetime of these structures. Acknowledegments: The authors thank FAPESP for the financial support.

ON THE RELATIONSHIP BETWEEN VISUAL MAGNITUDES AND GAS AND DUST PRODUCTION RATES IN TARGET COMETS TO SPACE MISSIONS

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In this oral communication we report the results of a cometary research, developed during the last 10 years by our group, involving a criterious analysis of gas and dust production rates in comets directly associated to space missions. For the determination of the water release rates we use the framework of the semi-empirical model of observed visual magnitudes (Newburn, ESA-SP, 174, 3, 1981; de Almeida, Singh & Huebner, Planet. Space Sci., 45, 681, 1997a; Sanzovo et al., MNRAS, 326, 852, 2001b; Sanzovo et al., MNRAS, submitted, 2002c), which once obtained, were directly converted into gas production rates. In its turn, the dust release rates were obtained using the photometric model for dust particles (Newburn & Spinrad, AJ, 90, 2591, 1985; de Freitas Pacheco, Singh & Landaberry, MNRAS, 1235, 457, 1988; Sanzovo, Singh & Huebner, A&AS, 120, 301, 1996). We applied these models to 7 target comets for space missions of "fly by" and/or impact. The main information pertinent to the missions, in chronological order, are the following (Target Comet-Period-Encounter-Mission-Launch-Ref.): 19P/Borrelly-6.88 ys.-2001/Sept/20-Deep Space 1-1998/Oct/25-c; 2P/Encke-3.28 ys.-2003/Nov/12-CONTOUR-2002/July-b; 81P/Wild 2-6.39 ys.-2004/Feb/02-Stardust-1999/Feb/06-b; 9P/Tempel 1-5.50 ys.-2005/July/04-Deep Impact-2004/Jan/06-c; 73P/S-W 3-5.34 ys.-2006/June/18-CONTOUR-2002/July-b; 6P/d'Arrest-6.51 ys.-2008/Aug/16-CONTOUR-2002/July-b; 46P/Wirtanen-5.50 ys.-2011/Nov.-Rosetta-2003/Jan-a.

WHERE DO THE KUIPER BELT OBJECTS WITH HIGH INCLINATION ORBITS COME FROM?

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Statistical analysis on the orbital inclinations of the Kuiper Belt orbits reveals the probable existence of two distinct populations in the classical belt, the region

between the 2: 3 and 1: 2 resonances with Neptune (Brown,M.E., AJ, 121,2804). Whereas one of the populations exhibits small inclinations and can be explained by the classical theory of resonance sweeping by a migrating Neptune, the objects that constitute the other population show an orbital inclination with an average around 17 deg. Here I propose a process that may account for the high inclination population. It is based on the classical planetary migration scenario where the major proto planets are embedded in a primordial planetesimals disk. Some of these planetesimals experience close approach perturbations from the migrating Neptune thus forming a primitive scattered disk. Some nonconservative dynamics processes can create evaders from this primordial scattered population by placing them on less eccentric safe orbits inside the classical belt. These orbits are also highly inclined and can account for the high inclination observed population.

A SEARCH FOR UNSTABLE ASTEROIDS IN THE 3: 1 RESONANCE NEIGHBORHOOD

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We search for short-lived asteroids in the neighborhood of the 3: 1 resonance. This question is interesting because by studying such objects we can better understand the efficiency of the Near-Earth Asteroids (NEAs) production, the collision and Yarkovsky processes. The borders of this resonance and the positions of the asteroids with respect to them are determined by using the mean elliptic planar restricted three-body problem and a method that invokes the representative plane concept. Using the full equations of motion with perturbers from Venus to Saturn, we performed numerical integrations of 41 asteroids found near the resonance edges with small eccentricities and inclinations. We find that about 40% of the studied asteroids enter and escape through the 3: 1 resonance within 100 million years. This feature suggests that the population in this close neighborhood must be also continually replenished. A natural source of this asteroids replenishment is the Yarkovsky effect that could be continually bringing asteroids to the neighborhood of the 3: 1 resonance. Besides that, chaotic diffusion may act at greater distances from the resonance than considered in this work however with longer timescales. This phenomenon may be responsible for at least some of the replenishment of asteroids into the close vicinity of the 3: 1 resonance, mainly for the larger ones which do not experience a nonnegligible displacement by the Yarkovsky effect.

CHARACTERIZATION OF A METEORITE FOUND IN RIO DO PIRES, BAHIA, BRAZIL

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A single stone meteoritic mass, of 118g, covered by a black fusion crust, was found by Professor H. Shigame from the Universidade Federal da Bahia, in a field trip near the city of Rio do Pires (13º 07‘ 40 S., 42º 17‘ W.). It was then donated to Mr. W. Carvalho who exchanged a slice (12g) with the Museu Nacional/UFRJ. The meteorite was registered by Adrian Brearly in Meteor. Bull. 77, but remained undescribed until now. In hand specimen it shows a light gray color and fine matrix with few visible chondrules, shock veins and few patches with areas of brown color and metal flakes. It displays poorly defined chondritic textures. Mineralogically it consists of essential olivine Fa 25.53, pyroxene Fs21.85 En76.7W1.45. kamacite with 0.8.

PAINÉIS

SAB

ASTROMETRIA

PAINEL 1

ANALYSIS OF REFERENCE FRAMES IN THE HIPPARCOS SYSTEM

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The Hipparcos System is the optical extension of the ICRS (International Celestial Reference System). Its primary materialization is the Hipparcos Catalogue. Secondary representations of the Hipparcos System have been built to meet further requirements for greater star density, fainter objects, and longer time basis proper motions. Following the works presented by Andrei et al. (2001a, XXVII SAB; 2001b, X RRLAA), the consistency between the ACT, Tycho2, UCAC-S, and USNO A2.0 catalogues are discussed, from the point of view of their role as secondary representations of the Hipparcos System. Radio stars fields observed at the Valinhos CCD Meridiam Circle (Φ= -23° 00’ 06" λ= +3^h 07^m 52.2^s) are used for the comparison, since the catalogs overlap in magnitude is generally poor. The fields have 30min in right ascension by 13’ in declination, and the equivalent pixel size is 1".5. On average, the fields have 1460 stars, in the magnitude range from V 8 to 16.5. In all, there are 866 observations from 106 fields. The sky representation concentrates evenly along the galactic plane from +30° to -70°. Initially, all observations have been reduced using the ACT catalogue, for which there are 35 stars in the fields on average (standard deviation of 21). The mean errors are 0".15 (σ= 0".22) in right ascension and 0".17 (σ= 0".22) in declination. No systematic dependence appears for the errors either with declination, number of catalog stars, or right ascension. Next, the ACT (X,Y) reductions are used to form the solutions for the other catalogues. The first results indicate that there important departures between the different representations of the Hipparcos system.

PAINEL 2

THE SOLAR RADIUS MEASURES EXPERIMENTS COMPARATION

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The solar semidiameter was gotten initially as by-product of astrolabe observations. The necessity and the importance of knowing an accurate value for the solar radius, and its possible variation, already had importance in the beginning of the last century. The technological evolution of the acquisition data systems made this possible; meanwhile the terrestrial atmosphere still has a significant contribution in the measures. This is noticed when are compared different techniques and even observations using the same instrument showing antagonistic results. We cannot attribute those discrepancies only to instrumental errors. In this work we compare several solar radius measurement experiments. We show that the observational techniques and the earth atmosphere could explain the discrepancy among the experiments.

PAINEL 3

CORONAGRAPHIC OBSERVATIONS OF SMALL SATELLITES - OBSERVATIONS OF PROTEUS

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The small satellites near the Jovian planets are good gravitational probes of their internal mass distribution and so an important tool for the study of the formation of these planets. However they are very difficult to observe since the bright planets light engulf the satellites faint images. In order to obtain astrometry of small satellites near the planets, a coronagraph was constructed using a variable-diameter occultation disk (Bourget et al. PASP 113, 436, 2001). It was used to observe the Neptune satellite Proteus. The observations were made at the Cassegrain focus of the 1.6 m reflector of the Laboratório Nacional de Astrofísica, Brazil, where 22 positions were obtained. The astrometric calibration was made using field stars, which positions in USNO A2.0 catalog were corrected using the Tycho 2 catalog. All the observed positions of Proteus were comparared with the JPL ephemeris and give residuals with mean equal to 0".23 and standard deviation equal to 0".20. For Triton, which appears always in the frames, we obtained 0".07 for the mean and 0".13 for standard deviation. The differences between the Triton and Proteus residuals are analysed.

PAINEL 4

RELATIVISTIC TRANSFORMATIONS BETWEEN ASTRONOMICAL REFERENCE SYSTEMS

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In the last thirty years, advances in wide-angle astrometric measurement (obtained by Very Long Baseline Interferometry, Radar Ranging to the inner planets, Laser Ranging to the Moon and the HIPPARCOS Space Astrometry mission) have improved the determination of the position of celestial objects by three to four orders of magnitude. This advances have also resulted in a redefinition of the IAU celestial reference system (IAU 23rd General Assembly, Kyoto 1998): the International Celestial Reference System (ICRS) as defined by the International Earth Rotation Service (IERS) and the corresponding fundamental reference frame, the International Celestial Reference Frame (ICRF) constructed by the IAU Working Group on Reference Frames. Although decisive progress were realized during the last decades in the field of reference systems and frames, the expected increase of the accuracy of astrometric observations by one or two orders of magnitudes will imply a similar improvement in the reduction algorithms and in the manner of to realize the link between various reference systems and coordinates systems. In this perspective, the General Relativity Theory plays a very important role in Modern Astronomy. In this work, we discuss the geometrical link between the dynamically and kinematically nonrotating reference systems based on the expression of the dynamical Euler angles. An Earth model composed by a rigid mantle and a stratified liquid core was used. So, in relation to the International Terrestrial Reference System we obtain an analytical solution in the form - 17",443 - 0",617sin(w) + 0" ,285cos(w) + t[0",033sin(w) + 0",102cos(w)], where the constant term is due to the geodesic precession between the dynamical and kinematical systems. The geodesic precession is a general relativity effect produced by the fact that the center of geocentric reference frame is not moving linearly, but along a geodesic in the barycentric reference system. This produces a constant relativistic perturbing force that depends on the dynamics of the barycenter of the Earth-Moon system. We hope that analytical improvements between reference system will again challenge the models for the Celestial Reference System.

PAINEL 5

VARIATIONS OF THE SOLAR DIAMETER

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This work aims to present the final results of the 1998 to 2000 campaign of solar diameter surveying. The employed instrument was a Danjon astrolabe, at the Observatório Nacional campus, and specially modified for the solar observations. During the time lapse, 10807 independent measurements of the solar diameter were made, Eastwards and Westwards from the local meridian and evenly distributed. A study is made to identify the systematic effects of the observational conditions upon the reduction final outcome. The mean temperature at the the moment of the observation is shown as the most influential parameter upon the final result. Next to it, follows the temperature variation, the Fried's factor, and the standard deviation of the reflected parabola, all these presenting a minor and complex degree of influence. The derived corrections are of the order of hundredths of arc seconds, thus being tenfold smaller than the typical error of one observation. The mean semi-diameter for the time lapse is 959".107±0".006. Through the use of a CLEAN algorithm the periodic terms of the semi-diameter are obtained. The largest amplitude is attached to that of 515 days. By using a second type of algorithm, namely the DCDFT, the found periods stand additional proof. A dependency of the semi-diameter on the observed heliolatitude is verified. The difference between the equatorial and polar radii calculated is Δr=0".013±0".004, and the solar quadrupole moment inferred is $|J_2|=(3.61\pm2.90)\times10^{-6}$.

COSMOLOGIA

PAINEL 6

BRANE WORLD COSMOLOGIES AND STATISTICAL PROPERTIES OF GRAVITATIONAL LENSES

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Brane world cosmologies seem to provide an alternative explanation for the present accelerated stage of the Universe with no need to invoke either a cosmological constant or an exotic *quintessence* component. Here we investigate statistical properties of gravitational lenses for some particular scenarios based on this large scale modification of gravity. We show that a large class of such models are compatible with the current lensing data for values of the matter density parameter $\Omega_m \leq 0.94$ (1σ). If one fixes Ω_m to be $\simeq 0.3$, as suggested by most of the dynamical estimates of the quantity of matter in the Universe, the predicted number of lensed quasars requires a slightly open universe with a crossover distance between the 4 and 5-dimensional gravities of the order of $1.76 H_o^{-1}$.

PAINEL 7

THE CORRELATION FUNCTION BETWEEN HIGH DENSITY PEAKS IN A MIXED DISTRIBUTION FLUCTUATION FIELD

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We calculate the correlation function of high density peaks in the primordial fluctuation field from the probability density function of a mixed random field. The correlation function is estimated using an expansion of the two-dimensional probability density in a finite series of generalized Hermite polynomials, taking the quasi-moment functions as the expansion coefficients. We compare the estimated correlation functions for a Gaussian probability density field with a

general random non-Gaussian field in order to quantify small deviations from Gaussianity. Our main assumption is that the fluctuation field has a mixed probability density function (PDF) of the form: $P(\delta) = (1-\alpha)f_1(\delta) + \alpha f_2(\delta)$, where: a) f_1 is the probability distribution of an adiabatic Gaussian field, b) f_2 is the probability distribution of a general random non-Gaussian field and c) α is a mixing parameter which allows us to modulate the contribution of each component to the resultant field. From the above PDF, we derive the correlation function between high density peaks for small deviations from Gaussianity. We show how this mixed correlation function can be applied to Cosmic Microwave Background data to search for possible deviations of a Gaussian signature in the statistical properties of the temperature fluctuations.

PAINEL 8

GAMMA-RAY BURSTS DEMOGRAPHY FROM THE SAMPLE WITH KNOWN REDSHIFTS

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Gamma-ray Bursts (GRB) are the most energetic events in nature on short time-scales, being second only to the Big-Bang itself. The mechanism for generating the enormous radiant energy output (with isotropic peak luminosities in excess of 10^{52} erg/s) is not fully understood, but there may be a connection with supernova events. The number of GRB with known redshifts is now large enough for statistical studies to be carried out. In this contribution we examine the constraints that can be put on the luminosity function of GRB and their space distribution by examining the predictions of simple models and comparing them to the observed redshift distribution, the observed $\log N \times \log S$ diagram and the observed distribution of luminosities. Preliminarly, we have verified that strong evolution effects are needed to explain the redshift distribution, both for the single luminosity case (as if GRB were standard candles) or spread luminosity functions. The evolution term has the form $(1+z)^{\alpha}$ with $\alpha \approx 3.5$. One key point in our analysis is that we chose the smoothest possible functionals to describe both the luminosity function and space distribution. This is important since there is a clear evidence for a bimodal distribution of peak luminosities. This work was supported by FAPESP 01/14527-3.

PAINEL 9

DEFLATIONARY COSMOLOGY: CONSTRAINTS FROM ANGULAR SIZE AND AGES OF GLOBULAR CLUSTERS

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Observational constraints to a large class of decaying vacuum cosmologies are derived using the angular size data of compact radio-sources and the latest age estimates of globular clusters. For this class of deflationary $\Lambda(t)$ models, the present value of the vacuum energy density is quantified by a positive β parameter smaller than unity. In the case of milliarcsecond compact radio-sources, we find that the allowed intervals for β and the matter density parameter Ω_m are heavily dependent on the value of the mean projected linear size l. Constraints from age estimates of globular clusters and old high redshift galaxies are not so restrictive, thereby suggesting that there is no age crisis for this kind of $\Lambda(t)$ cosmologies.

PAINEL 10

A TIME VARYING SPEED OF LIGHT FOR A MODIFIED VACUUM

C. S. da Câmara Neto, J. C. Carvalho, M. R. de Garcia Maia, R. B. do Nascimento
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In the last few years, several cosmologies with time variation of the speed of light, c, have been proposed. In these schemes, the functional dependence of c with time is either imposed or obtained through the use of scalar fields (analogous to what happens with G in the Brans-Dicke theory). A consequence of such approach is that the form of the equations of Electrodynamics must be altered. In the present work, we derive a form for the time variation of c for a vacuum with time dependent electric permittivity and magnetic permeability, whereas requiring the validity of Maxwell Electrodynamics. We show that some forms for the time variation of c, that have been postulated in the literature, may be justified in our approach. By imposing some simmetry conditions on the electromagnetic wave equations, the time dependence of c is determined. The solution for these wave equations are derivated and compared with the classical results.

PAINEL 11

THE DAMPED Q-OSCILLATOR AND THE LANGEVIN APPROACH

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The important role played by the study of vibrations in physics and related areas has long been known. Much effort has been dedicated to study the behavior of time dependent (damped and forced) harmonic oscillators in the classical, statistical and quantum domains. The growing interest on these systems comes from the possibility of modeling a wide variety of physical phenomena by changing slightly their basic vibrational structure. Modern studies in this field are related to dissipative models for earthquake dynamics, avalanches in granular systems, nonclassical states of light, motion of ions and atoms in ionic and magneto-optical traps, as well as the quantum description of highly cooled ions. Recently, a new parametric class of Lagrangians which incorporates time varying frictional effects to classical systems has been proposed (Santos and Lima 2000). This q-Lagrangian recovers the well known Bateman's Lagrangian for the damped harmonic simple oscillator as a particular case. The performance of this class of q-oscillators was compared with the harmonic oscillator under constant damping. A variety of qualitatively different dynamic behaviors is observed when the free parameter q is continuously modified. An interesting property of the damped q-oscillator is that a stable harmonic oscillatory regime is always attained after a finite transient period. This behavior suggests a more realistic description for some physical systems where the energy is partially released in a finite time scale, at the end of which the system enters into a simple oscillatory regime (normal mode) as happens in earthquake dynamics. Now, we are going one step further by analyzing the behavior of this class of oscillators under stochastic conditions with basis on the Langevin approach. The expression describing the average square displacement is obtained and we verify that for small values of time ($\gamma t<<1$), the behavior is independent of the q-parameter. However, for long time scales ($\gamma t>>1$), the system enters in a diffusive regime proportional to t^2. Some possible applications to astrophysics are also discussed in dynamics of massive black holes at the center of a dense stellar system.

PAINEL 12

IS THE CURRENT COSMIC ACCELERATION DRIVEN BY MATTER CREATION?

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Recent studies in which type Ia supernovae (SNe Ia) are used as calibrated standard candles suggest that the expansion of the Universe is accelerating. The existence of some kind of negative-pressure dark energy is usually assumed to explain the current accelerated expansion. It is well known that particle creation may also lead to negative pressures. So, in principle, this process may drive the cosmic expansion and be an alternative to dark energy. In the present work, we investigate this possibility. We assume that space is flat, in accordance with cosmic microwave background (CMB) measurements. Further, since observations indicate low values for the matter density parameter Ω_{m0}, we argue that matter creation can not drive alone the cosmic acceleration, and, as a consequence, we introduce a cosmological constant in the model. We consider that the particle source has the following form, $\Upsilon=3b n H_0 \left(\frac{H}{H_0}\right)^{\beta}$, where α and β are dimensionless constants and H_0 is the present value of the Hubble parameter. We use SNe Ia data and obtain confidence contours in the (Ω_{m0}, β)-plane for fixed values of α. We conclude that current SNe Ia data can not constrain very much the values of β if we do not introduce any information on Ω_{m0}. We reanalyze the same data, but now assuming a Gaussian prior, such that $\Omega_{m0}=0.27\pm0.06$, as indicated by recent observations. We show that, although models with $\beta<0.5$ can not be excluded with high confidence, the data now prefers values of β close to zero, indicating that, in the considered case, particle creation is not a favored mechanism to explain the cosmic acceleration. Finally, we simulate the observations to be expected from the proposed Supernova / Accelerated Probe (SNAP), and show that with future Sne Ia observations, it will be possible to obtain much tighter constraints on the parameter β.

PAINEL 13

PRODUCING SUPERHEAVY DARK MATTER DURING INFLATION

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Top down models for the origin of ultra high energy cosmic rays (UHECR's) propose that these events are the decay products of relic superheavy metastable particles, usually called "X" particles. These particles can be produced in the reheating period following the inflationary epoch of the early Universe. Their production can be thermal (indirect) or by the direct decay of the inflaton field. In this work we show these two production mechanisms, enphasizing some important features such as the calculation of the maximum temperature achieved by reheating, which is a fundamental parameter to determine the indirect production. We also obtain limits for the direct coupling of the X particle to the inflaton field from the requirement that X particles are responsible for the observed UHECR flux.

PAINEL 14

THE MISSING MASS PROBLEM IN GALAXY CLUSTERS AND MOND

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Attempts to explain away the missing mass problem in galaxy clusters using the MOdified Newtonian Dynamics (MOND) prescription have so far been unfruitful. The main technique invoked to estimate cluster masses is that of observing the X-ray emission from the intracluster gas and assuming hydrostatic equilibrium. The results indicate that there must exist a certain amount of dark matter in clusters even when the analysis is done in the MOND context. Although the mass discrepancy with MOND is reduced by a factor of two when compared to the Newtonian analysis, even the smallest amount of non-baryonic dark matter is obviously not desirable if MOND is correct. Thus we are left with the possibility that there is baryonic matter in clusters yet to be detected if MOND is to be a meaningful approach. It has been argued that another, more radical, possibility of reconciling MOND with the data would be that the Hubble constant H_0 is h=75 locally and h=50 at the distance of the clusters, where H_0=100 h km s^{-1} Mpc^{-1}. The idea is that the MOND parameter a_0 is determined from rotation curves of nearby galaxies, and its value would be different for distant clusters if the Hubble constant changes. This scenario would explain away the remaining discrepancy. We point out that if such change in H_0 is interpreted as a time variation of the Hubble parameter, then it implies a deceleration parameter q<-1

at some redshift between a typical distant cluster used in the analysis and the local galaxies. This picture is equivalent to a vacuum energy-dominated closed (k=1) universe, and is marginally consistent with the best fit MONDian model of McGaugh for early BOOMERanG data. The result is independent of how much the Hubble constant varies, as long as it increases with time. Another way of looking at the problem is to interpret that the change in H_0 has a dependence on scale rather than on time, which actually seems to be the originally proposed idea to get rid of the mass discrepancy. In this case one has to resort to scale-dependent cosmologies, and we briefly discuss one such scenario. The more natural hypothesis remains, however, that the source of the discrepancy is really an undetected component of baryonic matter, perhaps deposited in the cluster cores by cooling flows.

PAINEL 15

THE KOTTLER SPACETIME AND LEMAÎTRE COORDINATES

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The line element of a spherically symmetric and static spacetime with cosmological constant was first determined by Kottler (1918). It can be written as:

$$ds^2 = \left(1 - \frac{2M}{r} + \Lambda r^2\right) dt^2 - \left(1 - \frac{2M}{r} + \Lambda r^2\right)^{-1} dr^2 - r^2 d\theta^2 - r^2 \sin^2\theta d\phi^2$$

where M=Gm is the geometric mass of the central body, and Λ is the cosmological constant. For Λ=0 it reduces to the Schwarzchild spacetime. In the above coordinate system, the Kottler spacetime presents 3 singularities. The first one is the physical irremovible singularity at r=0, whereas the two remainders are determined by the values of the parameters M and Λ when one takes g_{00}=0. By generalizing the Lemaître coordinate transformation for the Schwarzchild spacetime, we show the existence of a simple form where the coordinate singularities disappear, and, therefore, the singularities are reduced to the physical singularity located at r=0. We analyze the cone light structure of the Kottler spacetime in both coordinate system. The method presented here may also be extended to include electric charge (Reissner-Nordström spacetime) and monopoles

.PAINEL 16

COSMOLOGIES WITH SPEED OF LIGHT DEPENDING ON HUBBLE PARAMETER

R. B. Nascimento, C. S. da Câmara Neto, J. C. Carvalho, M. R. de Garcia Maia
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Recently, there have appeared in the literature several cosmological models with variation of the fundamental constants of Nature, such as the speed of light (c), the elementary electric charge (e) and the Planck constant (h). The two main motivations for such interest are: (i)observations related to quasars that seem to indicate the fine structure constant is changing with time and (ii) the possibility that these models may solve some long standing problems of the standard cosmological model, without the need for inflation. In the present work, we investigate the consequences of using a new form for the time variation of the speed of ligth, in the schemes proposed by Albretch and Magueijo (Phys. Rev. D 59, 1999) and Barrow (Phys. Rev. D 59, 1999). We propose a power law dependence of c on the Hubble parameter. The Lorentz invariance and the principle of general covariance are violated and the gravitacional field equations have the same form as Einstein field equations in a preferred reference frame postulated by the theory. We have been able to obtain the exact solutions for universes with Friedmann-Robertson-Walker (FRW) geometries. We have also determined the values that the exponent of the power law n might attain in order to solve the flatness, the horizon and the classical cosmological constant problems. Some other not so well known problems are also analysed and solved, such as the quasi-flatness and the quasi-lambda problems. Our results are compared with other results derived for alternative forms of the time variation of c, found in the literature.

PAINEL 17

DEFLATIONARY Λ(*t*) COSMOLOGY: THE RECOMBINATION EPOCH

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We discuss the recombination in the expanding primordial universe for a large class of Friedmann-Robertson-Walker (FRW) type models driven by a decaying vacuum energy density, or a time varying Λ(*t*). This scenario (proposed by Lima & Maia in 1994 and Lima & Trodden in 1996), which has originally been termed phenomenological deflationary cosmology, is one of many candidates for quintessence. For this class of models, the effective time dependent cosmological

term is regarded as a second fluid component (vacuum energy density), which transfers energy continuously to the material component. Such scenario starts from an unstable de Sitter configuration, supported by the largest value of the decaying vacuum energy density. This nonsingular state evolves to a quasi-FRW vacuum-radiation phase and, subsequently, the Universe approaches continuously the present vacuum-dust stage. The vacuum energy density in these late stages is quantified by a positive β parameter smaller than unity. In this scenario, the recombination epoch is studied including the physical processes occurring during the recombination epoch, as the own recombination, photon drag, photon cooling, collisional ionization and hydrogen molecular chemistry in the baryonic fraction of the material component. We find that the recombination processes constrains the β parameter to intervals smaller than ~0.5, for flat or open universes. A remarkable effect also found in these kind of models is the recoil of the recombination epoch for higher redshifts.

PAINEL 18

MULTISCALING AND NONADDITIVITY OF LARGE-SCALE STRUCTURES IN THE UNIVERSE

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There has been a trend in the past decade to describe the large-scale structure of the Universe as a multifractal set. However, it has also been argued that the scaling generally used in this kind of analysis is not large enough to assure a precise determination of the scaling exponent. One of the main questions raised by the opponents of the fractal approach deals with the transition to homogeneity. They claim there is not enough sampling space to determine a scaling index which characterizes a (multi)fractal set. In this work we propose an alternative solution to this problem, using the generalized thermostatistics formalism. We show that applying the idea of nonadditivity, intrinsic to this approach, it is possible to derive an expression to the correlation function, describing the scaling properties of large-scale structures in the Universe and the transition to homogeneity, which is in good agreement with observational data.

PAINEL 19

STUDY OF THE CASIMIR ENERGY IN AN EXPANDING FINITE UNIVERSE

Sandro Silva e Costa, Reuven Opher
IAG-USP

Muller, Fagundes and Opher presented recently "a numerical investigation of the Casimir energy for a conformally coupled, massive scalar field in a static universe" with negative curvature and non-trivial topology (*i.e.*, a finite hyperbolic universe). The basic idea is that the finiteness of the universe imposes specific boundary conditions on a cosmological scalar field, resulting in the appearence of distinct patterns in the spatial distribution of the mean energy associated with the field. This behaviour, analogous to the appearence of a Casimir energy between two plates in vacuum, may be interesting in the investigation of the origin of the cosmological constant. Since the calculations made so far were for a static universe, we show, in this work, some results required for generalizing the above cited studies for an expanding hyperbolic finite universe.

ENSINO E HISTÓRIA

PAINEL 20

CENTER FOR ASTRONOMICAL STUDIES OF PERNAMBUCO - PUBLICISING, TEACHING AND RESEARCHING ON ASTRONOMY

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The aim of this paper is report the progress of the Centro de Referência em Astronomia de Pernambuco - CRA/PE, comprised of two facilities, the Observatório Astronômico Jorge Polman - OAJP and the Observatório Astronômico Automatizado - OAA. Three targets have been carefully set by the CRA: i. PUBLICISING. · It aims at making the local public highly aware of work and the findings of the astronomers. ii. TEACHING. · teach public and private young students; · increase the knowledge of astronomy among school teachers; · provide the general public with regular courses iii. RESEARCH · Researches will be carried out in a limited number of areas, including asteroids, comets, binary systems, variable stars, supernovae and bright QSO's. OAJP has been designed by Clube Estudantil de Astronomia - CEA, which, in October 2000, signed a formal agreement between the SECTMA and Fundação Instituto Tecnológico de Pernambuco - ITEP, with funding coming from private institutions. Construction began in March 2001 and conclusion, in November 2002. The main building will host CEA's administrative structure and is composed by various facilities, integrated over three floors. OAA will be located in the town of Itacuruba. It'll house a 42-cm remotely-controlled telescope, with CCD and other instruments. Itacuruba is a small (3.720 inhabitants) and isolated town, located 481 km west from Recife. Annual pluvial average is < 386mm, with reasonable observing conditions. The construction is at the stage of initial installation, supported by the local town hall, and we expect to start the activities early April 2003. At the beginning, the remote controlled operations are supposed to be only commended by researchers. This information will be available for students, teachers and to anyone who shows interest in using its facilities. Remote controlled operations will be commanded from the OAJP to the OAA.

PAINEL 21

HISTORICAL OUTLINE ABOUT THE UNDERGRADUATE TEACHING OF ASTRONOMY IN BRAZIL FROM 1808 TO 1889

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In this poster we present the main events occurred in the history of astronomy teaching in undergraduate courses existing in Brazil since the arrival of the Portuguese Royal Family in 1808 until the end of the monarchic period. In order to compose this historic outline, we mainly use didactic books, rules, decrees and laws that organized the contents offered and the careers of those in charge for the discipline. In the analyses of the used material, we searched for the presence of philosophical and scientific assumptions that may have oriented the contents of the disciplines. Comparisons with the teaching of astronomy in other countries haven't been made. We have ended showing that the teaching of astronomy, during the monarchic period, was more directed to forming engineers than astronomers. We would like to observe that the present poster doesn't aim to approach the subject in a complete and detailed way.

PAINEL 22

MORRO AZUL OBSERVATORY: A NEW CENTER FOR TEACHING AND POPULARIZATION OF ASTRONOMY

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In 1999, the Instituto Superior de Ciências Aplicadas (ISCA Faculdades de Limeira) started a project to build an observatory and initiate several astronomy related activities in the city of Limeira and region (São Paulo state) with the aim of teaching and popularizing astronomy. After contracting teachers, a technician and an intern, the Morro Azul Observatory was inaugurated in March 2000 as a part of the geosciences department of ISCA Faculdades. This poster describes the development phases of the Observatory, the activities initiated by the Observatory, and assesses the impact of the project. Several issues will be discussed such as the criteria for choosing the site, buildings, instruments, group visits, and particularly the goals that were reached. The Observatory, as described here, serves as a model for other centers with the same purpose in the country. The achievements of this project include the creation of two astronomical disciplines for the geography course and liaisons with other courses such as tourism, pedagogy, social communication and engineering. New activities

were initiated, educational materials created, and the Observatory is now part of the regions teaching network and is in contact with other Brazilian and foreign centers. This poster presents the results from report analyses, visitor records, the local media, goal strategy assessment, and the current state of the project. It concludes with an evaluation of the social commitment of the Observatory, its initiatives for the constant renewal and growth of the project, its policy of maintaining the activities and interchange with other national and international astronomy centers, and the future perspectives in terms of its contribution for the research in science education.

PAINEL 23

ASTRONOMY AND SCIENTIFIC METHOD IN A FREE PARADIDACTICAL WAY

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The basic astronomical notions such as night and days, seasons, phases of the moon, which are presented in the undergraduate levels, are facts intrinsically related to the most everyday experience. On the other hand, in a constructivistic way, the human personality is linked to its creative potential, and education should be designed to discover and develop this potential to its fullest in each individual and that the most valuable methods for student learning are those that correspond to their individual developmental stages and needs. In virtue of this, by its intrinsic properties, the construtivstic approach appears to be the as most appropriated to teach Astronomy. The teaching of Astronomy in the undergraduate levels in Brazil have several problems: in general, in spite of several recent efforts of the Brazilian Astronomical Society, the quality of the didactic material is poor and the teaching itself is in charge of a non specialized professionals. We present the first results in the construction of a paradidactical material, a narrative in which Astronomy and Scientific Method are presented, discussed and explained in a course of a several teenage adventures and actions. This material can be used by teachers to self improvement or in the classroom, as paradidactical instrument. It also can be read autonomously by children, teenagers and adults as a complementary study. We intend a free distribution of this material in its final format to all schools involved in the VI Brazilian Olympiad of Astronomy.

PAINEL 24

THE ASTRONOMICAL OBSERVATORY MANOEL MACHUCA - PONTA GROSSA/PR : 50 YEARS OF HISTORY AND ACTIVITIES

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The studies related with astronomy in Ponta Grossa/PR had been initiated in September 13th, 1952 with the creation of the Sociedade Pontagrossense de Amadores de Astronomia (S.P.A.A). This group was constituted of: Manoel Machuca, Elício Mezzomo, Eurico Batista Rosas, Faris Michaelis, among others. This was the first astronomical observatory in Paraná and one of the first amateur societies in Brazil. The S.P.A.A. was extinguished in the beginning of the 70s. The patrimony was donated integrally to the ¨Universidade Estadual de Ponta Grossa¨ (UEPG), act consummated in May 14th 1974. The Astronomical Observatory was developed through forming a library, and some didactic and illustrative equipment was acquired, as slides projector, panels, models in reduced scale, etc. In 1985, an auditorium and a room for optic work was built, thus allowing to receive a greater number of visitors during the lectures, courses and meetings; activities that are developed until today currently keeping an average of 800 (eight hundred) visitors per year. In this work we present the history and the main activities developed until today in the Manoel Machuca Observatory as well a project to transfer the observatory to the main campus. Observatories dedicates to popularize astronomy in Brazil are useful to cover deficiencies in the teaching of sciences. Teaching observatories began also to act as basis to form new research centers of astronomy in Brazil.

PAINEL 25

THE TOOLS OF THE ASTRONOMER: WHAT WE MEASURE, HOW WE MEASURE AND WHAT WE LEARN

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Currently the lack of a specialized bibliography to fill the existing gap between simple texts and technician books has motivated us to carry through a book of ***introduction to astronomy***. This task covers the necessity of having texts with a superior level compared with high school education and inferior level compared with a graduation study. All this took us to plan and write a book introducing the basic concepts of astrophysics. The objectives of this book are (**1**) to present the procedures fluently carried through astronomical observatories and (**2**) to describe how these procedures are related with the basic properties of the stars, galaxies and etc. - a kind of "*abc*" about modern astrophysics. The main topics of this book are divided in three chapters as follows: Chapter 1 - Telescopes, instruments and detectors; Chapter 2 - Images; Chapter 3 - Spectroscopy. Basic concepts equivalent to initial disciplines in a physics graduation course (Physics I to IV) are assumed, meanwhile a major part of the material presented here can be used for advanced learners or it can be adapted in high school. Minimum mathematical abilities are enough, no previous knowledge of astrophysics and calculus are assumed. However, this work is not a complete introduction to all these topics, subjects like coordinates, celestial movement, eclipses, time measure, seasons of the year and estelar evolution are little argue and therefore we suggest complementary readings. The topics are explained in a dynamic manner with many exercises of astronomical objects like stars, galaxies, nebulas and planets. During the complementary course for teachers at Bahia, this text will be applied in classroom. We are going to present the book entitled "Uma introdução à astrofísica e à astronomia" and we will show the acceptance of this book related to this course. We now have another option to introduce the pupils with the astrophysic's language, so the teachers will be able to use this book at high school or university.

PAINEL 26

VIRTUAL OBSERVATORIES AND TEACHING OF SCIENCE

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Motivated by recent progresses on robotic telescopes and also on the increasing interest in approaching the general public to the scientific community, several centers of research have been dedicating efforts to improve educational methods, most of them focused on Astronomy due to its multidisciplinary characteristics. Recently, several astronomers of different Brazilian institutions (IAG/USP, DAS/INPE, IF/UFRGS, IF/UFSC, OV/UFRJ, IF/UFRN) started a joint outreach project with the aim of using robotic telescopes in science education of students of all educational levels. The main goal is to provide to the students the opportunity of real time operation of CCD equiped remote robotic telescopes using the internet. This is the concept of virtual observatories. Supported by Fundação Vitae, 6 small robotic observatories are being built at Porto Alegre, Florianópolis, Valinhos, Rio de Janeiro and Natal. Each research institute associated to the project has at least one partner school that, during the pilot phase of the project, will help to develop and test educational material appropriate for our schools. We shall offer a set of real scientific projects that can be developed by the students and that will enable them to increase their knowledge of astronomy, mathematics, and computation, through a real imersion in a scientific project.

Later, all this educational material, as well as the access to our network of robotic telescopes, will be open to any interested school or group of students. The present work is dedicated to describe our project. More information can be obtained at www.observatoriovirtual.pro.br.

PAINEL 27

HOLISTIC ANTHROPOLOGICAL APPROACH TO ASTRONOMY TEACHING

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We present a holistic and multidisciplinary work we have been developing in the last several years whose guide line is based on the human being relationship with heaven objects and phenomena. We argue that the main objective of introductory courses on astronomy should not only be that of providing scientific education (as usually assumed), but instead they should provide students with the opportunity to live unique psycho-cognitive experiences and favour a better linkage between humanistic and scientific cultures. For that purpose we suggest that subjects like anthropology, comparative mythology, folklore, and history of human beliefs should inspire objectives, contents, and teaching practices throughout any such a course. We discuss the procedures and methodological approaches we adopt to accomplish our objectives. The practices developed may be as diverse as staging rituals, recreating pagan festivals, attending showings at the itinerant planetary we coordinate (with programmes we specially designed according to the philosophy exposed here), among others. Particularly important for us is the integration between astronomy teaching and local, or regional cultural aspects, the recovering of popular knowledge on astronomical affairs, i.e., the work on ethnoastronomy and archaeoastronomy, and the experiencing of several non-verbal activities. In this sense our proposal aim to reach cognitive domains which are mostly (although not exclusively) associated with thought patterns and intrasubjective experiences of symbolic, affective, analogical, intuitive, non-rational character, which are of great psychological importance to the person. We discuss the educational results obtained and present suggestions for further developing and broadening the techniques and practices proposed. (PRONEX/FINEP; NUPA/USP; Temáticos/FAPESP)

PAINEL 28

SPONTANEOUS CONCEPTIONS IN ASTRONOMY: WHERE ARE WE ON EARTH?

L. C. Jafelice, A. S. B. Queiroz, D. M. C. Silva, J. K. Ferreira, F. A. D. Lopes
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In this work we discuss a case study concerning the conceptions of a group of 50 children between 9 and 11 years old about where we are on Earth. It is well known from the literature on spontaneous conceptions in astronomy that many people, children and also adults, in particular primary school teachers, have the misconception that we live inside the Earth. We designed specific activities to evaluate in a more precise way at what level that conclusion is true. Those activities include a practical test involving concrete objects to represent persons and the Earth, an interview within a context oriented situation and a drawing session involving two and three dimensional models. Our results show that in fact just 10.0% of the surveyed children think we live inside the Earth. Furthermore, among those who think that way there are 20.0 % of them who are in a phase of conceptual change in which they keep at least two antagonizing conceptions at the same time, which makes even stronger the point that such a spontaneous conception, if in fact generally present at some previous age it is not else present at the ages range evaluated. The results obtained clearly indicate that the widespread conclusion, held by many people working on science education, that children think we live inside (or under) the Earth is not sustained. We discuss possible motives which lead to that mistaken conclusion. We also suggest educational procedures to evaluate some common misconceptions in astronomy and propose practices to work them out. (PRONEX/FINEP; NUPA/USP; Temáticos/FAPESP)

PAINEL 29

SOLAR OBSERVTION AS A MOTIVATING FACTOR TO THE EDUCATION AND DIFFUSION OF ASTRONOMY

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As a general rule, telescope observations occur during the night, when most of first and second grade students are not at school. Sometimes, this fact forces students and teachers to direct their attention to Museums, Observatories and Planetariums which sometimes are not near enough to be contacted. Furthermore, observation equipments are generally expensive and demand special care that most schools are not able to provide. Taking into consideration these factors, we present a coelostat produced at very low cost. Such instrument

could be used as a motivating device to students and teachers. Considering that the coelostat construction and solar observations could be done during the day at school, the coelostat could be a useful device to increase contact with Astronomy. Besides the mere observational aspect, we must emphasize another one: the possibility of dealing with different branches of study, such as Optics and Mechanics, in conjunction, for instance, with History, during the construction of the equipment.

PAINEL 30

A SIMPLE DEVICE SHOWING THE DIFFERENCES IN SOME MOON'S PHASES AS SEEN BY SOUTHERN AND NORTHERN-HEMISPHERE OBSERVERS

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The apparent Moon´s shapes, or phases, are related to how much of its daylight side is visible to us at different orbital positions. Most of literature concernig this subject shows Moon's shape as seen by northern-hemisphere observers because they are written by authors located in those regions. Translated books show reversed pictures of *first-quarter* and *third quarter* Moon´s phases as seen by a southern-hemisphere observer. It is interesting to notice that most authors do not pay attention on the differences that may be seen by southern and northern-hemisphere observers. Only recently Brazilian literature has been published putting emphasis on those differences. But even some Brazilian authors have repeated pictures for those phases that are not seen in southern-hemisphere. Keeping this fact in mind, a device was built aiming to show the students the Moon´s shape differences as seen by southern and northern-hemisphere observers. The student is requested to be in different positions to notice that in *new* and *full* Moon both observers see the same Moon shape. However, in *first-quarter* and *third quarter* phases observers in both hemispheres see the Moon with different shapes. In *first-quarter* phase a northern-hemisphere observer sees the Moon illuminated side as a D shape; however, a southern one sees the Moon as a C shape. When the Moon´s phase is *third quarter* its shape for both observers is reversed : a northern-hemisphere one sees the Moon as a C shape while a southern one sees the Moon as a D shape. It occurs due to the way an observer sees the sunlight reflected from Moon´s surface. The device was built in a very simple, but original way, by moving the Sun positions instead that of the Moon but with a similar effect. Simple material was used for building this device such as cardboard box, black chamois paper, wire, small isopor balls, battery, copper thread, small electric light-bulb, glue and binding tape. There is no one description in teaching literature of a device such as this one and with the same purpose. It was developed with cheap material aiming to allow school's teachers to rebuild it with their students. The device may be used in any introductory astronomy course.

PAINEL 31

SATURN´S RINGS: FROM GALILEO´S TRIPLE BODY TO MAXWELL´S SOLUTION

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Saturn´s rings, which instigate popular imagination, were discovered in 1656, by Christiaan Huygens. Prior to that, though, Galileo Galilei had noticed something strange with the then furthest planet of the Solar System. To Huygens´ discovery, followed 200 years of doubts and postulates with respect to the nature of these structures, leading to the solution currently accepeted, proposed by James Clerk Maxwell, in 1856. For this work, Maxwell was awarded the 4th Adams Prize, given by Cambridge University. Maxwell, though, was not the first to infer the true nature of Saturn´s rings. Giovani Cassini, as early as 1660, did not believe they were solid in nature. His studies led him to the discovery of four new moons and the dark stripe known as the Cassini gap. During the XVIII century, the French Mathematician Pierre Simon de Laplace sketched a mathematical theory to explain the dynamics of the rings. This theory, which was left incomplete, moved the Adams Prize committee to look for a definite solution to this problem. Maxwell, and his proof that the rings could not be a solid body and were, in fact, a system of multiple particles. Our goal, in the present work, is to highlight the importance of the result found by Maxwell in an area not commonly associated with him. Furthermore, we take this opportunity to review the discoveries and historical figures involving Saturn´s rings, from Galileo to Maxwell. We also dedicate some time to the original article published by Maxwell, for which he won him the 1856 Adams Prize. In this article, Maxwell explains his methods, based on prior assumptions made by Laplace. By a careful analysis of the gravitational forces involved, between the planet and its ring, Maxwell shows that the only possible solution for a solid ring is artificial and does not agree with observation. Therefore, as Maxwell states, the rings must be fluid, i.e., made of discontinuous parts.

PAINEL 32

HOW IS ASTRONOMY PRESENTED IN TWO BRAZILIAN GEOGRAPHY TEXTBOOKS?

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The Brazilian Ministry of the Education (MEC) has a governmental program for the assessment of the textbooks called Textbook National Program (PNLD). The textbooks from the first to the eighth grade of the Brazilian formal education are analyzed by university professors, researchers, and graduate students in five areas: History, Geography, Sciences, Portuguese Language and Mathematics. Since 1998, four classification categories are assigned to the revised textbooks: (i) excluded, (ii) recommended with warnings, (iii) recommended and (iv) recommended with distinction. In this work, the content of Astronomy is analyzed in two Geography textbooks (one is assigned as recommended by MEC). I point out that there are no astronomers in the Geography revision committee yet. On the other hand, MEC has invited astronomers as referees for the revision of Science textbooks after sometimes making a previous consultation to the Teaching Commission of the Brazilian Astronomical Society (CESAB). The same evaluation methodology adopted by MEC in PNLD for the Geography textbooks was applied. The Astronomy content in the Geography textbooks includes: geographic orientation, topocentric perspective of the sky, days and nights, yearly seasons and weather, fundamental Earth motions, and Moon phases. In both analyzed books, big conceptual mistakes were found in several astronomical concepts so that those natural phenomena can be poorly understood by the classroom teacher. Therefore, the transmission of the scientific knowledge to the students has been seriously affected. An important conclusion of this work is the imperious necessity to include astronomers in the Geography textbook revision committee of MEC.

PAINEL 33

THE FIRST GRADUATE COURSE ON ASTRONOMY TEACHING IN BRAZIL

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We present the history of the creation of the first master course on astronomy teaching in the country and its particularities. The works aiming the creation of a graduate course on physics, chemistry and mathematics teaching at the Universidade Federal do Rio Grande do Norte (UFRN) began more than two years ago, involving lecturers from those three Departments. The discussions

evolved till the creation of the Programa de Pós-Graduação em Ensino de Ciências Naturais e Matemática (PPGECNM), a Graduate Programme on Natural Science and Mathematics Teaching linked to the Centro de Ciências Exatas e da Terra of the UFRN. The lecturers involved opted for a professional master degree modality, which requires that the Programme students have to keep their teaching activities at schools during the course. Such a situation constitutes an ideal context to the effective implementation of the didactic and methodological innovations envisaged. It shall be emphasized that up to now the PPGECNM is the only graduate course with that professional master degree modality in the Northeast region of Brazil and the only one in the country which includes astronomy teaching. The present work can be useful to stimulate and help other Brazilian Universities to implement similar initiatives. We further discuss the recent creation of an International Research Group on Physics and Astronomy Teaching, the Base de Pesquisa em Ensino de Física e de Astronomia, coordinated by one of us (LCJ). We finally analyse our strategies aiming an effective development and quality improvement to the formation of graduate teachers specialized in astronomy contents. (PRONEX/FINEP; NUPA/USP; Temáticos/FAPESP)

PAINEL 34

DEVICES FOR OBSERVING THE SUN AND SOME SOUTHERN-HEMISPHERE STARS DAILY PATHS

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One of the greatest difficulties in teaching introductory astronomy is making a student to get used with motions in the celestial sphere. The fact that an observer may watch a clockwise apparent path for a star, a counterclockwise one for another , and a mix of both paths for another star becomes a puzzling problem for a beginner astronomy student. This student may get confused with the idea that if a southern-hemisphere observer follows a star daily path with a particular southeast rising, he will notice that this star will have both apparent motion, clockwise, in rising and setting, and counterclockwise, when it moves over a vertical circle containing east and west cardinal points and the observer zenith. This especial case, not usually reported in books, is very difficult to explain without a specific device showing its occurrence for a particu-lar latitude. Aiming to act as a teachers help to explain those little differences of daily apparent motion of stars, a simple device was built showing daily path of some stars for a southern-hemisphere observer placed at Cuiabá , MT (latitude ~15.5° S). As the student get familiar with the device his knowledge may be used for building a similar one for any other latitude. Still taking in account the concept of the celestial sphere, another device was built with the purpose of showing the Sun

daily apparent motion in the beginning of every season for a Cuiabá ´s observer. At this latitude the Sun will pass in the zenith twice during the year, once on its way north and then on its way south. Unfortunately, Brazilian astronomy books do not pay attention to this fact. Students may also realize that during its apparent annual motion the Sun transits the celestial meridian higher in its motion to the summer solstice, and lower, when it is moving to the winter solstice. Both devices were built with the purpose of helping beginner astronomy students to notice particular behaviors of apparent motion of the Sun and other stars. They have been used as a teacher's help in an introductory astronomy course at UFMT giving rise to a lot of interest by teaching Physics students. The devices were developed using accessible and cheap material such as a wood circle, paper, wire and isopor little balls.

PAINEL 35

SMALL TELESCOPE AS AN EDUCATION TOOL IN CITIES WITH INTENSE LIGHT POLLUTION

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The Fundação Planetário da Cidade do Rio de Janeiro owns a Meade LX-200 (250 cm) telescope which, in addition to a CCD ST-7e camera, has been used basically to the observation of nebulae, comets and planets, and the consequent production of images used in the diffusion of Astronomy. Recently, we have begun a more ambitious project, whose first stage is to monitor variable stars in order to obtain their differential light curve and estimate the quality of such measurements. The quality of the observation, even in front of an extremely bright sky as the one above the Planetário, enlarged our initial goal. One of our interns, an undergraduate Astronomy student (UFRJ), is currently developing his final term paper with the data being obtained. Furthermore, we have invited High School students in Rio de Janeiro to take part of this project. These students are having the opportunity to take part of a complete project that involves choosing an object and observing it, and the steps that follow the observation itself, such as image treatment and analysis. We believe this experience will enrich the educational process on the High Scool level, opening the doors to scientific literacy. This work presents the results of the observation of the stars AI Vel, BP Vel and GSC 7672: 2238, a probable eclipsing binary, discovered during our observations. The light curves obtained to AI Vel and BP Vel are very consistent with the ones in prior publications, as is their periods (0,11 days and 0,26 days). For all the stars, the estimated error is 0.01 magnitude or less. We propose a larger use of small telescopes as an education tool (High School and Undergrad levels) in cities with bright skies. Schools and Planetariums would be the proper environment to host

such instruments. The criteria in choosing the appropriate objects, the observational method employed and the quality of the results obtained are also present in this work.

PAINEL 36

SYMBOLIC REPRESENTATION, ARCHAEOASTRONOMY AND ASTRONOMY TEACHING

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We present the results obtained up to now in an archaeoastronomical research carried on in the Northeast region of Brazil. From astrometric measurements and data collected in situ we study the viability that some of the rock inscriptions found in that site were motivated by astronomical knowledge of the people living in that region between 7,000 and 4,000 years ago. Although the expression through symbols has always been an essential human characteristic in any culture, almost all the studies in that subject are devoted only to symbolic representations found in European or Asian prehistoric sites. We aim to broaden that universe and contribute to the comparative study of the symbols by including pictographic representations found in the archaeological site we are studying. There exists a universality in several of those representations which can be revealing of our humankind constitutive elements. In this study, besides treating concrete data obtained in that site and proposing a possible interpretation of archaeoastronomical character, we extend the application of those results to study human symbolic representations in general and their use to astronomy teaching. In our approach we aim to work out also the naturally multidisciplinary interconnections which have a very rich didactic and pedagogical potential. We make suggestions on how to take advantage of archaeological records to improve those connections and to contribute to recover and integrate local and regional cultural aspects within the astronomy teaching endeavour. We further discuss cognitive implications of the present proposal and its advantages from the educational point of view. (PRONEX/FINEP; NUPA/USP; Temáticos/FAPESP)

PAINEL 37

THE PARTICIPATION OF THE OBSERVATÓRIO NACIONAL IN THE PROGRAMME OF INTERNATIONAL LATITUDE OBSERVATION

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In the first decades of 20th Century, many international associations, such as the International Astronomical Union Commission 19, were dedicated to the studies of latitude variation. North Hemispheres observatories settled stations, provided with standard instruments and methods, to be used in a program of observations. One of the results of that program was the determination of the polar motion. In 1924, the Observatório Nacional started a free-collaboration with the International Latitude Service through Lélio Gamas effort, who proposed an observation program of 96 stars-pairs during at least eleven years. However, after seven years, in 1931, the work was enclosed because there were no conditions to reduce the observations data. This paper intends to discuss, through the analysis of the intense correspondence between Lélio Gama and the observatories and researches dedicated to this theme, how much the Observatório Nacional was inserted into the studies of the latitude variation. Besides the fact that the proposed research has not been concluded, the obtained data are a register of the participation of this observatory in an initiative of international astronomical cooperation, as also they represent a pioneer document of 26.000 observations of stars near the zenith in the Southern Hemisphere.

PAINEL 38

SOME REMARKS ON THE RELATIONSHIP BETWEEN COSMOLOGY AND PHILOSOPHY BEFORE WORLD WAR II

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The contributions given to cosmology before World War II by philosophy and mathematics (e.g., the axiomatic way of thinking) are discussed. With the application of the theory of general relativity to the universe as a whole, cosmology was finally able to start claiming the right of being accepted as a legitimate scientific endeavour. However, due to a lack of an adequate observational basis, many astronomers and physicists (if not the overwhelming majority) still refused considering cosmology as truly and fully integrated into physical science. Trying to circumvent the weakness of robust observations and in order to make cosmology accepted by the community at large, some

cosmologists, during the 1930s and the beginning of the 1940s, specially in Great Britain, regarded mathematics and philosophy as legitimate ways of attaining pertinent answers to questions such as: What is a cosmological model? What are truly cosmological objects? What is the role played by mathematical hypotheses? Some of the answers to these questions were heatedly disputed at the time. Here, the ensuing debate about the epistemological pressupositions put forward by the participants, such as Milne, Dingle, Tolman, MacCrea, and others, is presented and commented upon, the main conclusion being that many of the cosmologists involved saw both mathematics and philosophy as indispensable tools for the construction of viable cosmological models.

PAINEL 39

MULTIMEDIA SUPPORT TO THE "OBSERVATION SKY PROGRAM - MAST/MCT"

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3 - Observatório Nacional (ON/MCT)

The observation of the sky is a permanent and a delightful source of interest for most people. However, we verify that the act of looking the sky through a telescope could involve a misunderstanding of what is seen. Our experience at MAST showed us that is necessary to provide contextual elements for the public really enjoy the sky observation. In order to achieve this goal, we began to develop multimedia presentations since February 2001, pointing out the easiest identifying constellations each month and the most important visible objects that can be seen with the naked eye and with a small telescope, such as: star clusters, nebulas, planets, comets etc. The monitor is allowed to browse through the presentation and create changeable topics adapting it to the disposable time and to the interest of the visitors. These presentations where developed during this year, and where changed and updated according to a monthly demand. In January 2002, we released a beta version CD-Rom of The Monthly Sky Multimedia, edited for MAST indoor use. Than, we began to dedicate ourselves to the elaboration and application of a questionnaire to the visitors, for an evaluation of the new proposal of the Observation Sky Program. The questionnaire answers provide subsidiary information for the production of the CD-Rom new updated version which we are presenting now.

ESTRELAS

PAINEL 40

WHO'S WHO AMONG BARIUM STARS

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Around fifty one years ago, Barium stars were recognized as a distinct group of peculiar stars. The objects included in this group were G and K giants which showed strong lines of many s-process elements, particularly Ba II and Sr II, as well as enhanced CH, CN and C2 bands. The discovery that HR 107, a dwarf star, shows composition similar to that of a mild Barium giant has pushed the search for new Barium dwarfs. In this work, we present a detailed analysis of 18 stars, providing their atmospheric parameters (T_{eff}, log g, [Fe/H]) and elemental abundances. High-resolution spectra were obtained by FEROS spectrograph at the ESO-1.5m Telescope. We have found that $-1 \leq [Fe/H] \leq +0.2$, and $0.7 \leq \log g \leq 5$ for those stars, suggesting that our sample has giants, subgiants and dwarfs. Some of the dwarfs observed were previously classified as giants, hence more detailed studies of other Barium stars are necessary in order to correctly classify this interesting class of stars.

PAINEL 41

PULSATION MODES IDENTIFICATION OF PG1351+489 USING WET DATA

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The study of pulsation features of the pulsating DB white dwarf PG1351+489 contributes for the determination of the general structure and the origin of this kind of stars since there is just one of the eight known DBV stars studied by WET data (GD358). The WET (Whole Earth Telescope) data provide power spectra with high resolution because of the long observation time. This study is made by asteroseismology which gives physical parameters about the structure of the star (the best values of temperature and gravity from theoretical models)

from an observationally determined set of frequencies. In this work we analyse the 1995 campaign of WET (eXtended COVerage 12 or XCOV12) for PG1351+489 and, after the reduction process, we identify the pulsation frequencies (or periods) set in order to determine the pulsation modes of the star. These information can be compared with the HST data obtained in 2000 to verify possible variation of the main period.

PAINEL 42

MULTIWAVELENGTH OBSERVATIONS OF V1082 SAGITARII

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V1082 Sgr is a cataclysmic variable (CV) which displays very distinctive signatures of a late-type star spectrum corresponding to a ≈ K4 secondary star over all its optical spectrum. This is a relatively rare situation for CVs, since in most cases, the combination of short orbital period / low luminosity of the secondary star / high luminosity of the accretion disk prevents the late-type spectrum from being visible at all in the optical region. More interesting still, V1082 Sgr alternates high and low states of brightness in which the contribution of the accretion disk ranges from a maximum to a minimum, respectively. Thus, this system offers us the opportunity to study both a "normal CV" configuration – with a prominent accretion disk – and a configuration where the secondary star dominates. The latter is particularly interesting since in that state one can study ellipsoidal variations, illumination effects and the nature of the secondary star itself with a minimum contamination from the accretion disk. Unfortunately, a very basic piece of information is still missing for V1082 Sgr: the orbital period. In order to determine this quantity, we have used the CamIV infrared imager at Laboratorio Nacional de Astrofisica/MCT to obtain J and H photometry of V1082 Sgr. The best candidate we have derived so far for the orbital period from the ellipsoidal variations in the infrared, namely 0.7348 d, is compared with the results from the UBVRI photometry and with the results from radial velocities. Finally, using the newly derived orbital period, we use the technique of Doppler tomography to examine the location of the main sources of line emission in the system and build a scenario for the structure of the binary in the framework of the present knowledge about CVs.

PAINEL 43

HST ACCRETION DISC MAPPING OF IP PEGASI AT THE END OF THE MAY 1993 OUTBURST

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Recently Baptista, Haswell & Thomas reported an optical eclipse mapping experiment showing that the spiral structures were still present in the accretion disc of the dwarf nova IP Pegasi at the late stages of the May 1993 outburst, some 8 days after it has started. Here we report time-resolved eclipse mapping of IP Pegasi on the following nights of the same outburst. HST fast spectroscopy covering 3 eclipses is analyzed to produce velocity-resolved eclipse maps across the C IV λ1550 and He II λ1640 emission lines as well as in the ultraviolet continuum near λ1500Å. The maps reveal the final, complex evolution of the structures in the accretion disc as the system approaches and goes back to quiescence. The results are compared with those of Baptista, Haswell & Thomas and are discussed in the framework of the current models to explain dwarf nova outbursts.

PAINEL 44

MULTICOLOR ECLIPSE MAPPING OF IP PEGASI IN QUIESCENCE

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IP Pegasi is an intensively studied eclipsing dwarf nova with an orbital period of 3.8 hr. Doppler tomography of emission lines revealed the presence of conspicuous spiral structures during outburst in support of hydrodynamical disc simulations. The application of powerful indirect imaging techniques such as eclipse mapping and Doppler tomography, are useful to probe the dynamics, structure and the time evolution of IP Peg accretion disc in quiescence or in outburst. High-speed UBVR photometry of IP Peg is analyzed with eclipse mapping techniques to derive maps of the surface brightness distribution of its accretion disc in quiescence. For the reconstructions we used a tri-dimensional mapping surface consisting of a flared accretion disc plus a disc ribbom at the radial position of the bright spot to account for out-of-eclipse orbital modulations. Here we present and discuss (i) the eclipse maps and their structures as a function of wavelength, (ii) a color-color diagram used to investigate the disc spectra as a function of position, (iii) a comparison of the derived radial

brightness temperature distribution with the $T \propto R^{-3/4}$ law expected for a steady-state optically thick disc model, and (iv) an investigation of the changing temperature inwards along the gas stream trajectory. We use a color-magnitude diagram and the UBVR uneclipsed fluxes to pose constraints on the distance to the star. The results are compared with those obtained from similar mapping experiments on short-period dwarf novae.

PAINEL 45

ACCRETION DISC MAPPING OF THE DWARF NOVA V4140 SGR

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We present an eclipse mapping analysis of BVR photometry of the ultra-short period cataclysmic variable V4140 Sgr. The object was caught in the decline from an outburst in july 1992, which confirms its classification as an dwarf nova. Here we discuss (i) eclipse maps and their structure as function of wavelength in quiescence and in the decline from the outburst, (ii) a color-color diagram used to investigate the disc spectra as a function of position, (iii) a color-magnitude diagram, used to constrain the distance, (iv) a comparison of the derived radial brightness temperature distribution with the $T \propto R^{-3/4}$ law expected for a steady-state optically thick disc model, and (v) the evolution of the temperature ditribution on the decline from the outburst. The results are compared with those obtained from similar mapping experiments on short-period dwarf novae in quiescence and along the decline from outburts.

PAINEL 46

FLICKERING MAPPING: PRINCIPLES AND SIMULATIONS

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Flickering is a fast intrinsic brightness scintilation occurring on time scales from seconds to minutes with amplitudes of 0.01 - 1 mag. Flickering is observed in all sources whose energetics is dominated by accretion process (i.e., interacting binaries, active galaxie nuclei), and is considered a fundamental signature of accretion. Nevertheless, it is the least understood aspect of the accretion process. We study the flickering in cataclysmic variables stars because in these systems the masses of the component stars, their dimensions and geometry are well determined and the existence of eclipses yields a unique opportunity to isolate the emission of different regions in the binary. In this work, we report on the capability of the eclipse mapping method to reproduce the spatial distribuition of

flickering in cataclysmic variables stars. We developed a program to generate/simulate maps whose intensity for any given pixel varies in time according to a selected amplitude. For the simulations, we use two artificial maps: the map of the steady component and the map of the flickering amplitude. These maps were combined to simulate the time variations of brightness in the accretion disc. We simulate the eclipse of this brightness distribuition using a given geometrical configuration to generate artificial light curves. The ensemble of artificial light curves is then combined to produce a mean light curve (steady component) and a curve of the deviations with respect to the mean (flickering curve). These curves are then analysed by the eclipse mapping method to generate eclipse maps which are compared with the original maps. Our analysis is focused on investigating the capability in reproducing the flickering distribuition as a function of: (i) the flickering amplitude in the initial map; (ii) the S/N ratio of each light curve in the ensemble; and (iii) the number of light curves in the ensemble. The results allow us determine the necessary requirements for performing an eclipse mapping experiment to uniquely locate the sources of flickering in the binary.

PAINEL 47

A STUDY OF MASSES IN YELLOW SYMBIOTIC STARS

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In this work we report a study of yellow symbiotic stars, those with cold components presenting spectral types G or K. A sample of 22 stars was used, which corresponds to the complete set of yellow symbiotic stars present in the catalog of Belczynski et al. (2000 A&ASuppl. 146 , 407). A color-magnitude diagram (J-K vs. K) was built for this sample, taking apparent K magnitudes from this catalog. The values were later converted to absolute K using distances from literature when available, or otherwise calculated. In this sample 13 stars have known distances. These results, along with isochrones from the literature, were used to derive masses and evolutive stages of the cold components in the systems. The mass distribution obtained is discussed in comparison with other subclasses of symbiotic stars. In a next phase of this project, nebular chemical abundances will be determined for these objects in order to better characterize them. (Work supported by CNPq and FAPESP)

PAINEL 48

RADIATIVE TRANSFER IN HOT STELLAR WINDS, A MONTE CARLO APPROACH

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We present a new Monte Carlo method for solving the 3-D radiative transfer problem for the stellar winds of hot stars. Our code simulates the transfer of polarized radiation in an extended circumstellar envelope composed of pure hydrogen. It includes scattering by free electrons, continuous bound-free and free-free absorption and emission, and line emission using Sobolev escape probabilities. Finally, the code applies a radiative equilibrium scheme that enable us to correcly calculate the wind temperature throughout the envelope. Since the Monte Carlo simulation is inherently three-dimensional, our method is easily applied to arbitrary wind densities, geometries, and velocity fields. In this paper we outline the main code features and present the tests we made to validade the code against published results and results from other codes. As a first application of the code, we present a study of H alfa line profiles and line polarization arising from the rotating Keplerian disks of Be Stars.

PAINEL 49

EFFECTIVE TEMPERATURE AND SURFACE GRAVITY DETERMINATION FOR THE WHITE DWARF G185-32

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Evolving from the main sequence, a star with initial mass between 1 and 10 solar masses loses a fraction of its mass proportional to its initial value. The remaining degenerate stellar core is a white dwarf, typically with less than 1 solar mass. The present work aims to study the structure of pulsating white dwarfs, which present multi-period light variations, defining instability strips. We emphasize the determination of effective temperature and surface gravity for the star G185-32, by means of spectroscopy and light profile analysis. The spectra have been obtained with Hubble Space Telescope and Whole Earth Telescope, and compared with theoretical models developed by Detlev Koester, from Kiel University, especially for this project. With Hipparcos paralaxes, we determined the best values, based on the star's spectrum. Additional determinations of temperature and gravity have also been made using colour indices, employing the well-known mass-radius relationship for these stars. White dwarf evolutionary models (Matt Wood, 1995) have been used as well. Colours have been obtained from atmosphere models with the same properties as Koester models, i.e.,

ML2/alpha=0.6 and Hummer-Mihalas theory for pressure-induced shifts in energy levels. The values corresponding to this method do not match those obtained from the spectra or pulsation amplitudes. This indicates that a more accurate analysis with additional, different methods is necessary in order to minimize the uncertainties associated to the determinations.

PAINEL 50

LITHIUM ABUNDANCE AND STELLAR MASS IN BINARY SYSTEMS WITH EVOLVED COMPONENTS

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In a recent work (Costa et al. 1992, A&A 382, 1016) we have found a possible "inhabited zone" in the lithium abundance versus rotation diagram for binary systems with giant component. We have shown that for binary systems with orbital period lower than 100 to 250 days, typically the period of synchronization for this kind of binary system, lithium depleted stars seem to be unusual. How dependent of mass or metallicity is such an "inhabited zone"? Looking for an answer for this inquire, in the present work we investigate a possible connection between abundance of lithium and stellar mass, in binary systems with subgiant and giant component. Preliminary results show that stars with low mass function f(m), typically stars with low masses, are less depleted that stars with large masses. In fact these later, which present high mass function, are very probably double-lined binary systems.

PAINEL 51

IN SEARCHING FOR ZZ CETI STARS

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High speed CCD photometry observations were made at the IAG 0.6 m telescope at LNA/MCT in searching for variable DA white dwarf stars. We selected 20 DA stars with $V \geq 15$ from the Edinburgh – Cape Blue Object Survey and the Hamburg Quasar Survey with effective temperatures or colors near to the ZZ Ceti instability strip. The light curves for target and comparison stars were obtained. The Fourier analysis was performed to find a periodic light variation in the light curves. We present in this work both the light curves and the frequency spectra for each star. We found no variable DA stars with an amplitude greater than 4 mmag.

PAINEL 52

MULTI-ELEMENTAL CHEMICAL COMPOSITION OF SOLAR-TYPE STARS

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The chemical composition of the long-lived solar-type stars is an extremely valuable diagnostic of the chemical evolution of the Galaxy. There is some evidence that such evolution has been heterogeneous both in time and space, and that the Sun might not be a typical star in what concerns its multi-elemental abundance pattern. The purpose of this work is to determine the abundances of the elements C, N, Na, Mg, Si, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Sr, Y, Zr, Ba, Ce, Nd, Sm, Eu and Gd, in a sample of solar-type stars in the solar neighborhood. The technique utilized is the detailed and differential spectroscopic analysis, relative to the Sun, based on high resolution (R > 45,000) and high sign-to-noise ratio (S/N > 300) data obtained with the the bench-mounted echelle spectrograph of the 1.5 m telescope at CTIO. In addition, abundances of C and N are being obtained based on the spectral synthesis of molecular bands of the Swan and Red Electronic Systems using the Moog code. The atmospheric parameters were established using photometric colors, the excitation & ionization equilibria of the Fe lines and the stellar positions in the HR diagram. Our aim is to uncover details of the chemical evolution in the solar neighborhood and of the nucleosynthetic enrichment of the galactic disk, as well as find out how typical the solar chemical composition is relative to the local population of G-type dwarf stars. We are presenting the preliminary results of the determination of the atmospheric parameters, the detailed abundance analysis, masses and ages of the sample stars.

PAINEL 53

ETA CARINAE: CYCLE-TO-CYCLE SPECTROSCOPIC VARIABILITY

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We present a spectroscopic monitoring of eta Carinae along the last 13 years in the wavelength range 3 900 - 11 000 A. The contrasting behavior of high and low excitation lines is discussed. We suggest physical mechanisms responsible for the complicated pattern of line variability and present predictions for the year 2003.5 event.

PAINEL 54

FRANCK-CONDON FACTORS, SPONTANEOUS EMISSION PROBABILITIES AND OSCILLATOR STRENGTHS OF MOLECULAR SPECIES OF ASTROPHYSICAL INTEREST

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Interstellar molecules are important tools for obtaining physical conditions within stellar atmospheres and interstellar clouds, and fundamental physical-chemical processes that are difficult to achieve in laboratory. In particular, the molecular species CH, CN, NH, and OH are found in interstellar space as well as in the atmospheres and envelopes of late type stars, the sun, and comets. In this manner, using rotational and vibrational spectroscopic constants available in the literature, we applied the computer program TRAPRB developed by Jarmain and McCallum (1970), to obtain the Franck-Condon factors (FCFs) and respective r-centroids for the main vibrational bands for the electronic transitions CH[(A-X), (B-X), (C-X)], (C-X), CN(B-X), NH(A-X) and OH(A-X). We also calculate the spontaneous emission probabilities, the oscillator strengths (f-values), and the corresponding radiative lifetimes.

PAINEL 55

GEMINI BASED SEARCH FOR PULSATING WHITE DWARFS IN GLOBULAR CLUSTERS

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White dwarfs are very faint and hard to detect stars. A small part of these have low amplitude pulsations. Pulsating white dwarfs are essential in probing the physical characteristics of white dwarf interiors. In order to search for variable white dwarfs a three step method is normally used: 1) search for white dwarf stars using color index selection in surveys and further spectroscopy for confirmation; 2) do more refined spectroscopy to establish the temperatures and determine its proximity to one of the white dwarfs instability strips and; finally 3) do time-series photometry of the candidates to determine whether or not they pulsate. Globular clusters contain a very large number of stars (100,000), with a relatively old population. Simple calculations tell us that each globular cluster is expected to contain a few hundreds of white dwarfs, and a few dozen are expected to be pulsating. We obtained three hours of time series photometry of a small section of M4 using the Gemini North acquisition camera. Analyzing crowded fields as those of glogular clusters is a very problematic task. We are finishing the work on photometry, and after doing this, the variability detection limit of the instrumentation used to get these data will be achieved. Through this analysis we will discover several variable objects, and, by their color indices, magnitudes and variability characteristics, we will determine which are pulsating white dwarfs. In this way we may, for the first time, detect pulsating white dwarfs in globular clusters. In addition to greatly improve the statistics of the known pulsating white dwarfs, globular cluster studies will provide us with a sample of objects which have a common past history allowing, in the future, studies comparing objects in different clusters.

PAINEL 56

ASYMMETRIES AROUND AGB STARS: V CVN

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Astronomical polarimetry is an extremely useful technique for detecting asymmetries around emitting regions without spatially resolving them. In addition, since several processes may give rise to polarization of light, studying

the latter may provide insight into the physical processes that occur at the source or between the source and observer. A net polarization will then ensue when some asymmetry (temperature variations, spots, etc.) is present across the stellar disk. Among the objects being monitored at Pine Bluff Observatory (PBO), of the University of Wisconsin-Madison, there are a few late-type long period variables: α Orionis, V Canum Venaticorum and o Ceti. We will discuss PBO data for the semi-regular variable V CVn. Quite extraordinarily, it may show blue polarization of up to about 10%. The reasons for this are not entirely clear but the indications are that the polarization is produced in a strongly asymmetric photosphere and that the variability is directly linked to the stellar pulsation. The position angle of the polarization is rather stable with time and it suggests that the asymmetry may be related to stellar rotation. FAPESP, CAPES and CNPq support this research.

PAINEL 57

A STELLAR SAMPLE FOR THE NUCLEOCOSMOCHRONOLOGY OF THE GALACTIC DISK: ATMOSPHERIC PARAMETERS AND ABUNDANCES

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Nuclecosmochronology employs radioactive nuclides to determine time scales for the formation of the Solar System, the Galaxy and the Universe itself. ^{232}Th is a radioactive nuclide with a 14 Gyr half-life, while the most abundant isotopes of Eu are stable. The radioactive decay of ^{232}Th modifies the Th/Eu stellar abundance ratios in an age-dependent way, thus providing a tool for the determination of the formation time scale of stellar populations. The aim of this work is to establish the age of the Galactic disk. In order to carry out this task with high accuracy, we selected a sample of 32 F5-K1 dwarf/sub-giant disk stars with $-1.00 \leq [Fe/H] \leq +0.30$ and $0 < age(Gyr) \leq 10$. The Th abundance is determined from spectral synthesis of the 4019.14Å line, measured off CES spectra with R=235.000. This line is the only one strong enough to allow an acceptable measurement, even though its heavily blended with Fe, Ni, Co, Mn, V and Ce. We present the results of a detailed determination of atmospheric parameters and chemical abundances of 17 of the 32 program stars, using FEROS spectra. Equivalent widths of 50 FeI and 10 FeII lines were used, by means of a model atmosphere analysis, to determine effective temperatures, surface gravities, microturbulence and metallicities. The abundances of the cited contaminants of the Th line spectral region were then determined, again through detailed spectral analysis. The final goal is the determination of the Th/Eu stellar abundance ratios with unprecedented accuracy thus establishing reliably the age of the Galactic disk.

PAINEL 58

ROTATIONAL VELOCITY FOR CHROMOSPHERIC ACTIVE GIANT STARS

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One of the most puzzling questions in stellar astrophysics, concerns the role of rotation on the stellar activity. Chromospheric fluxes scale rather linearly with rotation, but presenting a large spread at a given spectral type, indicating that rotation might not be the only root cause controlling stellar activity. Further, it is expected that binarity plays an important hole on chromospheric heating processes. Most of the open questions in the study of the rotation-activity connection, results, admittedly, from the paucity of available observational data. In this work we present rotational velocity $v\sin i$ for a large sample of red giant stars with clear signature of chromospheric activity, selected from the catalog of emission-line stars by Bidelman (1954, ApJSS 1, 175). In addition, from radial velocity measurements, we define a single or multiple status for all the stars of the sample. Rotational and radial velocities were acquired on the base of observations carried out with the CORAVEL spectrometer.

PAINEL 59

A GRID OF THEORETICAL EMISSION LINE PROFILES OF MASSIVE STARS IN TRANSITION

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The uppermost part of the Hertzsprung-Russel diagram (HRD) is occupied by massive, luminous and (more or less) evolved stars. Using spectral morphology as a guideline many groups of objects have been identified. The groups are usually related to evolutionary states in the life of a massive star. From the theoretical point of view the evolutionary tracks computed by different authors provide stellar temperature, luminosity, surface abundances and mass loss rates at different times. The aim of this contribution is to present theoretical emission line profiles of massive stars in distinct evolutionary phases. A non-LTE numerical code for radiation transfer adequate to describe the winds of these objects has been employed. The code is based on basic assumptions as spherical symmetry, stationarity and homogeneity. The transfer equation is solved using the Sobolev Exact Integration method, what is justified by the large flow velocities seen in the winds. We have computed models according to the points of the evolutionary paths by Schaller et al (AA Suppl. Series 96,269, 1992) from

M=20 M⊙ to M=120 M⊙. Until now we have only used solar metalicities. Each path consists of a number of points which give the stellar parameters cited in the first paragraph and that are used as entry parameters for our radiative transfer code. For each point we have obtained Ha, Hb, Hg, Hd, He I l 5876 and He I l 6678 theoretical profiles. The line profiles vary from pure emission to P-Cygni type and to (almost) pure absorption. As a first application they have been compared with those observed in the peculiar B supergiant HD 327083. The method seems to be quite powerful for a quick spectroscopic analysis of massive stars and it deserves to be further developped.

PAINEL 60

METALLICITY EFFECT ON THE ROTATION OF POPULATION I GIANT STARS

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From the total area (W) of the CORAVEL cross-correlation dip we infer metallicitiy values for a large sample of giant stars of population I, along the spectral range F, G and K. We show that the precision of these data is equivalent to metallicity measurements obtained by the best existing methods. This method have an advantage that the metallicity determination is independent of interstellar reddening. The obtained metallicity values are combined with precise rotational velocity vsini, taken from the catalog o rotational and radial velocities by De Medeiros and Mayor (1999, A&AS 139, 433) to study the impact of metallicity on rotation. A preliminary analysis shows an increase of dispersion of vsini values with an increase of metallicity.

PAINEL 61

HIGHLY ROTATING Li-RICH K GIANTS

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Highly rotating cool K giant stars are appearing as excellent "laboratories" for the study of internal stellar mixing and its relation with surface chemical abundances, stellar activity, mass loss and chemical evolution of the Galaxy. Based on high resolution spectra obtained with the 4.0 m telescope at CTIO, the 2.7 m telescope of McDonald Observatory, and the 1.52 m telescope with spectrograph FEROS at La Silla, we studied a group of highly rotating K giants with velocities $v\sin i \geq 8$ km s^{-1}. We found that among these stars a very large

proportion (~50 %) are Li-rich, This is in a very large contrast with the low proportion (~2 %) of Li-rich stars among the normal slowly rotating K giants. A strong relation between high rotation and high Li abundance exists only when a large mass loss is present. Highly rotating Li-rich giants appear to present anomalous C and N abundances which differ from those expected for standard giant stars that have already passed the first dredge-up convective phase, in which ^{12}C is reduced and ^{14}N is increased. The eventual presence of the ^{6}Li isotope in the highly rotating Li-rich K giant PDS 365 was studied considering this isotope in addition to the usual ^{7}Li in the spectral synthesis of the resonance LiI line. The comparison of observed and calculated spectra shows that the absence of ^{6}Li agrees better with observations. Similar result was obtained by other authors for other highly rotating Li-rich giants, such as HD 9746, HDE 233517 and PDS 100. An extensive survey of the Hα line of the Li-rich, very highly rotating K giant HD219025 revealed large profile variations of this line even on a day to day basis. These variations result from a rotation modulation of a very strong surface activity region.

PAINEL 62

SPECTRAL VARIABILITY OF T TAURI STARS: GQ LUPI

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We present the 1999 low resolution time series of GQ Lupi, a typical T Tauri star with strong evidence of circumstelar disk accretion. Our unique data set consist of 18 exposures taken during 18 consecutive nights in February 1999. We compute the excess continuum emission distribution (veiling) and determine the distribution average veiling. The resulting veiling time series has a sinusoidal curve that shows a displacement between minima of about 13 days. We argue that this bell shaped curve is controlled by an accretion hot spot, on the stellar surface, crossing the line of sight as the star rotates. Further support for this period is found in previously published photometry of GQ Lupi as well as in our 1998 spectrophotometric campaign. The veiling time series does not correlate with the Balmer emission lines. On the contrary, individual line emission correlate with one another indicating the presence of a common mechanism governing their luminosities or a common physical origin. The inverse P Cygni profiles that are so conspicuously present in the Balmer lines and in the CaII H and K lines practically disappear in the present data set. Based on observations taken at the European Southern Observatory, La Silla, Chile, under the ESO-Observatorio Nacional agreement.

PAINEL 63

HOT STARS WITH ANOMALOUS VISIBLE, INFRARED, AND IRAS COLORS

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The class of hot giants and supergiants is under-represented in the HR diagram, since in their evolution, stars spend little time in that phase. However, knowledge of some basic paratemers is important to refining models of stellar structure and evolution. Using a large database of UVBRIJHKLMN photometry, we compiled a table of intrinsic colors for hot giants (O to F), a set of data which was, until now, not available. This result is presented, and applied to analyse the flux ratio of giants and supergiants, using dwarfs as reference. We observed that, probably due to the fact that hot supergiants tend to present more emission in their Balmer lines than hot giants, in the infrared fluxes for supergiants are depressed, which is interpreted as a result of energy transfer from the ultraviolet to the infrared, more important in the supergiants. Comparison of color (12-60) from IRAS database, with (J-L), showed that some O and B stars have sistematically more emission in 60 micra, while some A and F behave inverselly. For these 25 stars with atypical IRAS colors, we verified that extinction, Av, and R have typical values for supergiants, while, for dwarfs, these parameters are abnormally high, a possible link to peculiar properties in the neighbouring interstellar medium. All these results point to a sample of stars which are anomalous by several criteria, indicating the need of spectral observations for a selected sample of hot supergiants, giants and dwarfs.

PAINEL 64

STELLAR AND CIRCUNSTELLAR ACTIVITY IN THE Be STAR α ERIDANI

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High resolution and high S/N spectroscopic analysis for the epoch of November 1991 until October 2000, had shown line-profile variations of Hα, HeI and MgII in the Be star α Eridani (HD 10144). For metal lines, these variations had been interpreted in terms of the non-radial pulsations model (NRP), and frequency analyzed using CLEAN and CLEANEST algorithms, had allowed the detection of the following frequencies: 0.3 c/d, 0.8 c/d, 1.29 c/d, 1.90 c/d, 2.50 c/d and 3.77 c/d. The pulsations parameters had been determined by means of the phase variation of the frequencies, and estimated in ℓ~3±1 and $|m|$~3±2, characteristic from a *g*-mode, assuming the 1.29 c/d as the fundamental frequency and 2.50 c/d as its

respective first harmonic. Study of mean absolute deviation in the spectral line of HeI λ6678 Å shows evidence of matter ejections between 1997 and 1998, which are coherent with the high frequencies determined in this work. Long-term analyses in the Hα, had confirmed the cycle of OBAe phenomenon in α Eridani, in about 11 years, and allowed us to describe the time evolution of the circumstellar envelope in four different phases: relative quiescence, precursor phase, outburst, and relaxation.

PAINEL 65

THE STELLAR CONTENTS OF GALACTIC GIANT HII REGIONS

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The survey of Giant HII regions (GHII) in the near-infrared is very promising, since it can address important Astrophysical questions such as: 1) characterizing the stellar contents by deriving the initial mass function (IMF), star formation rate and age; 2) study of physical processes involved in the formation of massive stars, through the identification of OB stars in very early evolutionary stages, such as embedded young stellar objects (YSOs) and ultracompact HII Regions (UCHII); 3) tracing the spiral arms of our galaxy by measuring spectroscopic parallaxes of zero age main sequence OB stars. We are presenting high angular resolution near-infrared images of the 8 Galactic GHII regions. In particular, we concentrate on a recent survey of obscured GHII regions and the associated stellar clusters embedded in them. The regions have been selected as the most luminous radio continuum sources and, as such, the stellar clusters appear to be among the youngest massive clusters in the Galaxy. The emergent stellar populations are further studied through near infrared spectroscopy of the brighter members. We identify O-type stars and massive YSOs and we present our preliminary results using the same method developed in the study of GHII region NGC3576 (Figueredo et al. 2001 - astro-ph/0204348).

PAINEL 66

WHEN DOES AN "A" STAR TURN INTO AN "Ap" STAR?

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Ap stars present high abundance of rare earth elements. These overabundances are understood as the result of radiative diffusion. In the model, the rare earth

elements are pushed to the surface by selective radiation pressure as the wavelength where the radiation field is maximum is the same as the wavelength where the rare earths opacities peak. Radiation pressure is helped by the lack of convection in A star envelopes and by the inhibition of turbulence promoted by the magnetic fields. One fundamental question in the investigation of Ap stars is when, in the evolution process does an A star turn into an Ap star? . Previous work by Abt (1979) and Abt and Cardona (1983) have suggested that A stars turn into Ap stars as they aged. Later, other workers have questioned this result (see for instance North, 1993). All of the work done after Abt and Cardona was done based on photometric data rather than spectroscopy. Our goal is to solve this controversy studing the ratio of Ap to A stars on open clusters of different ages. In this work we show the current situation of this project. We have obtained classification spectra of nearly 200 late B, A and early F-type stars in 9 open clusters, including IC 2602, NGC 3228, NGC 2516, NGC 6193, NGC 2264, NGC 4103, NGC 2343, NGC 2422 and Collinder 258. The spectra were obtained with resolution of 4 Å with Cassegrain spectrographs on 1.5m CTIO and 1.52m ESO telescopes.

PAINEL 67

ASYMMETRIC EXPLOSIONS OF THERMONUCLEAR SUPERNOVAE

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A type Ia supernova explosion starts in a white dwarf as a laminar deflagration at the center of the star and soon several hydrodynamic instabilities, in particular, the Rayleigh-Taylor (R-T) instability, begin to act. A stationary combustion and a turbulent combustion regime are rapidly achieved by the flame and maintained until the transition to detonation is believed to occur. In a previous paper (Ghezzi, de Gouveia Dal Pino, & Horvath, ApJL,548, L193, 2001) we addressed the propagation of an initially laminar thermonuclear flame in presence of a magnetic field assumed to be of dipolar geometry. We were able to show that, within the framework of fractal models for the flame velocity, the front is affected by the field through the quenching of R-T instability growth in the direction perpendicular to the field lines. As a consequence, an *asymmetry* develops between the magnetic polar and the equatorial axis that gives a prolate shape to the burning front. We have presently computed the total integrated asymmetry as the burning front propagates through the outer, density decreasing shells of the magnetized, expanding progenitor star and found that a maximum asymmetry of about 50% is produced between the polar and equatorial directions, for progenitors with a surface magnetic field $B=5\times10^7$ G, and a composition $^{12}C=0.2$ and $^{16}O=0.8$. This asymmetry could explain recently detected asymmetries in spectropolarimetric observations of very young supernova

remnants. We have also found that the total asymmetry is larger for lighter progenitors (Ghezzi, de Gouveia Dal Pino & Horvath 2002).

PAINEL 68

THE ORIGIN OF THE BETA PICTORIS MOVING GROUP

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Practically unknown before the end of the eighties, the post-T Tauri stars(PTTS) with ages between 10 and 100 Myr, have been discovered as nearby (in general less than 100 pc) associations or moving groups. Two Brazilian surveys are responsible for the discovery of a large part of these discoveries. Two main properties of these stars are important: 1) they are forming planets 2) up to now, they have only been found in the Southern H. This last property has left some authors to suggest that these associations, at least those with ages ~10 Myr, were formed near the Sco-Cen OB Association. Here, we report the results concerning the studies of the origin of the β Pic moving Group (BPMG)which contains 19 stars systems together with the known β Pic star that contains the prototype of protoplanetary disks. This nearest group is at a mean distance of 36 pc from the Earth, and has an evolutionary age (HR diagram) of 12^{+8}_{4} Myr. By retracing the 3-D orbits of all members of PBMG and using a realistic Galactic potential, we find that a first maximum concentration of orbits occurs at 11.5 Myr and in a space region having a maximum size of 24 pc, three times smaller than its present size. We consider this region to be the birthplace of BPMG. This interesting similarity between independently obtained evolutionary and kinematical ages, indicates that the group could have already been formed as an unbound system as observed today. The birthplace of BPMG is located in a 3-D space at ~45 pc from the region where the LCC and UCL subgroups of the Sco-Cen OB association were when they were 4 to 6 Myr old. At that age, both subgroups were able to produce SNe capable of triggering the formation of BPMG. The interaction distance could even be smaller, up to ~26 pc, if the SNe exploded in the outer regions near the birthplace of BPMG. Different from BPMG, for which we propose a coeval formation, the LCC and UCL groups appear not to be truly coeval.

PAINEL 69

COMPARING THE WHITE DWARF STAR MASS DERIVED FROM DIFFERENT EVOLUTIONARY MODELS

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In this work we present the masses obtained for 95 DA white dwarf stars using two different evolutionary models. The white dwarf evolutionary models were developed by M. Wood (Florida Institute of Technology) and by L. Althaus & O. Benvenuto (Universidad Nacional de La Plata) and they show the evolution of the stellar parameters as funciton of the age or effective temperature. We have determined the atmospheric parameters (T_{eff}, log$g$) for each star from observed optical spectrum and used these parameters to derive the stellar mass by interpolating the evolutionary models. Both the models have carbon-oxigen core and an outer helium mass of $10^{-2}M_{\star}$. The differences between the models are the outer hidrogen mass (M_H) and the metallicity (Z). The Wood's tracks have M_H=$10^{-4}M_{\star}$ and Z=0 while the La Plata group's ones have M_H of 0, 10^{-10}, 10^{-6}, and $10^{-4}M_{\star}$ and metallicity of 0 and 0.001. The derived masses are shown as a function of M_H and Z and the mean difference is determined. The adopted mathematical treatment is also an important aspect that can be compared when the stellar parameters are the same in both models. In this case we obtained a mean difference of ~0.05$M_{\odot}$.

PAINEL 70

FLICKERING CHARACTERISTICS OF V2116 OPHIUCHI

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V2116 Oph is the optical counterpart to GX 1+4, an X-ray pulsar that shows many unique features, like a large period derivative ($|dP/dt| \approx 2$ sec/yr), a very hard X-rays spectrum (kT of up to 50 keV in a thermal bremsstrahlung model) and the presence of relatively large amplitude (up to 4 %) optical pulsations consistent with the correspondent in X-rays. Relatively little is known about the photometric behavior of V2116 Oph in short time-scales. In this contribution, we examine CCD time-series data collected during 1991-2002 at Laboratorio Nacional de Astrofisica/MCT trying to characterize the flickering properties of the system. Two basic approaches were used: (i) a characterization in the time domain that is very robust with respect to effects like scintillation, guiding errors

and non-photometric sky conditions, and (ii) a frequency domain approach in which we examine the power spectrum of the light variations. We discuss our results in terms of the energetics of the flickering, its frequency of occurrence and relationship to quasi-periodic oscillations (QPO) – in the light of the best scenario for the structure of this interesting X-rays binary.

PAINEL 71

SLOW AND FAST VARIATIONS IN THE PULSATING WHITE DWARF STARS

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Pulsations in white dwarf stars are tools to study their interiors and evolution because they are global oscillations, as in the Sun. The eigenmodes detected in the pulsating white dwarf stars have periods of order of 100 to 1500 s. Even though the pulsation frequencies are extremely stable on most stars, the amplitudes may vary on timescales from days to years. We show that the DAV star G117-B15A is the most stable optical clock known, with the pulsation period varying by less than 1 second in 10^8 years, caused by the slow cooling of the white dwarf. On the other hand, the DBV star GD358 showed a huge amplitude variation in only one day, of still unknown origin. It is clear that the larger the pulsation amplitude, the larger the amplitude variation, so nonlinear effects are causing the amplitude variations,but it is unclear if we have amplitude saturation, resonances or nonlinear response of the medium caused by pulsation-convection interaction. Pulsations in white dwarf stars are tools to study their interiors and evolution because they are global oscillations, as in the Sun. The eigenmodes detected in the pulsating white dwarf stars have periods of order of 100 to 1500 s. Even though the pulsation frequencies are extremely stable on most stars, the amplitudes may vary on timescales from days to years. We show that the DAV star G117-B15A is the most stable optical clock known, with the pulsation period varying by less than 1 second in 10^8 years, caused by the slow cooling of the white dwarf.On the other hand, the DBV star GD358 showed a huge amplitude variation in only one day, of still unknown origin. It is clear that the larger the pulsation amplitude, the larger the amplitude variation, so nonlinear effects are causing the amplitude variations, but it is unclear if we have amplitude saturation, resonances or nonlinear response of the medium caused by pulsation-convection interaction.

PAINEL 72

THE EVOLUTION OF ORBITAL PARAMETERS AND MASS TRANSFER EFFECTS IN CLOSE BINARY SYSTEMS

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The study of the stellar evolution is the key to explain the status of each star that we can observe. The evolution of single stars is very well established, but stars in close binary systems have additional effects that make their study one of the most exciting branches of Astrophysics. The tidal interactions in close binary systems determine peculiar effects like synchronization, circularization and mass transfer. These effects are observationally well established, but theoretical models are still incomplete, in particular for evolved phases. In this work, we present a theoretical study on the dynamic evolution of close binary systems from the main sequence up to evolved stages. We combine the hydrostatic equations of the standard model with a mass transfer criterion and equations developed by J.-P. Zahn (1976 A&A 57,383 and 1978 A&A 67,162) to produce a complete evolution of structural aspects and orbital parameters for both components of a close binary system. As a first result, we computed the evolution of orbital parameters for one solar mass and a comparison with observations was performed.

PAINEL 73

NON RADIAL PULSATIONS AND STELLAR PARAMETERS REVISITED FOR THE BE STAR HD 127972

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Line profile variations (lpv) in HeI, FeII, MgII and SiII transitions were detected in the Be star HD 127972 (η Cen), by means of high resolution and S/N spectroscopic observations secured in six epochs from May 1996 to April 2001. They were interpreted in terms of nonradial pulsations (NRPs). Time series analyses were performed using Cleanest algorithm and showed the following frequencies with high order of significance: 0.6 c/d, 1.5 c/d, 3.8 c/d, 5.3 c/d, 9.2 c/d and 10.3 c/d. From phase variation diagrams we estimated ℓ parameters in the range 3 - 7. If the 10.3 c/d frequency is considered to be the first harmonic of 5.3 c/d, the corresponding azimuthal number for this mode is $|m|=4\pm2$. Unless 0.6 c/d, all the other frequencies are compatible with NRPs. During the phase of strengthening of Balmer emission lines, it was observed an episode of enhancement of Hα peak separation, possibly related to mass loss. The stellar

fundamental parameters (T_{eff}, log*g*) of HD 127972 were obtained by two methods, from the fitting of synthetic spectra to observed Hγ and Hδ profiles, and from the BCD spectrophotometric system (developed by Barbier, Chalonge and Divan in 1952) which is based upon the determination of (D_*,λ_1) parameters related to the Balmer discontinuity and with the advantage of being free from circumstellar extinction. These parameters have been used straightforward to derive the stellar mass, radius and rotational frequency, imposing an important constraint over the above detected signals.

PAINEL 74

DUST IN S STARS

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AGB stars are often surrounded by circumstellar dust shells (CDS). The C/O ratio abundance defines the chemical composition in these media. CDS of carbon-rich stars (C/O > 1) present emission features due to amorphous carbon (A.C.), SiC and MgFeS dust grains. On the other hand, oxygen-rich stars (C/O < 1) present silicate and corundum features. S stars (C/O ≈ 1) are transition objects between M-type and C-type stars. Their IRAS spectra present, sometimes, a very strong emission feature at 10 μm (oxygen-rich) and sometimes the feature at 11.3 μm (carbon-rich). Recently, Ferrarotti et al. (2002) have show that FeSi dust condensates in S star's envelope. In order to verify the composition of the dust present in CDS of S stars we have inspected IRAS LRS and ISO data for a sample of 149 S star candidates. Our results show that in IRAS sample (131 objects) only 22 are S stars: 18 present the 10 μm emission feature and 4 the 11.3 μm ones. In ISO sample (18 stars) we have found 7 S stars: 4 present a 10 μm emission and 3 the 11.3 μm feature. Since we are interested in a deeper insight into the nature of the circumstellar dust grains, it is necessary to solve the radiative transfer problem, and to reproduce the features seen in the mid-IR LRS together with the properties of the complete CDS. We have calculated models for a sample of 8 S stars and the procedure adopted is described in Lorenz-Martins et al. (2001, A&A, 367,189). Our results show that S stars which present the 11.3 μm feature can be described with models using A.C. and SiC grains and we suggest that these stars can be in fact, SC stars. The sample which present the 10 μm feature were fitted with silicate and quartz grains. We could not test the suggestion of the presence of FeSi grains because of the lack of optical constants.

PAINEL 75

HR DIAGRAM AND MASS RANGES OF SYMBIOTICS STARS TOWARDS THE GALACTIC BULGE

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In this work we present preliminary results of a study on symbiotic stars towards the galactic bulge. The sample was selected from Belczynski et al. (2000, A&ASuppl. 146, 407), defining the bulge region as 20° < l < 20° and 20° < b < 20°. According to this criterion, we found 88 stars towards the bulge. A bibliographic survey provided us apparent K magnitudes, colors (J-K) and distances for 24 objects. Absolute K magnitudes were derived from these values and corrected from interstellar absorption using the expression by Medina-Tanco and Steiner (1995, AJ 109, 1770), which built a color-magnitude diagram for 22 bulge stars adopting a fixed distance of 8.5 kpc for all of them. Adopting more realistic distances, we plotted a color-magnitude diagram for our sample and traced isochrones to study the evolutionary stage of the red component of each system. From the results we derived a mass range for the red components, placing them as giants or supergiants, as expected. Types D (dusty) and S (star-like) objects lie in different places in a HR diagram, indicating different evolutive stages for each class. In a forthcoming phase, we intend to derive chemical abundances of CNO for these objects and investigate their evolution, related to other bulge components. Work supported by CNPq and FAPESP

PAINEL 76

SPECTRAL MAPPING AND PHYSICAL PARAMETERS OF THE V2051 OPH ACCRETION DISC

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We report on the spectral mapping experiment of the short period eclipsing dwarf novae V2051 Ophiuchi, based on spectroscopic data collected with the Hubble Space Telescope (HST), covering two eclipses on January 1998, one in the ultraviolet range (UV) [1250-2506] Angstroms and one in the optical range [3236-4781]Angstroms. For this work we separated the spectra in 30 narrow spectral bands in UV and 35 spectral bands in the optical, and we extract the light curves for each band. For the strongest lines, the light curves were resolved in velocities of 1200 Km/s, resulting in 5 bands for each line centered in 1200 Km/s. For the weakest lines, the light curves were resolved in just one band for a velocity of 3000 Km/s by line. For a continuum, the spectral bands were resolved with a width of around 55 Angstroms in UV and around 78 Angstroms in the visible.

The curves were analised with eclipse mapping techniques in order to obtain the map of the brightness distribution on the accretion disc. We divided the disc in a central region, the bright spot region, and the rest of the disc in concentric rings. For each spectrum a simple model consisting of an LTE hydrogen emission plus blackboby has been adjusted to the extracted fluxes allowing us to estimate the effective temperature, the column density and the solid angle of each region. We compare the radial brightness temperature distribution with the $T \propto R^{-3/4}$ law expected for an optically thick steady state disc.

PAINEL 77

IDENTIFICATION OF YOUNG STARS IN THE CMA R1 COMPLEX

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We have used *ROSAT* data to search for previously unidentified young stars in the giant molecular cloud *Canis Majoris* R1 (CMa R1), whose distance is ~1kpc. The knowledge of star formation in distant clouds is supported by the luminous massive young star observations. The lack of data on faint low-mass stars does not allow a correct evaluation of the entire young population, nor the confrontation between the theoretical predictions and observational data, which could answer open questions on star formation. In a study of Monoceros and Rosette complexes, the X-ray data indicated the presence of T Tauri stars and Herbig Ae/Be stars associated to these giant molecular clouds that were previously considered as being regions typically forming massive and isolated stars. CMa R1 revealed 61 sources suspected to be T Tauri or Herbig Ae/Be stars, as they show X-ray luminosities typical of these young stars. In order to characterize the nature of the candidates, low- and medium-resolution spectra were obtained at OPD 1.6m and ESO 1.52m telescopes. Deep optical images for three X-ray sources without optical counterpart were obtained with Gemini 8.1m. Optical and near-infrared photometric data were acquired from literature. A visual extinction map based on star counts was made, providing dereddened J_0 *vs.* $(H\text{-}K)_0$ and $(J\text{-}H)_0$ *vs.* $(H\text{-}K)_0$ diagrams. Several tests were applied to better understand the nature of the sources. In this work, we present the partial results obtained in the identification and classification of the CMa R1 members. Correlations of the X-ray data with optical and infrared bands are shown and compared to other star forming regions. The results are similar to those found for the population associated to distant molecular clouds, as *Monoceros* R2 and *Rosette*.

PAINEL 78

WEAK EMISSION LINES CENTRAL STARS OF PLANETARY NEBULAE

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Central stars of planetary nebulae (CSPN) can be divided in two main groups according with their superficial abundances : H-rich and He-Rich. This last group show three different spectra : WC spectra (like Wolf-Rayet of Pop. I), absorption and weak emission lines (WELS) spectra. Observational evidences suggest a general evolutionary sequence between them : [WCL] => [WCE] => WELS => PG 1159. Where PG 1159 is a (pre) white dwarf. Nevertheless, this scenario and the origin of CSPN with a H-deficient atmospheres remain controversial. In order to clarify this situation, observational studies have been very useful as an empirical source of data. In this work new homogeneous spectroscopic data of 15 CSPN candidates to the WELS subtype is presented. The observations were performed using the 1.52m telescope in ESO, Chile, with a 1200 lines/mm grid, giving a spectral resolution of 2Å in the 4000-6000Å range. We measured equivalent widths and full widths at half maximum of lines of the ions : C II, C III, C IV, He II, O III, O V e O VI. The main features of the WELS were confirmed and we discuss the spectral differences between them and a possible classification in subgroups.

PAINEL 79

ROTATION, CHROMOSPHERIC ACTIVITY AND Li ABUNDANCES IN SUBGIANT STARS

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The study of the connection of stellar rotation with chromospheric activity and abundances of light elements in evolved stars has known important advances along the past decade. Nevertheless, in practice, the mechanisms controlling such a connection, as well as its dependence on different stellar parameters as metallicity, mass and age is not yet well established. In this work we present a novel analysis of the connection rotation–CaII emission flux–abundance of lithium for subgiant and giant stars, by analysing the behaviour of these parameters through the HR diagram, on the basis of precise and homogeneous rotational velocity measurements. One of the most interesting results of this study shows a discrepancy in the location of the discontinuities in $v\sin i$ and CaII emission flux and that for the abundance of lithium.

PAINEL 80

VARIABILITY AND THE CIRCUMSTELLAR ENVELOPE OF MAGELLANIC CLOUD B[e] SUPERGIANTS

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In the HR diagram, there is a temperature dependent upper limit for the stellar luminosity. Among the stars located around that region, we find the Luminous Blue Variables (LBVs), Wolf-Rayet stars and the less well understood B[e] supergiants (B[e]SG). The B[e]SG present evidences of axisymmetric circumstellar envelopes with a hot, fast, polar wind and a cool, slow, dense wind in the equatorial region. These envelopes can produce observable polarization and this has indeed been observed. Recently, there has been some evidence that the B[e]SG show photometric, spectroscopic and polarimetric variability, which may indicate a connection between the B[e]SG and the LBVs. Magellanic Clouds (MC) B[e]SG are important because they have well defined luminosities, as opposed to those in the Galaxy. In this work, we present high-resolution data based on observations with the ESO 1.52m telescope and the FEROS spectrograph. The sample is composed of four MC B[e]SG with polarization variability and two without such variability. We check for spectral line variability through the equivalent width of lines, especially those of Balmer series. We also give estimates of radial and expansion velocities for Balmer lines and other ions. This research is supported by CAPES, FAPESP and CNPq

PAINEL 81

SEARCH FOR DUSTY OBJECTS IN MAGELLANIC CLOUDS

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Dust envelopes are present in cool evolved objects like AGB and post-AGB stars. The grains are heated by the central star and thermally radiate in mid- and far-infrared. In addition there are also hot stars which present a strong near/mid infrared excess due to hot circumstellar dust, indicating dust temperatures of ≈ 1000 K; these stars are named B[e] stars (Zickgraf 1998). Then this infrared range is therefore particularly well adapted to study stars with dust emission. Infrared (IR) colour-colour diagrams and spectrophotometry allow first-order classification of dust shell stars and evolutionary stages that were not previously detectable. In particular these diagrams represent a easy and fast method to search for different kind of objects with emission in near/mid IR. In this work we have used data of DENIS (Deep Near Infrared Southern Sky Survey) project to select AGB, post-AGB and also B[e] supergiants in Magellanic Clouds (MC). We have developed a code to separate these types of stars among

1.319.900 sources in Large Magellanic Cloud (LMC) and 315.780 in Small Magellanic Cloud (SMC). Using (I-J) x (J-K) diagrams we were able to distinguish between carbon-rich and oxygen-rich stars. We have found 19612 carbon stars and 29451 oxygen stars in SMC. In LMC we have found 19924 carbon-rich and 19578 oxygen-rich stars. On the other hand, it is very difficult to distinguish between post-AGB and B[e] supergiants using these colours. Their colours are very similar in this wavelength range. Anyway, we have found about 25000 supergiants (post-AGB and B[e]) in SMC and 36000 in LMC. In the future we plan to use the same procedure with 2MASS data (J,H,K) in order to discriminate both classes of stars.

PAINEL 82

A NUCLEAR MANY-BODY THEORY AT FINITE TEMPERATURE WITH TSALLIS STATISTICS APPLIED TO PROTONEUTRON STAR

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Thermodynamical properties of nuclear matter were studied in the framework of an effective many-body field theory at finite temperature through a nonextensive statistical, Tsallis´ statistical, on the distribution functions. We have performed the calculations using the nonlinear Boguta-Bodmer model, with Sommerfeld approximation, including the fundamental baryon octet and leptonic degrees of freedom. The protoneutron star macro-properties were determined by the integration of the Tolman-Oppenheimer-Volkoff equations. Our predictions include the determination of an absolute value for the limiting mass of protoneutron stars and new structural aspects on the nuclear matter phase transition via the behaviour of the specific heat.

PAINEL 83

HeI 10830 Å SPECTRAL ATLAS IN HOT STARS

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The evolution of LBV stars (in addition to Of/WN and Wolf-Rayet) strongly depends on their mass-loss rates. However, despite rapid progress in massive star studies, these rates and other basic physical parameters are not yet well determined because the presence of fast, strong, irregular winds around massive stars makes the interpretation of their spectra a difficult task and also because we know little about the structure of their winds and the origin of their variability. In this project we intend to study the He I line at 10830 Å to improve our knowledge of the temperature, velocity and structure of

the winds of a sample of known and candidate LBV stars. The infrared He I line has been shown to provide, through comparison with synthetic line profiles, a very sensitive diagnostic of the wind temperature. This is because the location where the He ionization changes depends on the stellar temperature, and so does the line strength. In many cases, no other unblended He I line is seen in ultraviolet and visible spectra of Wolf-Rayet stars, while the infrared line is very strong and unblended. The He I line has also been shown to provide an accurate measure of the wind terminal velocity, as it is formed in the outer regions of the wind. A preliminary study has already been done in this line, but with a few objects. It is necessary to obtain better resolution and high S/N. We present the results for Eta Car and AG Car, obtained from 10 years ago to now, as for a group of hot stars, compiling a spectral atlas around 10830 Å.

PAINEL 84

VARIABILITY OF SOUTHERN T-TAURI STARS (VASTT PROJECT)

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The VASTT project is designed to study the variability of T Tauri stars that show clear evidence of disk accretion. Observations were done in two blocks of consecutive nights, two months apart, in 1998. Here, we explore the time series analysis of BZ Sgr and EX Lupi. The spectral energy distribution of BZ Sgr and EX Lupi present the largest changes in slopes (continuum) and line features of our sample of 20 stars. The excess continuum emission (veiling) can be mild and relatively constant in one of the months (r < 5.0 , low levels of accretion rates) and grows to beyond our detection limit (r > 10.0, large accretion rates). We estimate a change in accretion rates on more than a factor of 100 within two months. We determine the line flux and the excess continuum emission for the observations with low accretion rates. We find that the line emission fluxes of BZ Sgr correlate with one another, indicating a common origin for the bulk of line emission or that a common physical mechanism is powering all the the lines. On the contrary, the line flux emission and the excess continuum emission are not correlated, in accordance with previous findings for GQ Lupi and TW Hya.

PAINEL 85

THE LONG-TERM SPECTROSCOPIC BEHAVIOUR OF ETA CARINAE

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The spectrum of eta Carinae has been changing since the great eruption of 1843. The low excitation spectrum described in 1870 was rich in H, HeI and FeII lines.

It was replaced by an F5I during the lesser eruption of 1895, then returned to the previous appearance until 1930-40. At that time the high excitation lines showed up, but presently their strengths are decreasing, indicating that they reached a peak sometime in the past 50 years. Low excitation lines behave in completely different way, remaining almost unchanged along the last 100 years. Based on historical spectra, we trace back the long-term variability and try to explain what is the mechanism responsible for such behaviour.

PAINEL 86

THE SPECTROSCOPIC ORBITAL PERIOD OF HD 45166

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HD 45166 was selected, as a candidate to the V Sagittae Class, for an spectroscopic study to be performed at LNA and La Silla. HD 45166 is classified in the Sixth Catalogue of Galactic Wolf-Rayet Stars (van der Hucht et al. 1981) as a low mass WR-like star of spectral type qWR + B8V. However, its spectrum shows unusually narrow emission lines for a Wolf-Rayet star, besides both WN and WC features. Despite its high brightness (v = 9.9 mag), its orbital period was unknown and no radial velocity variability in excess of ~10 km/s is reported in the literature. If the amplitude of radial velocity variations is lower than10 km/s this could mean a low inclination for the binary system, which is compatible with the narrow emission lines of H, He, N, O, C and Si found in its spectra. In an effort to determine the orbital period of HD 45166 we performed high resolution spectroscopy with the Coudé spectrograph (R = 24000) at LNA in 1999 and with the FEROS spectrograph (R = 48000) at La Silla in 2002. Besides the emission lines, the spectra present absorption lines which are probably originated at the secondary star. From the emission lines radial velocities we determined a period of 8.5 h, while from the absorption lines the derived period is 15 h, which we associate to the orbital period. In such circumstances we propose that HD 45166 may be the first observed example of an AM Her cataclysmic variable progenitor.

PAINEL 87

INFRARED STUDY OF STELLAR X-RAY SOURCES

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UEFS

The study of stellar x-ray binary sources usually is performed in the x-ray and optical spectral bands, where the accretion disk around the compact object

(neutron star or black hole) is the main observable source of emission of radiation. Variations in the infrared (IR) luminosity are a prelude of changes in the accretion rate. The combination of information in different spectral bands can be an important tool to understand the accretion process in these systems. In this sense, the IR study of the secondary star and the cool outer disk can produces a near complete picture of the accretion process. This work presents a photometric study of IR counterparts of stellar x-ray binary sources. The IR data were obtained from the Second Incremental Point Source Catalog produced by the Two Micron All Sky Survey (2MASS). The data are a sample of near-IR broadband JHK_S photometry obtained from low and high mass x-ray binaries selected with the GATOR interface with a cone search of 5 arc second around of the x-ray position. The 2MASS IR data sample is compared with the data of previous works of Glass (1979) and Coe et al. (1997). The most remarkable result is obtained from color-color diagrams where average values of J-H=0.3(5) and H-K=0.4(4), for high-mass systems and J-H=1.1(9) and H-K=0.6(5) for low-mass systems are observed. The colors observed in the low mass systems can be due the cool secondary counterpart (usually a late type star) or/and the outer accretion disk. These possibilities are checked doing a comparison with IR counterparts of cataclysmic variables (Hoard et al. 2002) and symbiotic systems (Kamath and Ashok 1999).

PAINEL 88

WHY POST-T TAURI STARS ARE FAST ROTATORS?

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ON

The evolution of star rotation during the pre-main-sequence evolution is a complex problem. The interpretation of observations and the mechanisms involved is a matter of debate nowdays. Concerning T Tauri stars (TTS) associated with clouds and with ages less than 10 Myr, the Classical TTS (CTTS) with inner disks are in general slow rotators, whereas Weak TTS (WTTS) without inner disks, appear to rotate faster. This bimodality has been found not to exist in Orion but yes in Taurus. Also in Orion, the rotation appears not to be related to disks. In reality, the stellar mass appears to be the real bimodal discriminator. Bimodality exists only for masses larger than 0.25 $M_{\odot}$.In any case, the magnetic disk-star connection is the main braking mechanism. Due to star's contraction and accretion from the disk via magnetic tubes, a spin-up effect will appear. A spin down effect will be manifested only if the magnetic lines connect to the part of the disk which is exterior to the corotation radius, when angular momentum must be carried away by disk viscocity or by mass loss from the disk (disk braking). In this work, which is the PhD subject of one of the authors (GP), we will try to explore the immediate evolutionary stage; the post-T Tauri (PTTS) stage with ages between 10 and 100 Myr where a large and clear spin up effect is present. PTTS have been recently discovered. For Horologium and β Pic PTTS associations we have measured mean vsin i values, which are equal to 31 and 59 km/s respectively. These values are much larger than the typical ~10 km/s found for CTTS. We consider that the vanishing of the magnetic braking in PTTS is the main reason of this spin up effect in PTTS. In fact, PTTS are suffering severe disk transformations. The fine dust is being converted into planetesimals and the disk gas is being lost. This lost of gas can be produced in forming giant planets and also probably due to a twist up effect, where the magnetic lines are deformed and open. In this case, the new field geometry transform accretion into an external mass loss. Other aspects will be explored such as the effects of metallicity (in progress). To realize our work we dispose of high resolution spectra of near 100 PTTS recently discovered. We intend also to construct a stellar rotation model adapted to this scenario.

PAINEL 89

LITHIUM IN THE CHEMICALLY PECULIAR roAp STARS

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We present the results of the spectroscopic study of some chemically peculiar roAp stars carried out in the frame of the International Project "The enigma of lithium: from CP stars to K giants". High-resolution observations were obtained recently at ESO with the 1.52 m telescope and spectrograph FEROS and at Mount Stromlo Observatory with the 74 inch telescope and echelle spectrograph. The spectra of roAp stars present very anomalous behavior of the LiI line at 6707 Å: in some stars it is a strong feature, in other, with similar atmospheric parameters, it is not observed at all. In some roAp stars this line varies with the stellar rotation, in other stars it is not variable. The behavior of the LiI line can be explained either by the existence of Li-rich spots on the star's surface or by the influence of the temperature inhomogeneities due to stellar spotness. Strong variations of other lines, such as PrIII line at 6707 Å, OI triplet at ~7770 Å, and NaI D doublet were revealed in the spectra of the roAp star HD 83368. Analysis of the observational data on line profile variations, magnetic field and brightness oscillations showed their rotational modulation. Applying of the Doppler imaging method to the star HD83368 permitted to map the distribution of some elements on its surface. Analysis of the behavior of

the Li I line with the rotational phase has allowed us to determine the size of the spots, their positions on the star as well as their lithium abundance.

PAINEL 90

PHYSICAL PARAMETERS OF OH/IR STARS IN THE GALACTIC PLANE

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Very recently, a high-resolution survey of the OH molecule at 1612 MHz over a wide range of longitude has been completed (Sevenster et al. 2001, A&A 366, 481). The total number of sources found amounts to 766 objects, mostly double-peaked, which indicates that the majority of them must be AGB stars surrounded with dust and OH shells (commonly known as OH/IR stars). In this work we study a sub-sample of 82 OH/IR stars that have been observed in the infrared. The sample shows a wide range of luminosities and mass-loss rates (10^{-7} 10^{-5} $M_{\odot}$ /year) (PRONEX, Millennium Institute, CNPq).

PAINEL 91

SULPHUR ABUNDANCES FOR SOLAR NEIGHBORHOOD SOLAR-TYPE STARS: IS THE SUN CHEMICALLY ANOMALOUS?

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The Sun is over-abundant in oxygen by +0.4 dex with respect to the local interstellar medium. The existing data suggests that this anomaly could possibly be extended to the elements carbon and krypton, but not to sulphur. A few of the possible explanations for this anomaly are: a SNII that enriched directly the protosolar nebula prior to its condensation; an infall episode of metal poor material that diluted the local interstellar medium; or the dynamical migration of the Sun from an inner and more metal rich birthplace in the Galaxy. The precise knowledge of the solar oxygen abundance with respect to the local population of solar-type stars is necessary for a decision among the above scenarios. Detailed data are available in the literature for carbon, but not oxygen and sulphur. These last two elements are products of SNII and should present identical abundance patterns. This project seeks to clarify the status of the Sun and of stars with known extrasolar planets in the local distribution of oxygen and sulphur abundances. In this work we present the preliminary results of the determination of sulphur abundances, through a full model atmosphere analysis, for a large sample of solar neighborhood G-dwarfs, spanning a range of ages, metallicities and galactic orbits. The sulphur abundance was derived from the S I 8694,8696 lines, observed at the OPD coude spectrograph, and also at the ESO/FEROS spectrograph.

PAINEL 92

THE CHROMOSPHERIC ACTIVY-AGE RELATION FOR SOLAR-TYPE STARS: THE CA II H AND K LINES

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The magnetohydrodynamic chromospheric phenomena in cool stars are potential diagnostics of the physical conditions of the stellar surfaces and interiors, such as convection, turbulence, granulation and rotation. These phenomena are observed in detail in the Sun and show a marked cyclic behaviour, also observed in other low mass stars. Their occurrence is linked to the stellar angular momentum, by the interaction of differential rotation with the convective motions. They are correlated with the stellar age, as the magnetized wind arising from active regions carries away angular momentum and slows down the stellar rotation. In stars, the chromospheric flux is evaluated by the excess flux in the core of very strong spectral lines, such as Halpha, the Ca II H and K lines and the Ca II infrared triplet. There is some evidence that the angular momentum decay with time follows different paths from star to star, not being monotonical as suggested by most. Particularly, metallicity might play a role, as expected from theoretical considerations. Also, the Sun might be an exceptionally quiet star, showing less activity than most stars of its age. Since the angular momentum loss might be connected to other important astrophysical problems, such as the lithium depletion and the formation of planetary systems, a detailed investigation of chromospheric fluxes in a stellar sample with well determined metallicities and ages, never attempted before, is of great interest. In this work we present preliminary results of this effort, discussing the Ca II H and K line activity-age relation for a sample of 44 solar type-stars, with very well determined atmospheric parameters, metallicities and ages, observed with the FEROS spectrograph.

PAINEL 93

SPECTROSCOPIC ANALYSIS OF LOW MASS PRE-MAIN SEQUENCE STARS

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In the last years, efficient methods have been applied in the search for new pre-main sequence (PMS) stars. A considerable number of low-mass PMS stars have been recently discovered by the X-ray surveys, most of them are weak-T Tauri stars

(WTTS) stars and other several objects are post-T Tauri or young main sequence stars. We have developed a project based on spectral synthesis for abundance and metallicity determination in WTTS. Few results like these have been reported in the literature for T Tauri stars, due to the veiling effect on absorption lines, which causes an incorrect determination of the physical parameters. The identification of large samples of young stars and a detailed analysis of the distribution of their chemical abundances, comparing PMS stars with young clusters and associations, is of great interest to galactic chemical evolution models. Among PMS stars, the WTTS are specially suited for spectroscopic abundance analysis. Some hot and intrinsically bright WTTS do possess a disk, as the examples of SU Aur, Sz 68 and RY Lup. However, most of WTTS do not show evidence of accretion (in principle the veiling effect is not enhanced). We have performed a spectroscopic study of a sample of 20 low mass PMS stars, aiming at deriving chemical abundances for Li, Na, Mg, Si, Ca, Ti, V, Cr, Mn, Fe, Co, Ni, Y, MgH and C_2. Stellar fundamental parameters T_{eff} and log g were obtained by excitation and ionization equilibria of iron absorption lines. We used these parameters to calculate abundances by spectral synthesis using model atmospheres through a differential analysis with the Sun as standard. We found that the heavy elements are all overabundant with respect to the Sun.

PAINEL 94

A SEARCH FOR YOUNG STARS DETECTED AS X-RAY SOURCES AROUND THE CLASSICAL T TAURI STARS AS 216 AND AS 218

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T Tauri stars (TTS) have usually been found closely associated with molecular clouds, where they have been formed. However TTS are occasionally also found to be isolated from molecular clouds, as in the case of the classical TTS (cTTS) AS 216 and AS 218. In the last years several X-ray surveys have discovered hundreds of new weak-line TTS (wTTS) and very few cTTS distributed over the complete extensions of star-forming regions (SFRs). In order to understand the origin of those isolated stars we performed a search for other young stars via their X-ray emission and we studied their stellar properties and kinematics. We pre-selected TTS candidates among the 323 ROSAT All-Sky Survey sources of a ~ 64 deg^2 area by using X-ray hardness ratios. For the sources with a nearby optical counterpart in the HST Guide Star Catalog, the pre-selection was improved by incorporating the X-ray to optical flux ratios as well as the photographic magnitude. We conducted follow-up optical

spectroscopy of 35 stellar X-ray sources ($B_J \leq 13$ mag) at the Pico dos Dias Observatory (LNA, Brazil) to identify standard signatures of pre-main sequence (PMS) stars. We found 16 stars that have Li equivalent widths above our detection threshold: two also have weak Hα emission, i.e. are wTTS, and six are PMS stars because show more Li than ZAMS stars of the same spectral type. We determined radial velocities and effective temperatures for the 13 $B_J < 12$ mag stars for which high-resolution spectra were obtained at the 1.52 m ESO telescope (Chile). We also determined proper motions of the observed X-ray sources. We compared the stellar properties and the kinematical data of these stars to those of the PMS stars of the Ophiuchus-Scorpius SFR. Our results show that there is no new young association around AS 216 and AS 218, suggesting that the new and the previously known PMS stars could be an extension of a greater structure.

PAINEL 95

IS THE SUN A NORMAL ROTATING STAR?

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One of the most exciting questions in astrophysics concerns the behaviour of the Sun as a normal or abnormal star. Along the past decade, a number of studies have tried to answer this question, by the investigation of different physical parameters of stars, for example metallicity, chemical abundances and magnetic activity. Among these studies, one of the most important concerns the discovery of the solar-twin stars, namely stars presenting a large number of parameters identical or close to the solar values. In the present study we perform an unprecedented analysis of the rotation of the Sun and solar-twin stars, following its evolution from the main sequence to the red giant region, along an evolutionary track of 1.0 solar mass. By using precise rotational velocity $v \sin i$ measured with CORAVEL spectrometer we discuss a possible scenario for the evolution of the rotational velocity of solar mass and solar metallicity stars, from their earliest evolutionary stages to their latest times as giant stars.

PAINEL 96

DETAILED ABUNDANCE ANALYSIS OF BARIUM GIANT STARS

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Barium stars are late GK-type giant stars which present strong composition enhancements of the heavy s-process elements. Such are expected to be produced

during the thermal pulsing phase of asymptotic giant branch stars. However, the barium giants are less luminous and less massive than the AGBs, and therefore cannot be self-enriched. The most accepted hypothesis to explain such anomaly is a mass transfer scenario. Here the barium star belongs to a binary system where a more massive star evolved to the asymptotic branch, enriched itself with s-process elements and then through mass loss transferred the enriched material onto the companion, which now we observe as the Barium star; the former primary evolves to white dwarf. The Barium stars are then useful as observational tests of neutron capture nucleosynthesis, convection and mass loss theoretical models. Yet detailed multi-element chemical analyis of these objects are still very much scarce in the literature. In this work we present the final results of a model atmospheres, detailed differential analysis of the chemical composition, atmospherical parameters and evolutionary state of 11 barium giant stars and 3 normal giants. We have placed these objects accurately in a theoretical HR diagram and obtained masses and ages. We determined LTE accurate abundances of the elements C, Na, Mg, Al, Si, Ca, Sc, V, Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, Sr, Y, Zr, Ba, La, Ce, Nd, Sm, Eu e Gd. We discuss this detailed chemical data in the light of current nucleosynthetic models, comparing the observed abundance ratios of barium stars with those found in normal giants.

PAINEL 97

STUDY OF THE SPECTRAL DISENTANGLING METHOD KOREL AND APPLICATION TO MULTIPLE SYSTEMS

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We study the limitations and the applicability of the KOREL code, used to disentangle composite spectra of multiple systems. The code has been successfully applied in studies of stellar abundances, distances determinations, stellar rotation and evolution. We study the code through simulations, using “templates” spectra of individual stars and setting the orbital parameters of the system. We generate the corresponding composite spectra and verify how the KOREL code reproduces the stellar and orbital parameters and the individual spectra. In doing so, we developed many auxiliary programs to generate composite spectra of double or triple systems (in circular or eccentric orbits) influenced or not by noise and stellar rotation. Other auxiliary procedures were created to help understand the limitations and advantages of the code. We concentrate our work in the study of double systems in circular and eccentric orbits. We investigate the minimum number of spectra needed to obtain accurate orbital parameters and individual spectra. We also analyse the influence of the noise, of the spectral phase distribution and the contribution of eclipse phases to

the convergence process and optimization. We verify that the code needs relatively few (~6) exposures disposed in constant velocity steps on the orbital cycle. We noted that the convergence process is strongly dependent on initial values and on the steps of each parameter. The introduction of observations in phases of total eclipse helps the convergence process more efficiently than use spectra of parcial eclipses. The code applies very well to spectra whose S/N is 200, 100, 50, 20, as long as we gradually make use of more exposures in order to compensate for the decrease of S/N.

SAB

EXTRAGALÁCTICA

PAINEL 98

THE H_2 MOLECULE IN ACTIVE GALACTIC NUCLEI

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Significant amounts of H_2 molecule can exist inside the ionized region of planetary nebulae (Aleman 2002, MSc. Thesis). In this work we present an analysis of the concentration of H_2 in active galactic nuclei (AGNs). Intense H_2 emission lines had already been observed in these objects. We use the one-dimensional numerical code Aangaba and some subroutines that we especially developed for the study of the H_2 concentration in photoionized regions. The presence of dust is taken into account in our calculations, since grains act as catalysts for the production of H_2 and they shield the molecule against the primary radiation. We are studying of the dependence of the H_2 concentration with the ionization parameter (U) and with the power-law spectral index (α) of the incident ionizing radiation. Our preliminary results show that the ratio of the mass of H_2 to the total H nuclei mass decreases with the increase of U and also does not change significantly with α in the range 1.0 - 1.5.

PAINEL 99

NEAR-IR NARROW-BAND [Fe II] AND H_2 IMAGES OF SEYFERT GALAXIES: RELATION WITH RADIO MORPHOLOGY

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This work presents a morphological analysis of the central region of eight Seyfert galaxies in the infrared in both line emission and continuum. We studied images in [Fe II]λ 1.257 μm, [Fe II]λ 1.644 μm and/or $H_2\lambda$ 2.122 μm lines as well as J, H and K band continuum images, the latter ones to study the stellar population and dust absorption. The morphological study in the emission lines was done in order to investigate the mechanism producing these lines. Previous spectroscopic

studies and theoretical models suggest that Fe emission is associated with radio jets, star forming regions and ionization cones. In five out of six objects of our sample for which we obtained Fe images, we found elongated structures associated with ionized gas regions traced by [O III], Hα and radio 6-cm emission with conical and biconical morphology. These results are in excellent agreement with the Unified Model predictions concerning the collimation process and gas ionization in the conical structure. In the Unified Model, the collimation of the radiation and obscuration of the central source is produced by a dusty molecular torus surrounding the nuclear engine. If this is true we should observe H_2 emission from such a torus either unresolved or extended perpendicular to the cone or radio jet. In one galaxy we found unresolved H_2 emission, while in the remaining five galaxies for which we have H_2 images, we found extended emission we could not conclude was only emitted by the torus because the extent is not in the expected direction. We also found that one of the galaxies shows extended H_2 emission in a cavity inflated by starburst winds. We constructed J-H and H-K diagrams and graphs of J-K colors *versus* distance from the nucleus to study the dust content in the nuclear region and the age of the stellar population. We found conclusive evidences of the contribution of dust black body radiation in the nucleus of two galaxies with colors compatible with emission from dust with temperature T~1000 K (this is the temperature predicted by torus models). We have also found young/intermediate age stellar population contribution in the nuclear region of four galaxies. The large scale dust distribution was mapped by J-K images. Conclusions and proposals concerning the imaging and reduction process in order to achieve better image quality have also been presented.

PAINEL 100

STELLAR POPULATION IN NORMAL AND BARRED LENTICULAR GALAXIES

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The presence of a bar structure in a late-type galaxy enhances its star-formation rate when compared to an object with the same morphological classification without the bar. Gas and dust falling through the bar accumulate in the central region and trigger star-formation bursts with a time-scale of about 1Gyrs. This result has been ascertained by means of a stellar-population analysis in the ultraviolet applied to spiral galaxies (Bonatto, Pastoriza, Alloin & Bica 1998). In early-type galaxies the star-formation is less episodic, being characterized mainly by a single burst of approximately 10Gyrs. An interesting issue still open to debate is the star-formation process in normal and barred lenticular galaxies, particularly the SB0 which contain, besides a bar, a spheroidal component

(typical of E0 galaxies) and a disk. The goal of this work is to determine the role of the bar in the star-formation process in the lenticular galaxies NGC1023 (SB0), NGC3115 (S0) and NGC4203 (SB0). The present analysis is based on stellar-population synthesis applied to ultraviolet, visible and near-infrared Hubble Space Telescope spectra. Our results are quantified in terms of flux and mass fractions of each stellar component. We found that the old population dominates the stellar content in the central 500pc of our galaxies. We also found evidence of circumnuclear bursts in NGC4203 and NGC3115.

PAINEL 101

THE [L(Hα)-σ] CALIBRATION FOR LOCAL HII GALAXIES

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The structure found in H II galaxies has profound implications on several topics, such as star formation and its possible sequential propagation in H II galaxies, and how the ISM is structured in these galaxies. Central in this field of research is the validity of the interpretation, and use of the empirical correlations, of size and luminosity vs their supersonic line widths for high redshift galaxies. A fine calibration of these relations for local H II galaxies may be of great importance if used as a distance indicator of galaxies at high redshift, since H II galaxies are easy to find at great distances (Melnick, Terlevich & Terlevich 2000). In a recent paper (Telles, Muñoz-Tuñón & Tenorio-Tagle, 2001) was shown that: (i) enhanced spectral and spatial resolution seems to unveil an intricate structure in H II galaxies. (ii) H II galaxies when resolved, present several emitting knots with a variety of shapes, luminosity and sigma values. (iii) The intrinsic properties (luminosity, velocity dispersion) of a galaxy are dominated by the central (core) component. Here we present our most recent calibration of the [L(Hα)-σ] relation from a homogeneous sample of about one hundred local HII galaxies, using line widths measures from FEROS espectrograph(ESO) data. This new calibration is a significant improvement in the accuracy in which distances can be derived due to mostly improved statistics in addition to improved observational error in the determination of line widths. We will show that our calibration is consistent with previous works, verifying the validity of relation $L \propto \sigma^4$ for H II galaxies. Melnick, J., Terlevich, R. & Terlevich, E. 2000 - MNRAS, 311, 629, Telles, E., Casiana Muñoz-Tuñón & Guillermo Tenorio-Tagle 2001 - ApJ, 548, 671.

PAINEL 102

SEARCH OF LARGE SCALE STRUCTURES AT HIGH REDSHIFT

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We are conducting BVRI observations of fields containing z > 1 quasar pairs to search for distant groups and cluster of galaxies. The pairs were selected from Véron & Véron catalogue (2000). They have redshifts in the range 1 < z < 2.5, projected separations smaller than 240 arcseconds (~ h_{50}^{-1} Mpc) and radial velocity differences smaller than 1800 km s^{-1}. Quasar pairs separated by distances smaller than 15 arcseconds were not considered to prevent fictitious pairs, caused by gravitational lensing. With these parameters we have selected 15 quasar pairs. The sample is being observed with the 2.2 m University of Hawaii and the 2.5 m Las Campanas telescopes. Preliminary analysis of the object sample extracted from images of the pair QNZ: 02+QNZ: 46 indicates that these quasars are indeed near two object concentrations. We will also present the design of a matched-filter algorithm which uses positional and multicolor photometric data to calculate the probability of having a structure of a given richness as a function of z.

PAINEL 103

J,H AND K PHOTOMETRY OF COMPACT GROUPS OF GALAXIES

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We present measurements of J, H and K magnitudes of 50 galaxies in 20 compact groups. Combining the new data set with optical data available in the literature, we investigate how the luminosities, colors, sizes and masses of galaxies in compact groups have been affected by dynamical processes, and how they differ from those of galaxies in the field. A comparison of our derived values with those listed by the 2MASS catalog shows that, for 30 galaxies studied in common, the J, H and K magnitudes agree well, within the errors. A preliminary analysis of the H-J vs. J-K diagram of the studied galaxies show that the locus of the compact group elliptical galaxies in such a diagram is very similar to that of field elliptical galaxies while for the spirals there is a small shift to redder colors of J-K for compact group galaxies. This difference could be due to enhanced star-formation activity in galaxies in compact groups.

PAINEL 104

MASSES AND DYNAMICAL STATES OF SUPERCLUSTERS OF GALAXIES

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The superclusters of galaxies, due to their huge dimensions and young dynamical state, may provide information about the formation and evolution of large scale structure and of the galaxies and galaxy systems they contain. In this work we present the results obtained from the study of two very rich superclusters, at intermediate redshifts, located in a $10^{\circ}\times6^{\circ}$ region in the Aquarius constelation. The first one, named *Aquarius-1 Supercluster*, is made of about 14 clusters and many groups, and forms a filament that extends for about 16° in its projection on the sky, with a PA ~120°. The part of that structure in the studied region presents an overdensity of 85 times the mean one, a Virial mass of $1.1\times10^{16}h^{-1}M_{\odot}$, an harmonic radius of $12.5h^{-1}$Mpc, and contains two cores, each one with at least two bounded clusters. The second supercluster, named *Aquarius-2 Supercluster*, on the other hand, is restricted to the studied region and presents a flat shape, almost perpendicular to the line of sight (similar to the nearby Pisces-Perseus Supercluster). It contains about 15 clusters and many groups and represents an overdensity of about 125 times the mean on. Its estimated Virial mass is $2.5\times10^{16}h^{-1}M_{\odot}$, its harmonic radius is $17h^{-1}$Mpc, and it also has two main cores, each one with 4 bounded clusters and/or groups. The two superclusters comprise distinct structures, contrary to the previously claimed single filament of 110 h^{-1} Mpc. Their virialization times are about $2.5\tau_H$ and they may be in the process of dynamic collapse. We also discuss the above results compared with the few studies already carried out for superclusters of galaxies.

PAINEL 105

AN ANALYTICAL MODEL FOR POWERFUL RADIO SOURCES

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We construct an analytical model for the expansion of powerful classical double sources which includes equations of energy and motion for the jet head, the cocoon, and the bow shock. We use the results of the numerical simulations to test and constrain the analytical model. We focus on three main results - (1) the non-uniform distribution of pressure in the shocked ambient gas region limited

by the bow shock and cocoon both parallel and perpendicular to the jet axis, (2) the time dependence of the source volume, and the variation of pressure with source size, and (3) the overall shape and aspect ratio of the cocoon and bow shock. We compare the predictions of our improved analytical model with the numerical simulations over the same broad range of parameter space and find that they are generally in good agreement, especially at high Mach number which the effects of turbulence and instabilities in the cocoon are reduced in the simulations. We also compare our improved analytical model with the self-similar models. In general, the behavior of the analytic model (i.e., the exponents of the main scaling laws) depends on both the source size and the Lorentz factor. In the case of a constant density atmosphere, there is somewhat better agreement with the predictions of the Type I (jet advancing with constant speed) self-similar models. On the other hand, in the case of a declining density atmosphere, there is somewhat better agreement with the predictions of the Type III (jet advances keeping a constant head to cocoon pressure ratio) self-similar models.

PAINEL 106

SUPERNOVA EFFICIENCY IN HEATING THE INTERSTELLAR MEDIUM OF STARBURST GALAXIES

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The interstellar medium heated by supernova explosions (SN) may acquire an expansion velocity larger than the escape velocity and leave the galaxy through a supersonic wind. Galactic winds are effectively observed in many local starburst galaxies. SN ejecta are transported out of the galaxies by such winds which thus affect the chemical evolution of the galaxies. The effectiveness of the processes mentioned above depends on the heating efficiency (HE) of the SNs. In a starburst region several SN explosions occur at high rate inside a relatively small volume. A superbubble of high temperature and low density takes place, and in this environment the successive generations of SNRs do not reach high density during their expansion, their radiative losses remain negligible and it is common to assume a value of HE close to unity. But this assumption fails in reproducing both the chemical and dynamical characteristics of starburst galaxy. In order to solve this problem, we have constructed a simple semi-analytic model able to give us insights on the thermalisation of the ISM inside a starburst region. The most important physical phenomena are studied, assuming a three-phase medium composed by hot gas, SNR and clouds. The most important result is a very low SN efficiency value in the first 10 Myrs, which gets closer to 1 only after about 15-20 Myrs. On the whole, we can conclude that the HE has a depending-time

trend as it results from initial conditions and parameter assumptions. This model allows to scale down typical HE values and explains the low values assumed in some chemical models (D'Ercole & Melioli, MNRAS, 2002). Presently, we are implementing a 3D, gasdynamical code aiming to check the SN HE estimates obtained from the analytical model above, by including all the SB environment contents and fully solving the chemo-dynamical equations of the three-phase system.

PAINEL 107

FP-LIKE RELATIONS FROM COLLISIONLESS STELLAR DYNAMICS

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We report on new results of numerical simulations aimed to understand the structure of elliptical galaxies and the origin of the correlation embodied in the Fundamental Plane. In a previous work (Capelato, de Carvalho & Carlberg 1995, ApJ, 451, 525) we have shown that dissipationless, one-component *merger simulations* could reproduce entirely the "Fundamental Plane" (FP) of elliptical galaxies. Subsequent numerical investigations by Dantas et al. (2002, A&A, 384, 772) showed that, as opposed to mergers, one-component, equal mass *collapses* of several different initial models and collapse factors do *not* retrieve a FP-like relation. In continuity to these investigations, we extended the hierarchical merger scheme by using a different initial grid of one-component models which follow a Hernquist-type profile. We also investigate two-component Hernquist models in order to better understand the effect of the presence of a massive dark halo on our results. We find that the one-component Hernquist mergers also reproduce a FP-like relation, in agreement with the results of Capelato et al., implying that the effect is model independent. The two-component mergers reproduce a FP-like relation with a steeper tilt than that of one-component models. We discuss the origin of the Fundamental Plane in the light of the dynamical processes occurring during the merger.

PAINEL 108

NUMERICAL SIMULATIONS OF GALAXIES WITH A CENTRAL MASSIVE BLACK-HOLE

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Merger of galaxies is an essential process in the widespread accepted hierarchical structure formation scenario. However, during the last decade there has been growing evidence that the galactic centers are housing supermassive Black Holes (BH, c.f., Kormendy & Richstone, 1995, ARA&A, 33, 581). It has been shown that the masses of these BHs correlate linearly with the central stellar velocity dispersion. The existence of such a relation implies that the formation and evolution of both the galaxy and its central BH are coupled. It may also conflict with some predictions of the hierarchical formation scenario of galaxies as well as with some restrictions deduced from the Fundamental Plane (Ciotti & van Albada, 2001, ApJ 552, L13). Numerical simulations involving massive BHs are known to need high computational performance. This is due to the requirement of high spatial resolution of the simulation and, as well, to the extreme dynamical range involved (M_{BH}/M_{star}~10^{6-7}!). We describe here simulations aimed to study the dynamical influence of central massive BH and the implementation using the code GADGET, a parallelized version of the well-known TREECODE, with the 16 Pentium nodes cluster built by the DAS/INPE under a FAPESP project. We compare simulations of a self-gravitating sphere (Hernquist mass model) with and without BH, showing quantitatively the increase of the computational effort due to the presence of the BH. We show how important is the fine-tuning of the TREECODE parameters, the softening ([epsilon]) and the time-step parameters, and give their optimal values for our problem. The general performance of the cluster, compared to mono-processor computers, will be discussed.

PAINEL 109

DWARF GALAXIES IN COMPACT GROUPS OF GALAXIES

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This work presents the results of a study of low surface brightness dwarf galaxies in the compact groups HCG44, HCG68 and the NGC7582 Group. Dwarf galaxies are the most common type of galaxies in the local universe and due to their intrinsic low luminosities and sizes they are also the hardest galaxies to observe. Since they are so

common and due to their large dark matter content, these galaxies may give us important information necessary to better understand the formation process of structures and the distribution of mass and luminosity in the universe. Our data consist of CCD images collected at the 0.9m telescope at KPNO (Kitt Peak National Observatory) in filters B and R, for the compact groups HCG44 and HCG68. For the group NGC7582, we have CCD mosaic images obtained at the Warsov 1.3m Telescope at Las Campanas Observatory in Chile, and spectroscopic data obtained at the ESO 3.6m telescope using the MEFOS instrument. The images were processed with IRAF and detection and photometry of the objects was done with the program Source Extractor. The technique used in this work is similar to that used by Carrasco et al. (2001, AJ, 121, 148). Our sample consists of about 70 dwarf galaxies candidates, selected based on their sizes and magnitudes at the average limiting isophote of 26 mag/arcsec^2, adopting an exponential surface brightness profile. The average central surface brightness, sizes, and total magnitudes are similar to those found for the dwarf galaxies in other studies. Their colour distribution of peaks near B-R = 1.2, compatible with the colours of the dwarf galaxy population in other groups. We present the properties (spatial and color distributions, sizes and morphological classification) of the selected dwarf galaxies for each group, as well as some spectroscopic results for the group NGC7582.

PAINEL 110

A SHOCKWAVE MODEL TO EXPLAIN QUASARS AND BL LACERTAE OBJECTS VARIABILITY

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This work intends to present both an analysis and application of a recent relativistic plasma jet shockwave model for AGN (active galactic nuclei) and BL Lacertae objects. Such model was applied to explain spectral and temporal variabilities due to synchrotron outbursts, observed during the last decades in quasars and BL Lacertae objects events. A theoretical treatment was accomplished based on observed properties of the bursts by decomposing light curves into a series of self-similar flaring events at different frequencies. An average evolution of the outbursts was deduced from well known physical aspects of the relativistic jets in AGN and was fitted to a couple of equations empirically proposed to describe some observed features of the studied sources. This fit was accomplished by an iterative numerical approach of normalized parameters in order to achieve a consistence between physical and observational aspects. Given the average outburst evolution, many bursts could be described by the model simply by modifying three jet parameters at the onset of the shock: K (electrons spectral energy distribution coefficient), B (magnetic field) and D (Doppler beaming factor). An optimal approximation of

OV236, OJ287, 3C273 and BL Lac light curves in the 1980-2000 period was reached, especially at 4.8, 8.0, 14.5, 22 and 37 GHz, for data acquired from University of Michigan Radio Astronomy Observatory database, Radio Observatory of Itapetinga (Brazil, SP) database and Metsähovi Radio Observatory (Finland) database. As fundamental results, we obtained a confirmation of the jet shockwave model relevance and generality, since a good fit for the referred sources light curves was found, which has never been reached before by other similar model; a strict proximity of some acquired parameters values with that obtained by other jet shockwave models was found; and a remarkable elegance and physical consistence of the model was noted. As conclusions we could verify that: the fitted parameters really were able to describe jet features; the index that describes jet expansion assumed values which suggest a non conical jet structure; the magnetic field is undefined and turbulent behind the shock front; and, the outbursts specificities are due to the influence of the quantities K, B and D at the onset of the shock.

PAINEL 111

ANALYSIS OF X-RAY STRUCTURES IN ABELL 1795 AND 1835

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We present a detailed analysis of the x-ray emission from the Abell 1795 and 1835 clusters, using both Chandra and XMM-Newton data. For each satellite we determine the temperature and the radial brightness profile of the clusters. The profile is subtracted from the images in order to enhance the low surface brightness structures, which are then identified using the sliding cell, the Voronoi tessellation and the wavelet transform methods. For the identified structures we provide position and x-ray properties, as well as a classification into compact and/or extended. We proceed a comparison between the results obtained from both satellites in order to pinpoint the strengths and weaknesses of each data set and method of structural analysis.

PAINEL 112

EXCITATION GRADIENT IN M101

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The physical origin of HII region excitation gradients across the disks of spiral galaxies is attributed to variations in the abundance of metals and dust, and in the stellar effective temperature of ionizing stars (T_{eff}). The Sc I galaxy M101 (NGC 5457) has long served as prototype system for several theoretical and

observational studies of these excitation gradients due to its proximity and its rich system of bright HII regions. However, several aspects of the properties of excitation gradients remain poorly understood. In this work, we reanalyse the observational data of HII regions in M101 available in the literature in order to study the effect of temperature gradient of the ionizing star on the estimates of the abundance gradient. We estimated the T_{eff} gradient in M101 using the index $\Re$=log([OII]λ3727/[OIII]λ 5007). Then, using this gradient as an input parameter in the photoionization code Cloudy, we fitted models for HII regions located at different positions along the M101 disk in order to estimate the magnitude and the shape of the gradients of abundance and dust. Our findings are in agreement with previous results.

PAINEL 113

THE INFLUENCE OF AGN ON THE ISM OF SEYFERT HOST GALAXIES

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We present the results of a long-slit spectroscopic study of the emitting gas in Seyfert galaxies, 18 Seyfert2 and 6 Seyfert1. The extension of the emission lines was in the range 0.5–6 kpc. Fluxes of the emission lines, measured throughout the extended narrow-line region (ENLR), are used to derive the surface brightness of the emission lines and line ratios. These observables suggest a mean *influence radius* for the AGN phenomena in Seyfert galaxies of 2 kpc – where the AGN dominates almost completely the emission line formation. However, even more externally we found that the AGN is important to explain the observed emission lines, although an increasing contribution of HII regions to the emission lines is observed. A characterization of the ENLR observables – such as gas mass, density and reddening – as a function of distance from the nucleus is shown.

PAINEL 114

AN ANALYSIS OF QSO PARAMETER SPACE CORRELATIONS

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A great effort is still underway to understand the correlations of continuum and line parameters of QSOs. The importance of this kind of study resides in the fact that it can give some valuable clues of the physical processes occurring in the AGN central engines and in their surrounding regions, as the Broad Line Region (BLR). For instance, the scaling relation between the reverberation radius of the

BLR and the ionizing continuum has allowed recent studies to derive masses for the central object, and to better understand open issues as the eigenvector 1 physical origin and the radio-loudness dichotomy. Optical spectra of 11 QSOs were acquired as part of a spectroscopic monitoring program of 1-2 years at OPD and at ESO-La Silla. We fitted simultaneously the spectra with a power-law continuum and the FeII multiplets in some spectral "windows" believed to be free of other emission lines. This fitting procedure allowed us to obtain parameters such as spectral indices, fluxes, equivalent widths and velocities of optical lines for all the objects, in all epochs. For each object, simulations of fitting noisy synthetic spectra have been run in order to test whether the detected spectral variations were real or an artifact of the measurement errors and analysis procedure. We discuss general correlations obtained in the parameter space, like the ones between optical spectral indices and line equivalent widths/ratios, photometric variability versus Hβ velocities and equivalent widths, etc. This project is financially supported by FAPESP.

PAINEL 115

SPECTRAL EVOLUTION OF EXTRAGALACTIC RADIO SOURCES

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AGNs(Active Galactic Nuclei) are among the strongest energy sources in the Universe. They radiate at all wavelengths. Another important feature of this kind of phenomenon is their variability: The emitted flux-density varies rapidly. Among the main processes for supplying the AGNs energy figure black holes, high energy accelerated particles originating the synchrotron emission and ultra-relativistic jets of matter. Our purpose is to verify some of these possibilities by studying the spectra of 25 radio sources. We processed data from the radio telescopes of Itapetinga (Brazil) at 22 and 23 GHz, Michigan (USA) at 4,8, 8,0 and 14,5 GHz, Metsahovi (Finland) at 37 and 90 GHz, SEST (Chile) at 90 and 230 GHz and from CRIMEA (Russia) at 37 GHz. Parameters like maximum flux-density and frequency and spectral indices due to the optically thin portion of the spectra were obtained by plotting the spectra at successive epochs. Comparison spectra were obtained by plotting data from Kühr et al.(1981), making possible to understand their evolution through 20 years. We conclude that the high frequency components - related to the innermost emitting regions of the radio source - present higher variability amplitude; the peak frequency is between 20 and 40 GHz; the flat spectra exhibited by some sources are composed by a superposition of many synchrotron components and many of the sources present a power-law spectrum above 20 - 40 GHz.

PAINEL 116

DUST OBSCURATION IN HIGH REDSHIFT STAR FORMING GALAXIES

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The prototypical star forming galaxies at redshift ~3, the Lyman Break Galaxies (LBGs), seem to constitute a population orthogonal to the submm sources, in the sense that the LBGs, with very few exceptions are not luminous in the submillimeter. On the other hand, LBGs have greater characteristic luminosities for a given FIR/UV ratio than local galaxies, suggesting that LBGs are less obscured per unit luminosity than lower redshift star forming galaxies. We applied a chemodynamical model with dust production to model the early stages of a spheroidal galaxies, for a wide range of galaxy masses. The evolution of the dust content of the galaxy predicted by the chemodynamical model is consistent with a scenario in which the LBGs have masses typically in the range few $\times 10^9$-10^{11} $M_\odot$. Galaxies more massive than that would be seen as a LBG only if they were young (ages less than 0.3 Gyr) or, if mature, over a very short interval (with a duration of few 10^8 yr). Over most of its evolution, the more massive galaxies would be heavily obscured by dust, and its very red *G-R* would prevent it from be classified as LBG. During most of its middle-aged evolution, the galaxy would be seen as a submm source, and for late stages of its evolution, it would be seen only as an Extremely Red Object (ERO).

PAINEL 117

STELLAR POPULATION IN YOUNG STELLAR SYSTEMS

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The analysis of the stellar content of nearby galaxies through the photometry of their resolved stars combined with spectroscopic and radio observations, provide important information about the history of the star formation and the processes of the star formation in galaxies. The understanding of these processes is relevant, since they define the path followed by a galaxy in its evolution. When no star can be resolved, the most powerful method consists in the analysis of the stellar content of the galaxies through their integrated colours along with spectroscopic information that combined with evolutionary synthesis models can constrain both the initial mass function and the star formation history. In this context, late type galaxies, in particular, irregulars, are relevant for a number of reasons: they are relatively simple objects, with a high activity of star formation and are relatively young objects (they usually show low abundances of heavy elements and a large amount of gas). We present the results of a photometric analysis of a sample of 9 late-type galaxies of the local universe (NGC 2366, NGC 4395, NGC 4656, NGC 2403, NGC 4214, NGC 4449, NGC 4236, HOII, IC2574) that have

been observed with a good spatial resolution in the B,V and R bands at the 2.5m Isaac Newton telescope of the observatory Roque de los Muchachos in La Palma (Canary Islands, Spain). We have determined the integrated color indices for all the galaxies in our sample and the color magnitude diagrams (CMD) for the resolved ones. For NGC 2366 and HOII, we have derived the star formation history through the analysis of the CMD and compared with the results given by the analysis of the integrated color indices in conjunction with stellar population synthesis models (Starburst 99). Our main conclusion so far comes from the analysis of NGC2366 which shows that star formation histories derived from integrated colours are not unique and degenerate in the parameter space of age-extinction for a given IMF.

PAINEL 118

PHYSICAL CONDITIONS IN HII GALAXIES

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HII galaxies are dwarf galaxies undergoing violent star formation. Their integrated spectra have relatively blue continua and are dominated by emission lines due to photoionization from the presence of significant numbers of O type stars. Such galaxies can be observed up to great distances and help us answer some questions as how galaxies form and evolve . Also, they are relatively young objects in the sense of that they have low metallicities and a large amount of gas. We present a spectrophotometric catalogue of HII galaxies obtained on the 1.52m telescope at ESO, based on samples selected with objective prism. We determined plasma parameters (temperatures, densities) and N, O, S, Ne abundances. We investigated the differenciated enrichment in N and O of possible previous multiple bursts in that galaxies. We calculated also the number of WR stars in the galaxies in which we identified the HeII(4686) emission line, and put some constraints in the age and duration of the starburst.

PAINEL 119

THE EVOLUTION OF STARS AND GAS IN STARBURST GALAXIES

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In systems undergoing starbursts the evolution of the Young stellar population is expected to drive changes in the emission line properties. This evolution is usually studied theoretically, with a combination of evolutionary synthesis models for the spectral energy distribution of starbursts and photoionization

calculations. In this paper we present a more empirical approach to this issue. We apply empirical population synthesis techniques to samples of Starburst and HII galaxies in order to measure their evolutionary state and correlate the results with their emission line properties. A couple of useful tools are introduced which greatly facilitate the interpretation of the synthesis: (1) an evolutionary diagram, whose axis are the strengths of the young, intermediate age and old components of the stellar population mix, and (2) the mean age of stars associated with the starburst, t^F_{SB}. These tools are tested with grids of theoretical galaxy spectra and found to work very well even when only a small number of observed properties (absorption line equivalent widths and continuum colors) is used in the synthesis. Starburst nuclei and HII galaxies are found to lie on a well defined sequence in evolutionary diagram. Using the empirically defined mean starburst age in conjunction with emission line data we have verified that the equivalent widths of Hb and [OIII] decrease for increasing t^F_{SB}. These correlations are substantially improved once the diluting effects due to an underlying old stellar population are corrected using the results of the synthesis. The same evolutionary trend was identified for line ratios indicative of the gas excitation, although no clear trend was identified for metal rich systems. All these results are in excellent agreement with long known, but little, theoretical expectations.

PAINEL 120

SPECTROSCOPY OF NGC 3819 AND NEAREST COMPANIONS

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NGC 3819 (galaxy D of Hickson Compact Group 58) and its nearest companions, H58D1 and H58D2, were observed with the Double Spectrograph, mounted on the 5-m Palomar telescope. We made spectra of the nuclear jet in NGC 3819, at PA=109°, in order to assess its activity through the strength of emission lines. The presence of the jet is an indication that gravitational interactions may be taking place between this galaxy and its companions. We measured for the first time the redshifts of the companions. We found no emission lines along the jet. The development of such structure requires a few 10^8 years, which is also comparable to the fading timescale of a starburst due to gas depletion. This means that all gas, coming from the interaction, probably has already been used in star formation and now the galaxy is in a quiescent phase. Thus NGC 3819 presently is not an active galaxy. The spectra were flux calibrated and, from them, redshifts were determined for each galaxy. H58D1 and H58D2 are not just projections on the field of NGC 3819. They are components gravitationally bound with redshifts of 0.02090±0.00004 and 0.02104±0.00004. NGC 3819's redshift is 0.02070±0.00006. A spectral classification was made for each galaxy. NGC 3819 was classified as an elliptical galaxy and the others as lenticular ones. Considering that the differences in velocities between NGC

3819 and its companions are due to bound Keplerian orbital motion, we estimated a lower limit to NGC 3819's mass of $5\times10^{10}M_{\odot}$. The companions are approximately 10 times less massive than NGC 3819.

PAINEL 121

ULTRAVIOLET SPECTRA OF METAL-POOR STARBURST GALAXIES

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Sets of ultraviolet spectra of metal-poor starbursting galaxies are calculated using the STARBURST99 code. We employ a new spectral library of O-type stars in the Small and Large Megallanic Clouds observed with the Hubble Space Telescope. The synthetic spectra cover the range 1200Å to 1600Å with 1Å resolution and have a mean metallicity of 1/4 $Z_{\odot}$. We compare sets of model spectra (standard IMF and SFR) calculated with the new sub-solar metallicity library with those obtained with the old solar metallicity library. We find that the lines are correspondingly weaker at lower metallicity due to the expected lower metal abundances. However wind-lines do not correlate monotonically with metallicity. Finally we compare our new synthetic model spectra to the ultraviolet spectra of NGC5253 and MS 1512-cB58 (two star-forming galaxies with 1/4 $Z_{\odot}$ metallicity at high and low redshift respectively) and find a better fitting than using the previous solar metallicity models.

PAINEL 122

INITIAL CONDITIONS FOR A REALISTIC DOUBLE RADIO SOURCE EVOLUTION MODEL USING NUMERICAL SIMULATIONS

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In a realistic model for the evolution of powerful double radio sources one must consider a non-uniform pressure distribution over the cocoon volume. To properly study how the shape and pressure of the cocoon evolves with time we must solve the equations of energy and motion for the jet head, the cocoon, and the bow shock. Besides, the advance of the jet head through the ambient medium is a function of the area of the head. In this work, we investigate what are the initial conditions for these

equations based on the results of a large number of numerical hydrodynamic simulations performed for a broad range of jet parameters. We present the relations we found between initial head pressure and expansion speed as a function of the jet Mach number and contrast density as well as how the head radius increases with time. These can then be used to solve the equations of a detailed analytical model which is in close agreement with the numerical simulations.

PAINEL 123

NEW OBSERVATIONS IN X-RAYS OF THE CLUSTER OF GALAXIES ABELL 85

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Early observations of the bright X-ray cluster Abell 85, made with the ROSAT satellite, have shown a number of particular features: (I) an X-ray emission excess in the south region associated with a group of galaxies (the "south blob") falling towards the main cluster structure; (II) a filament of groups of galaxies and diffuse matter with at least 4 Mpc; (III) an X-ray excess in the west region co-spatial with synchrotron radio emission suggesting an inverse Compton origin. We present here preliminary results obtained with the recent observations by the satellites Chandra (august/2001) and XMM-Newton (january/2002). We emphasize the morphological analysis, based on the adaptative kernel smoothing technique, and the high-resolution spatially resolved spectral fits. We present new temperature and metallicity maps, showing evidence for a cool and metal rich central region; we have also detected a possible "hole" in the X-ray emission near the center, showing that even the inner parts of Abell 85 may not be as relaxed as previously thought. The existence of a filament reaching Abell 85 at its south region is confirmed with deep XMM-Newton imaging, while high-resolution Chandra imaging shows the discrete, unrelaxed nature of the "south blob".

PAINEL 124

DYNAMICAL EVOLUTION OF THE CLUSTER OF GALAXIES A970

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We report on new results on the X-ray emission of the cluster of galaxies A970, based on observations made by BeppoSAX detectors MECS and LECS in the

range [0.15 – 10] keV. Previous work (Sodré et al. 2001, A&A, 377,428) , based on the analysis of the galaxy radial velocity distribution, suggested that A970 may be just reaching its dynamical equilibrium. The scarce available X-ray data (Einstein IPC and ROSAT All-Sky Survey) also suggested a recent merged cluster scenario, with a weak cooling-flow and an offset between X-ray isophotes and galaxy distribution. The new data presented here allowed us to obtain low resolution spatial profiles for the temperature, the abundances and N_H. We have also been able to derive the global α-elements/iron ratio of the cluster. The combined X-ray and velocity analysis suggests that Abell 970 is between two meals: a recent merger event, which occurred some ~ 3 – 4 Gyr ago and another one which will happen in the next ~ 4 – 6 Gyrs.

PAINEL 125

PROPERTIES OF AGNs IN THE LOCAL UNIVERSE

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Considering the Southern Sky Redshift Survey - SSRS2 - as representative of the general galaxy distribution of the nearby Universe, we characterize some of the properties of the hosts of Seyfert types 1 and 2. The Sey identification in the SSRS2, is based on the ratio of optical emission lines for about 70% of the SSRS2 galaxies. The literature and NED was also used in the process of Sey identification. Among the properties examined we find that: **a)** the percentage of Sey galaxies is at least 3% of the one for the general population (162/5399); **b)** the ratio of Sey-2/Sey-1 is ≈ 3: 1; **c)** by means of the Luminosity Function estimate of SSRS2 and Seyferts, we conclude that the AGNs represent 1% of the galaxy population, and are distributed preferentially in hosts with absolute magnitude brighter than M^*+1; **d)** Seyferts are hosted preferentially by early-spirals (S0a-Sb), and 11% are hosted in systems presenting clear evidence of strong interaction (twice the value found for SSRS2); **e)** Sey-1 and Sey-2 show similar distribution among the different morphological types; **f)** Seyferts contain 2 times more barred hosts than the SSRS2 galaxies; **g)** in general, Seyferts are less frequent in isolated galaxies, prefer binary systems, and show a slight tendency for not being in groups of galaxies, when compared to the SSRS2 sample.

PAINEL 126

THE ENVIRONMENTAL DEPENDENCE OF STAR FORMATION IN THE NEARBY UNIVERSE

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We investigate the environmental dependence of galaxies with star formation from a volume-limited sample of nearby galaxy spectra extracted from the 2dF Galaxy Redshift Survey. The environment is characterized by the local number density of galaxies. We discriminate the star-forming galaxies in distinct spectral classes by the use of a set of equivalent widths. We also determine galaxy spectral types through a Principal Component Analysis of their spectra. The frequency of galaxies of different classes and types are then evaluated as a function of the environment. We show that the fraction (relative to star-forming galaxies) of short starburst galaxies seems to increase with their local density, and we then argue that this is an indication that morphological transformations, although stronger in clusters, occurs in all environments.

PAINEL 127

STELLAR POPULATIONS AND ENVIRONMENT OF GALAXIES IN THE LOCAL UNIVERSE

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We investigate the environmental dependence of galaxies with different stellar populations using a volume-limited sample of nearby galaxy spectra extracted from the 2dF Galaxy Redshift Survey. The environment is characterized by the local number density of galaxies. The stellar populations are obtained with empirical population synthesis techniques, with the maximum entropy method. Using numerical simulations, we show that some parameters, like the mean age of a galaxy stellar population and the fraction of its young stars, can be robustely estimated from the spectra. We will also present preliminary results regarding the frequency of galaxies with different populations and parameters as a function of the environment.

PAINEL 128

PHENOMENOLOGICAL FITS TO ROTATION CURVES OF SPIRAL GALAXIES

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The standard way of accounting for the flat rotation curves of spiral galaxies is to assume that these galaxies have a dark halo component. Dark halo fits have in general three free parameters and can fit virtually any set of rotation curve data. It is well known that MOND (MOdified Newtonian Dynamics) can do a better job than that with only one free parameter (although it is usually said that MOND was designed for that particular end). Here we use two phenomenological models, namely MOND and an effectively one-parameter model by de Souza & dos Anjos, to fit a sample of 22 galaxies observed in the optical and radio bands. The two models show on average the same quality of fit, and we argue that there might be a physical connection between them. We also test new mathematical formulae for the asymptotic MOND function and find that, for given total masses, all of them predict flat rotation curves for large radii with different peculiar features for intermediate radii.

PAINEL 129

THE VELOCITY DISPERSION-METALLICITY RELATION IN NEARBY EARLY-TYPE GALAXIES

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The mass-metallicity relation – expressed as the stellar line-of-sight velocity dispersion σ_v *vs.* the Lick absorption line-strength Mg_2 – is known to be an important diagnostic of chemical evolution processes and/or formation conditions of early-type galaxies. However most of the studies are restricted to the central regions due to historic observational reasons. In this work we make a first attempt to study the spatial dependence of the mass-metallicity relation of early-type galaxies by comparing the nuclear correlation with these obtained from measurements inside an effective radius r_e of each galaxy. The nuclear quantities (i.e, inside a $r=0.60h_0^{-1}$kpc at $cz=7{,}290 km.s^{-1}$) have been estimated directly from central extracted spectra and then aperture corrected using the previously measured radial gradients by us. However, since the classical mass-metallicity relation (nuclear values) is build from large samples adopting average radial gradients, in order to compare our results with the classical ones we have also aperture corrected our data using average radial gradients from the literature. The long slit spectra of our sample of a dozen nearby E/S0 galaxies (most of them belonging to groups) were collected with the Boller &

Chivens spectrograph installed in the 1.60m telescope of the Pico dos Dias Observatory. First results show that the classical relation is reproduced with our data, although with a larger scatter, which obviously decreases when average radial gradients are used. We also find that, within a significance limit, there is a similar dependence of the Mg_2-σ_v relation for both galactic regions (nuclear and at $1r_e$).

PAINEL 130

THE NATURE OF THE NUCLEAR STRUCTURES OF NGC 5248

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NGC 5248 is a spiral galaxy with circumnuclear starbursting ring (diameter 1500 pc) and LINER nucleus. In order to study the morphology of these central regions, we obtained and analized images in the *H*α band from the 1.5 m telescope of C.T.I.O. (Chile). Direct images was obtained using narrowband filter centered on the *H*α line (plus [NII] λλ6548,6584; "on-band") and adjacent continnum ("off-band"). An image in *H*α+[NII] was produced by subtracting the off- from the on-band images. The ring shows 6 "Hot Spots" (complexes of giant HII regions) and one of them divided in three more regions, each complex consisting of numerous smaller photoionized regions. The core emission in the "off-band" image presents a very high concentration, while the *H*α+[NII] image shows strong emission in the circumnuclear Hot Spots and almost no core emission; we deduce that the nucleus is very compact (diameter 100 pc). Furthermore, using the synthesis code Metropolis, we obtained that the relative populations in the nucleus corresponds to an older population respect to that of the ring. The nuclear spiral previously detected in the infrared also presents *H*α emission, indicating the presence of photoionized gas besides the dust component detected by others authors. We also analized archival images in the ultraviolet, infrared, and radio (CO molecule) bands and compare them to ours images. We don´t detect any bar in any spectral band, contrary to its classification.

PAINEL 131

SPECTROSCOPY AND PHOTOIONIZATION MODELS FOR THE IONIZED GAS OF THE NUCLEUS AND CIRCUMNUCLEAR RING OF NGC 5248

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In order to know the physical conditions of the interstellar gas in the nucleus and ring of NGC 5248, we (1) carried out spectroscopic observations in the visible

(6500 Å to 6800 Å, resolution 8 Å) obtained from the telescopes of 1.54 m of Bosque Alegre, 2.16 m of Casleo, 1.5 m of CTIO and 4 m of CTIO; and (2) performed photoionization models (Cloudy, version C90) for both regions. The map of electronic density obtained by means of the doublet [SII] 6717,6731 shows a maximun in the core of the galaxy, as well as the maps of the [NII]/$H\alpha$ and [SII]/$H\alpha$ ratios. We also obtained the maps of FWHM of $H\alpha$, [NII] and [SII], which are signs of the velocity disperssion (where these lines originates). Furthermore, we carried out photoionization models for the nucleus and ring regions, and compared them to the observed values in the diagnostic diagrams, which prompt to the idea that the so called "Hot Spots" and nucleus are indeed HII regions (althought the nucleus ratios are closer the LINER region), with differents values of chemical composition, ionization parameter and temperature of the ionizing stars. However, the ratios [NII]/$H\alpha$ and [SII]/$H\alpha$ are spatially correlated to the FWHM of [NII] and [SII], respectively, being the correlations strongest inside the ring, showing that there exist another excitation mecanism besides that of the stellar photoionization, probably shock waves.

PAINEL 132

KINEMATICS OF THE NUCLEUS AND RING OF NGC 5248

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We report the results of spectroscopic observations of the nuclear region of NGC 5248, carried out with the telescopes of 1.54 m of Bosque Alegre (Argentina), 2.16 m of CASLEO (Argentina), and 4 m of CTIO (Chile). Extensive spectroscopic observations were made in order to cover the nuclear region of the galaxy. We study the kinematics and present a detailed H_α velocity field for the central region. The derived rotation curve of the H_α baricenter is also presented. Although the main part of the nuclear (ionized) gas rotates in a circular motion, we found radial velocity residuals (not reported previously) spatially associated with the Hot Spots of the circumnuclear ring, indicating non circular motions for the ionized gas. We also obtained the radial velocities of the nuclear spiral (Laine et al, 1999) and determined a trailing motion for it. The derived mass for the central regions is 3×10^9 $M_\odot$ within 10" (750 pc of proyected distance).

PAINEL 133

SPIRAL GALAXIES: HOW MUCH MASS UNDER HI?

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It is well known that most spiral galaxies need an additional, invisible component to fit their observed rotation curve. Persic et al (1996, MNRAS 281, 27) model the rotation curve of galaxies as a function of a single parameter: their luminosity. Fainter galaxies exhibit rotation curves that require more dark matter when compared to the more luminous ones. In this work I investigate a relationship between the amount of dark matter in spiral galaxies and the HI radio emission at 21 cm. I assume various distributions of density and temperature of the gas throughout the galaxy. Synthetic 2-D radio spectra are obtained, which are compared with the observations. Studying the same sample of galaxies compiled by Persic et al. I observe that the HI excess is strongly correlated with the I-band absolute magnitude: fainter galaxies have more HI gas than the brighter ones. The results indicate that part of the matter commonly considered as “dark matter” might be in fact stored in a “cold gas” component (PRONEX, Millennium Institute, CNPq).

PAINEL 134

STELLAR POPULATION GRADIENTS IN SEYFERT 2 GALAXIES

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We use high signal-to-noise ratio long-slit spectra in the optical range of Seyfert 2 galaxies to study the variation of the stellar population properties as a function of distance from the nucleus. In order to characterize the stellar population and other continuum sources (e.g. featureless continuum FC) we have measured equivalent widths Ws of absorption features, continuum colours and their radial variations, and performed spectral population synthesis as a function of distance from the nucleus. About half the sample has Ws values smaller at the nucleus than those at 1kpc from it, due to a younger population and/or FC. Only two galaxies show the opposite bevaviour, while the others do not present significant variation in the Ws. The stellar population synthesis shows that, while at the nucleus, 75% of the galaxies present significant contribution of ages younger

than 1Gyr and/or of a FC, this proportion decreases to 45% at 3kpc. In particular, 55% of the galaxies have significant contribution of the 3Myr/FC component at the nucleus, but only 25% of them have this component at 3kpc. A comparison of the stellar population content between the Seyferts and normal galaxies of the same Hubble type shows that the contribution of ages younger than 1Gyr is in most cases larger in the Seyferts than in normal galaxies, except for the galaxies classified as Sc or with uncertain morphology. For the S0 galaxies we could compare the stellar population gradients observed in the Seyferts with those of normal galaxies. At the nucleus the contribution of the 10Gyr component in normal galaxies is larger than that of the Seyferts, which present an excess of younger populations. At 1kpc this result still applies, while at 3kpc from the nucleus the stellar population is more similar between the normals and Seyferts.

PAINEL 135

IS THERE A DEPENDENCE OF THE FUNDAMENTAL PLANE OF EARLY-TYPE GALAXIES WITH MORPHOLOGY OR ENVIRONMENT ?

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There are well-established relations between parameters of early-type galaxies. This is the case of the so-called Fundamental Plane: a relation between effective radius, mean surface brightness inside it and central velocity dispersion. It defines a plane, where early-type galaxies (ellipticals and lenticulars) are found. It is of great interest to verify if this relation is universal and what causes its small scattering. Here we evaluate this issue in regard to the morphology of galaxies and their environment. If galaxy formation occurs basically through a similar process, differing in its initial conditions (e.g. mass, rotation), the different morphologies or different evolution histories could manifest themselves in the Fundamental Plane and give significant clues for understanding a more realistic scenario of galaxies origin and evolution. With this purpose, we used the data from the ENEAR project, which assembled a homogeneous and representative sample of the local Universe, as well as true distances for all objects. We confirmed the equivalency of the distance indicator (Dn-sigma relation) of the ENEAR project with the Fundamental Plane, and compared the planes obtained with samples in high and low environment densities and for ellipticals and lenticulars separately. Just a few percent of the sample shows a systematic residual, associated to photometric parameters. However, the large majority of early-type galaxies are well described by the Fundamental Plane, no dependency being found of this relation with either the objects morphology or their environment.

PAINEL 136

NEAR-INFRARED SURFACE PHOTOMETRY OF EARLY-TYPE GALAXIES

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Surface photometry of elliptical galaxies is a powerful tool to study the general properties of these objects. Large databases on surface photometry have been produced, but mainly in the V band, albeit observations in the near infrared bands are crucial to understand the structural and populational properties of early-type systems. We performed CCD infrared (JHK_s) photometry for a sample of 10 elliptical and 2 lenticular galaxies. Isophotal parameters, brightness profiles, integrated colors and color gradients are presented. Color gradients found are very weak, showing bluer colors towards the outer regions. The colors of the sample galaxies are compatible with stellar populations like those found in metal-rich clusters of the Galaxy; objects NGC 7192, NGC 7562 and NGC 7619 are compatible with less metal-rich populations. The brightness profile of most galaxies is well described by the $r^{1/4}$ law. The profiles of NGC 1600 and NGC 720 are described by Sérsic's law with n~1.5 and n~1.8 respectively. The infrared effective radius of the objects studied is typically one half of its counterpart in B band, what can be an indication that the stellar population that dominates the infrared emission is more concentrated in the central regions. We show that the sample satisfies the Fundamental Plane relation of elliptical galaxies in the infrared, with an rms scatter of 0.20 for J and H and 0.23 for K_s.

PAINEL 137

NGC5044: STELLAR POPULATION AND IONIZED GAS

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In this work we investigate the stellar population and ionized gas in the elliptical galaxy NGC 5044. In order to investigate the stellar population, we have applied a stellar population synthesis method based on 3 spectral components with different ages and nearly-solar metalicity. The largest contribution, both in 5870 Å flux fraction and mass fraction comes from old stars. However, the mass contribuition of the young component implies that star formation still occurs in the center of NGC 5044. The HII region flux contribution decreases from 14 % in the center to 3 % in the external region (at 4.26 kpc). The presence of a young population in the center of NGC 5044 may account for the negative gradient observed in the equivalent widths. Additionally, the synthesis provided a color excess gradient in E(B-V), decreasing from the center to the external regions. In

order to investigate the ionized gas, we have analized the radial dependence of the emission-line intensity ratios $\frac{[NII]}{H\alpha}$ and $\frac{[SII]}{H\alpha}$. $\frac{[NII]}{H\alpha}$>>1 at the galaxy center indicates a non-thermal nature for the ionization source. Variation of this line-rati, as well as $\frac{[SII]}{H\alpha}$, indicate the presence of additional ionization sources in the external regions. This source is, probably, hot post-AGB stars.

PAINEL 138

PHOTOMETRY AND SPECTROSCOPY OF TWO FAINT GALAXIES IN THE FIELD OF NGC7479

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The barred spiral galaxy NGC7479 has several features indicative of interaction, like the unusually strong bar, the asymmetrical spiral arms, and a tail in the North side. Nevertheless, no companion has ever been detected. In a deep image taken with the Prime Focus Camera (PFC) at the 0.8m telescope of McDonald Observatory, we detected two small objects, close to the tail, that we selected as possibe companions. To determine if they are really close to the galaxy, or not, we took their spectra with the Low Resolution Spectroscope (LRS) at the 9.2m Hobby-Eberly Telescope (HET). In this work we present the results obtained from the surface photometry and spectroscopy of the two small galaxies. We calculated photometric parameters, as integrated magnitudes and brightness profiles, and determined radial velocities using cross correlation with 6 elliptical galaxies. The obtained colors are B-$V\simeq$ 1.1 for both galaxies, suggesting they are elliptical galaxies. The derived radial velocities are around 36 000 km/s for one galaxy and 38 000 km/s for the other, which indicates clearly that they are very distant objects, and thus are not companions of NGC 7479, whose heliocentric radial velocity is 2381 km/s. Their correspondent absolute magnitudes are around M_B = -19 (H = 75 km/s/Mpc), also typical of normal galaxies. Therefore, NGC7479 remains in placid isolation.

PAINEL 139

RADIAL ABUNDANCE GRADIENTS IN SPIRAL GALAXIES

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The existence of radial abundance gradients in the disk of the Milky Way is well established, from the analysis of photoionized nebulae (HII regions and planetary nebulae, PNe) or hot stars. Similar gradients in other spiral galaxies have been predicted by chemical evolution models and observationally detected from the analysis of high spatial resolution spectroscopic data. In this work we present the results from the analysis of HII regions observed in nearby spiral galaxies. For NGC 55, a set of HII regions throughout its disk was observed using the ESO 1.5m telescope, and chemical abundances of helium, oxygen, sulfur, argon and nitrogen were derived. Ionic abundances were calculated using a three-level ion model, and elemental abundances were derived using ionization correction factors. These data were combined with others already derived for the Milky Way (see Costa, Maciel and Uchida, IAU Symp. 209, in press) and Andromeda, and the results indicate an analogous abundance profile for both objects: there is a clear gradient in the abundances along the galactic disk, with higher values nearer the bulge, but the gradient tends to disappear for R 10 kpc. The same kind of analysis was performed for some galaxies in Sculptor and Centaurus groups, using fluxes from the literature and re-deriving abundances. (Work supported by FAPESP and CNPq)

FÍSICA DO SOL

PAINEL 140

FAST PULSATIONS OBSERVED IN A DECIMETRIC WAVELENGTH SOLAR FLARE

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Fast drifting pulsations have been observed between 15: 25: 43 - 15: 25: 51 UT in a long duration (about half hour) decimetric solar burst associated to the April 9, 2001 flare, and observed by the Brazilian Solar Spectroscope (BSS). The observations were carried out with a high frequency and 50 millisecond time resolution in the frequency range of 1500-2500 MHz. The fast drifting pulsating structures were observed in a short duration group of about 15-20 time structures with a bandwidth of > 400 MHz starting at 2100 MHz. To investigate the dynamics of the fast drift pulsations the time series of three frequency channels (2360, 2390, 2400 MHz) during about 8 seconds has been selected and analyzed for its complex temporal variability. For this analysis we used the technique of Global Pattern Analysis (GPA). Also, the Assymmetric Amplitude Fragmentation (AAF) operator from GPA is applied. The average slope of -0.75 obtained for the GPA spectrum indicates a long-range correlated stochastic process. The AAF applied to the three series produced moments of fragmentation of about 1.12 for 2390 and 2400 MHz, which suggested a normal regime. However, the value around 1.05 for the 2360 MHz series indicates that a component of diffusive-reactive regime is also present in that channel. Using the Global Wavelet Spectrum (GWS) the power spectrum of the three frequency signals combined has been determined. The power spectrum exhibits a -0.5 average power law. This characteristic value, combined with the gradient pattern analysis (GPA) technique, suggests the presence of plasma weak turbulence driving the energy release process in the radio source.

PAINEL 141

A NEW METHOD TO OBTAIN THE SOLAR RADIUS

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We present a new method to obtain the solar radius based on the wavelet transform. The measurement of the solar radius had received great attention on last years because its variation could indicate alterations in the balance of energy between the different layers of solar atmosphere. The most explored bandwidth is the visible and there are few results on microwaves. Observations in UV an X-Ray are getting more importance with new telescopes with more spatial resolution and bigger acquisition rates. In these frequencies the coronal emission makes difficult the determination of solar limb using the traditional methods. In this work we use a two-dimensional wavelet transform with a B3 spline scale function to determine the solar limb. The wavelet transform allows choosing a more suitable spatial scale to obtain the limb. The corona emission has a diffuse emission with big spatial scales, while the solar disk is full of structures with rapid variations; therefore the emission is more pronounced in shorter spatial scales. The wavelet transform allows finding the limit between both types of emission and therefore the solar limb. We present also the comparison between this new method and others found in the bibliography.

PAINEL 142

SPECTRAL TOMOGRAPHIC RECONSTRUCTION OF ACTIVE SOLAR REGIONS IN A PARALLEL COMPUTATIONAL ENVIRONMENT

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A solar spectral tomography can be reconstructed from two-dimensional images of an active solar region in order to visualize the three-dimensional distribution of the electron density in that part of the solar atmosphere. This density is a basic parameter in the analysis of the plasma in the solar corona and also of the spatio-temporal dynamics of the associated phenomenum, both important for solar flare forecasting. Recently, the Smith method was used in the three-dimensional reconstruction of the solar corona from soft X-ray (SRX) and hard X-ray (HRX) images obtained from the Yohkoh satellite (Rosa et al., APS Conf. Series v.228, 2000) for resolutions of 64x64, 256x256 and 512x512 pixels. The current work presents a version of that implementation using parallel computing techniques. It is based on a computational performance evaluation of the original sequential code by means of timing and profiling tools (Stephany et al. in Applic. HPC in Eng. VI, WIT Press, 2000). The parallel version was coded in C language and employs calls of the message passing communication library MPI (Message Passing Interface). The code was executed on a multicomputer based on IA-32 architecture. The results have shown the suitability of the chosen methodology and implementation. The processing time was reduced almost linearly with the number of processors. Furthermore, it is discussed the application of this methodology for the reconstruction of images of active solar regions from radio-frequency data (metric and decimetric wavelengths).

PAINEL 143

ANALYSIS OF DECIMETRIC TYPE-III BURSTS OBSERVED WITH HIGH TEMPORAL RESOLUTION

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The type-III radio bursts are considered as signatures of the moving electron beams accelerated during the solar flares. Their investigations can provide evidences of the acceleration processes, and the characteristics of the exciting agent and the acceleration site in the solar atmosphere. The typical duration of type-III bursts in decimetric band is of order of 300 milliseconds. Thus, the observations of type III bursts with high time resolution able us to obtain the detailed time profiles and to determine their temporal characteristics more precisely to investigate the emission processes. On September 13th, 2001, the Brazilian Solar Spectroscope (BSS), for the first time recorded three groups of decimetric (2.0 - 2.5 GHz) type-III bursts with high temporal resolution of 20 milliseconds. The type-III bursts were associated with a sub-flare (13: 02-13: 05 UT), a C2.4 class X-ray flare (13: 02-13: 07 UT) and radio activity in meter frequencies (25-180, 254, 410 and 606 MHz). Also, they were harmonically related with type-III bursts recorded by the radio spectrographs at Ondrejov Observatory, in the frequency range of 0.8 - 1.0 GHz. The temporal and spectral characteristics of each individual decimetric type-III bursts were determined: the total duration is in the range of 100 - 400 ms, the upper value of flux density is ~ 300 sfu, the bandwidth varies from 40 MHz to the observing frequency band (500 MHz) and the low limit for frequency drift rate is ~ 2000 MHz/s. The analysis of the rise and decay times is being concluded. Their implications on the plasma emission processes will be discussed.

PAINEL 144

FINE STRUCTURES IN SOLAR DECIMETRIC RADIO BURSTS AND CORONAL INHOMOGENITIES

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This work describes some spectral/temporal fine structures observed during solar radio bursts recorded in September 18th, 2001, by the Brazilian Solar Spectroscope (BSS) in decimetric frequency band of (2000 - 2500) MHz. This event is associated with an optical sub-flare (17: 06 - 17: 13 UT) and an X-ray M1.4 class flare peaked at 17: 07 UT. The dynamic spectrum of the bursts recorded with high time resolution (20 ms) revealed details of each fine structure such as short duration of ~ 150 - 500 ms, intermittent emission like-striation, with frequency band of ~ 20 - 90 MHz and center-to-center frequency separation of ~ 25 - 50 MHz. These main characteristics lead us to suggest the process of induced scattering of Langmuir waves by thermal ions for the generation of the fine structures recorded. The intensity variations with frequency of the group of intermittent bursts ("emission gaps") observed are suggested to be caused by extremely small interaction lengths corresponding to very high density gradients. For an interaction length of 10^3 km, the estimated excess electron density in coronal inhomogenities is of order of 2 - 3 % over the ambient, considering the source site located at 9×10^4 km above the photosphere. This value is in agreement with the previous determinations from decametric and interplanetary scintillation observations.

PAINEL 145

SOLAR SUBMM AND GAMMA-RAY BURST EMISSIONS*

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Solar flare emission was measured at 212 GHz in the submm range by the Submillimeter Solar Telescope (SST), in the 1.2-18 GHz microwave range by the Owens Valley Solar Array (OVSA) and in the gamma-ray energy range (continuum) by experiments onboard of the Yohkoh (>1.2 MeV) and Shenzhou 2 (> 0.2 MeV) satellites. At the burst onset, the submm and microwave time profiles were well correlated with gamma-rays to the limit of the temporal resolution(£ 10s). At 212 GHz fast pulses (<1s), defined as time structures in excess to the bulk emission, were identified as the flux increased. Their spatial positions were scattered by tens of arcseconds with respect to the main burst emission position. Correlation of submm with gamma-ray fast time structures less than 500 ms is suggested at the gamma-ray maximum. The time variation of the rate of occurrence of the submm rapid pulses was remarkably well correlated with gamma-ray intensities in the energy range (>1.2 MeV), attaining nearly 50 pulses/minute at the maximum. These results suggest that gamma-rays might be the response to multiple rapid pulses at 212 GHz, and produced at different sites within the flaring region. *Complete version to be published in ApJ, August 2002.

PAINEL 146

DISTRIBUTION OF THE LIMB BRIGHTENING IN 212 GHZ

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We have analyzed solar maps obtained with the Solar Submilimetric Telescope (SST), in the Argentinean Andes, working at two frequencies: 212 and 405 GHz. Previous results at 235-250 GHz, obtained from sporadic observations, showed the existence of a limb brightening between 5-15% above quiet Sun levels close to the limb. It is believed that the positive temperature gradient in the solar atmosphere is parcialy responsible for this limb brightening. We report the results obtained in the study of the limb brightening distribution, more specifically, the variation of this limb excess brightness with time and position angle. In order to do so, a uniform disc model with constant temperature was convolved with de SST reconstructed beam at 212 GHz (FWHM of 4'). Then, this model was subtracted from the original map, and the residues were analysed for several maps since April 2001. Radial scans through the center of each subtracted map suggested the existence of a limb brightening in the maps, with an emission excess between 2-6% above quiet sun values. The quiet sun was defined as the most probable value found in each map. Moreover, the South pole appears to be brighter than the North pole in many maps. These results are compared with observations at other frequencies. This research was funded by FAPESP grant number 00/10299-3.

PAINEL 147

SUBMILLIMETER EMISSION STUDY ASSOCIATED WITH QUIESCENT AND EXPLOSIVE SOLAR ACTIVE REGIONS.

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"The Solar Submillimeter Telescope (SST) has detected numerous solar activity at 212 GHz and 405 GHz, whether pointing at active regions or not.In order to identify the physical origin of this activity, we tried to relate its time evolution with the characteristics of the involved active regions (size, number of sunspots, magnetic complexity). This analysis was made using observations for which the zenital atmospheric opacity was below 0.4 nepers at 212 GHz, thus minimizing the possibility of these features to be absorved by the Earth's atmosphere. We did

not find correlation between the submillimeter activity at 212 GHz and 405 GHz and the physical parameters of the corresponding regions. This can be explained by taking some factors into account like (i) the SST beam sizes compared to the region extend and their displacement in relation to the solar disk during the day (ii) the possibility of the emitting source to be a point source, compact and/or of low intensity. We will also present the characteristics of the detected activity in active centers in function of their flare production."

PAINEL 148

SOLAR DIAMETER OBSERVATIONS IN THE VICINITY OF THE MAXIMUM OF CYCLE 23

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The Solar activity cycle 23 was less intense than the two previous ones. It also presented unique features, as a smoother rise and double peak.This is highly interesting to verify whether the observed variations of the semi-diameter can be correlated with variations in the solar activity. Previously unpublished results from the Observatório Nacional program of solar diameter monitoring are presented, from 2001/January to 2002/May, that is, covering the late peak period. During this lapse over 2000 independent measurements have been obtained. Typically 16 measurements are taken at the east and west sides of the meridian transit, spanning quite different atmospheric conditions and, usually, different heliolatitudes. In spite of this, the results from the two series of sessions are highly consistent. The provisional value for the mean semi-diameter is 959".107 ±0"009, resulting to the error of a single observation at 0".6. The standard deviation within the sessions is 0".15 on average. This indicates that the error budget is dominated by non-systematic errors and that truly semi-diameter variations with amplitude of order of tens of milli arcseconds can be determined. With the above presented period of observations, the Observatório Nacional program, started in 1997/January, covers the rise and the begin of the decline of solar cycle 23. The comparison between the measured semi-diameter values and the sunspots number count shows common trends. Admittedly, the daily basis comparison is drowned by the noise from the two series. However, by averaging the values and by additionally using the data from the longer CERGA visual observations series, obtained by Laclare since 1975, the correlation between the sunspots counts and semi-diameter values can be discussed, as well as any indication of longer term trend for the latter. The first results indicate correlation

at 0.9 on yearly basis, on the contrary there is no correlation on daily basis (0.1). The correlation is higher for observations inside the royal zone, suggesting that fluctuations of the limb darkening function must also be taken into account.

PAINEL 149

THE RADIO SIGNATURE OF MULTI-SCALING FLARE LOOP INTERACTIONS

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Since 1980 many temporal high resolution observations of active solar radio emission have shown that the energy released during solar flares is fragmented. Recent observations in metric and decimetric ranges suggest that a short-range correlated, and non-linear time-dependent, stochastic process, can produce intermittent radio spikes whose frequency distribution are power-laws. Here, the solar radio emission at 3GHz observed during june 6, 2000 flare has been analyzed for its intermittent temporal variability. Using the Fourier Power Spectrum (FPS) and the Global Wavelet Spectrum (GWS) the power spectrum of the 3GHz signal has been determined. The combined power spectra exhibits a -1.99 average power law. The presence of a characteristic power-law implies that the temporal variations do not have a dominant characteristic time scale, as for example the loop-loop interaction models predict. It follows from our analysis that loops exist on a host of spatial scales and their mutual interactions give rise to the corresponding host of temporal scales with no preference for any particular period. In other words, the oscillating periods involved in a loop coalescence dynamics depends on the spatio-temporal observational scales.

PAINEL 150

ON THE ORIGIN OF SUPRATHERMAL ELECTRONS IN THE SOLAR CORONA

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The energy release processes in the sun affect its atmosphere, the interplanetary environment, and sometimes, the Earth's neighborhood. They heat the coronal

plasma and produce energetic particles which propagate and radiate in the solar atmosphere. Fifty years ago was detected the first evidence of this activity at metric wavelenghts which was denominated noise storms. Their origin is yet not known because they have no clear association with other phenomena, such as solar flares. The noise storms are of low energy content, thus it is hard to detect them with the sensibility of the instruments used. We analize noise storms detected between 0.1 and 1 solar radius above of the solar surface with the Nancay Radio Heliograph (NRH) which operates in the 150-450 MHz range, and we study their association with CMEs (Coronal Mass Ejections) detected above 1.5 solar radius by SOHO Coronographs. NRH provides 2D images of the noise storms which are used to determine their position projected on the solar disk, and to define which active region was envolved. The time evolution of noise storm emission is compared with 7 GHz data, obtained with high sensibility by the solar Radio Polarimeter of Itapetinga (Atibaia).We find a good correlation between both emissions, suggesting that noise storms, which are high corona phenomena, also have counterpart in the middle/low corona. This may indicate that the behavior of the middle/low corona result in low energy particles responsible for the noise storms emission. In spite of low energy content of noise storms, these results show that the phenomena resulting in noise storms disturb a large part of solar atmosphere, like a solar flare.

PAINEL 151

THE INFLUENCE OF SPICULES ON THE BRIGHTNESS VARIATION OF THE SOLAR DISC

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In order to explain the observed excess limb temperature seen in maps of the Nobeyama Radio Heliograph (NRH), a model of the center-to-limb variation of the brightness temperature of the Sun at 17 GHz is constructed. Solar maps at 17GHz from NRH show an excess brightness of 25% above quiet sun levels at polar regions and 15% near the equatorial limb. Despite the fact that a limb brightening is predicted by theoretical models, the observations so far have been controversial, the majority of which have shown limb excess emission below what is expected. Several authors have attributed these results to the presence of spicules, that is, jets of denser material which emerge from the photosphere reaching heights of 5000 km, and occupying around 10% of the solar surface. In order to estimate the brightness temperature, we model the solar atmosphere (chromosphere and corona) according to temperature and density values given in the current literature, and then include the spicules using the Monte Carlo method to attribute their physical characteristics. The spicules are modeled as cylinders of fixed diameters of 500 km,

temperatures between 5000-15000 K, densities in the range of 10^{10}-10^{12} g/cm^3, heights of the order of 4000-8000 km,and tilt angle with respect to the surface normal of 30 to 120 degrees.According to our model, the calculated brightness temperature at 17 GHz, for an atmosphere without spicules, is of the order of 10,000 K, where the emission originates from heights between 3000 and 3500 km.Since most spicules are optically thick at 17 GHz, the height of the emission depends on the height reached by the spicules. Our results for the model with spicules have shown that the brightness temperature suffers small variations at the center of the solar disc, with respect to the model without spicules, while at the limb, the brightness temperature is severely reduced from its undisturbed value. However, a temperature excess above disc center is still obtained. We discuss the differences of limb emission for equatorial and polar regions, observed in the NRH maps, in terms of spicules characteristics. This research was supported by FAPESP grant number 01/02106-3.

PAINEL 152

METHOD FOR SUPRESSION OF ATMOSPHERIC EFFECTS ON THE SOLAR SUBMILLIMETER EMISSION OBTAINED WITH SST.

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The SST (Solar Submillimeter Telescope) was developed for the analysis of the spectral and time-space characteristics of energy releases in the solar corona, in a frequency domain still unexplored. The instrument uses six different channels, being two at 405 GHz and four at 212 GHz. The physical observable obtained is the emitting source temperature (Kelvin) and/or its flux density (sfu). Before to get this quantity the obtained signals need to be calibrated and corrected for different effects. The main one is the atmospheric attenuation and its time variation, which comes to be fundamental at the high frequencies of the SST. We show a method which try to identify and correct this effect. The method is based on sky observations where necessary constants of signal normalization are determined for the different channels of the SST, relatively to the signal of a reference channel. The method was applied with success in the analysis of some solar observations. In this work we show the results and the viability of the method.

PAINEL 153

SOLAR PATROL RADIO TELESCOPE AT 12 GHZ SOLAR FLARES LOCATION: PRELIMINARY RESULTS

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2 - UPM (Universidade Presbiteriana Mackenzie)
3 - INPE (Instituto Nacional de Pesquisas Espaciais)

We are presenting here the complete characterization of the receivers and the preliminary results of solar observations with the Solar Patrol Radio Telescope (SPRT). This radio telescope uses three antennas pointing to different regions on the Sun to compare the input signal, in order to obtain the position of flaring active regions. Generally, active regions have angular dimensions between 1 to 4 arc minutes. Patrol telescopes, such as the 12 GHz we are working with, can not resolve the flaring region without the method proposed for this instrument. The data acquisition equipment, monitoring system and digitalization system were successfully concluded at the end of 2001. We studied the acquired data from SPRT since January 2002 when the radio telescope started its operation in a campaign basis. We determined receiver characteristics such as antenna temperature, beam efficiency, poiting characteristics and the real capacity of the system to locate solar bursts. We also are presenting here the solar flares occurred on January, 30 and 31 and their respective coordinates. The location of the solar flares were shown at NOAA site to be the reference of the preliminary results.

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A GALÁXIA E AS NUVENS DE MAGALHÃES

PAINEL 154

HEN S18: B[e] SUPERGIANT VERSUS LBV

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B[e] stars are objects with spectral type B which show forbidden emission lines in their optical spectrum. They are characterized by a hybrid spectrum, i.e., narrow low excitation emission-lines and broad absorption features of higher-excitation lines, such as Si IV and C IV, indicating high expansion velocity (about 2000 km/s). The B[e] phenomenon is present in different types: B[e] supergiants (B [e]Sg), Herbig AeB[e], compact planetary nebulae B[e]-type stars, symbiotic B [e]-type stars and other unclassified B[e] stars. The most homogeneous group of stars that show the B[e] phenomenon is formed by the B type supergiants in the Magellanic Clouds (Lamers et al.,1998 A&A, 340,117), but some Galactic stars have also been identified with similar characteristics. In order to estimate the physical parameters of these objects and their evolutionary stages, we present a study of B[e]Sg HEN S18, located in the Small Magellanic Cloud (SMC), which was observed with FEROS spectrograph at ESO. We have identified about 350 emission lines and their equivalent widths. We have found that Balmer lines present P-Cygni profiles and Paschen lines with double peak structures. We have also found several others forbidden and permitted Fe II lines as well as lines of other metals. In addition we have suggested the presence of La II emission lines, although the presence of these lines have never been reported in the literature for these kinds of objects. Despite the previous classification as a luminous blue variable (LBV) by Massey et al (2001 ApJ550, 713) our data indicate that this star is indeed a B[e]Sg.

PAINEL 155

VARIABILITY OF SAGITTARIUS A* AT 22 AND 43 GHZ

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CRAAM/INPE

The bright, compact radio source, Sgr A*, is thought to be associated with a supermassive black hole at the dynamical center of the Galaxy. Analysis of archival VLA data shows that Sgr A* appears to have quasi-periodic flares with a cycle time 106 days. The radio variability data should provide valuable information for understanding the accretion processes onto the black hole. The radio cycle likely responds to the instability in the accretion disk driven by the central mass. Recent results from stellar proper motion studies indicate that there is a dark mass of 2.6 x 10^6 Mo enclosed within 0.01 pc. Therefore, the higher frequencies will preferentially detect matter closer to the black hole. In addition to variability in the radio, there are signs that Sgr A* emits strong flares in the x-ray. We have observed the Galactic Center at 22 GHz and 43 GHz during ten years with Itapetinga radiotelescope (Atibaia, Brazil). The observations were made with the 13.7 m radome enclosed Itapetinga radiotelescope at the frequencies of 22 GHZ and 43 GHz during the period July 1980 and end of 1996. The receiver, operated in the total power, had a bandwidth of 1 GHz and a system temperature of 700 K. The observations consisted in scans across the source with a amplitude of 60´ in 22 GHz and 30´ in 43 GHz. The beam width was 4´ and 2´ in these frequencies, respectively. Each scan lasted 20s and each observation consisted in the mean value of 30 scans. Analysis of Itapetinga data shows that the amplitude of the variability tends to increase towards higher frequency and is consistent with a model in which flares arise from an accretion disk surrounded by an opaque radio plasma. Sgr A* presented fluctuations of about 20% at 22 GHz and 10%-60% at 43 GHz. Recent VLA data shows that this fluctuation found at 22 and 43 GHz is realistic. We can conclude that there is strong variability in this source and a compelling evidence that SgrA* is a cyclo-synchrotron-emitting region surrounding a massive black hole.

PAINEL 156

AN EVALUATION OF THE RATE OF GRB INCIDENCE IN THE HISTORY OF THE GALAXY

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IAG/USP

There is growing evidence that GRBs are closely related to the massive stellar formation regions and also for strong beaming of the events. We calculate numerically in this work the probability *a priori* for the earth to be illuminated

by N events along the history of the galaxy, with special attention to the various hypothesis concerning stellar formation and geometry. We show that for beaming angles $\leq 10^{-3}$ the rate per year falls below 10^{-8}, suggesting few events in the geological history of the planet. We also discuss in some detail how each one of these catastrophic illuminations should have affected the terrestrial organisms, mainly simple marine populations amenable to model analysis.

PAINEL 157

ESTIMATES OF ANTI PROTON FLUXES IN THE NEAR EARTH'S ENVIRONMENT

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Interest in measurements of leptons and isotopes of light elements, in the near Earth's space environment, is increasing in recent years and very sophisticated and heavy nuclear instrumentation is being utilized or planned on manned space flights like shuttle, space station etc. With this motivation, we started examining the possible source mechanisms of production of positrons and anti-protons. Here, we report the simulation results of anti-proton production fluxes, considering the interactions of protons of cosmic ray primaries of energies above 8 GeV with the interstellar matter and also the constituents of the exosphere like O, He and H. The results of the fluxes of the anti-protons in the near space environment are more likely due to cosmic ray interactions in the exosphere with the oxygen atoms, as the cross section of interaction and also density of oxygen is large compared to other species at altitudes of L<1.2. The expected fluxes of 10(-1) /(m2.s.sr.GeV) at 1 GeV are about 10 times the balloon observations of interstellar nature.

PAINEL 158

NUMERICAL REPRODUCTION OF LONGITUDE-VELOCITY DIAGRAMS FOR THE GAS IN THE GALAXY

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IAG/USP

The longitude-velocity (l-v) diagrams of neutral and molecular hydrogen constitute important tools for the study of the Galactic structure, since they provide information about the distribution of the gas and about the velocity field in the Galaxy. We constructed a model of gas distribution in the Galaxy that reproduces the l-v diagrams of both the neutral and molecular hydrogen. The model makes use of the galactic rotation curve, and starts with a mean

axisymetric radial distribution of gas. We add to this distribution density excess in the form of logarithmic spirals, described by the following parameters: starting point (galactocentric angle and radius), inclination angle, length, width, and peak density. The arms are Gaussian distributions in the radial direction, centered at the radius of the spiral. A procedure has been developed that calculates the amount of gas along a line of sight a a function of observed velocity, taking into account the interception of arms, and therefore reproduces the observed spectra. We compared the predicted spectra with those observed in HI and CO surveys (Parkes, Leiden, NRAO and Berkeley surveys for HI, and Columbia survey of CO), at intervals of 10 degrees in longitude. The direct comparison of spectra complements the model construction of l-v diagrams. With this procedure we obtained the terminal velocity as a function of longitude, and we constructed 2D maps of the Galaxy as it would be seen face-on, with the main spiral structure and details such as bridges, bifurcations, and segments of arms.

PAINEL 159

NGC 1912 AND NGC 1907: A CLOSE ENCOUNTER BETWEEN OPEN CLUSTERS?

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We investigate if the closely projected open clusters NGC 1912 (M 38) and NGC 1907 are a binary cluster. Previous study suggested that they are a binary open cluster based on similar distances and ages. In the present study we estimate the spatial velocities of the clusters derived from available radial velocities and proper motions, the bundle of orbits allowed by the errors was retrieved by mean of N-body simulations in a Galactic potential model. We conclude, that the clusters were born in different regions of the Galaxy and presently experience a fly-by.

PAINEL 160

A NEW CATALOG OF OPEN CLUSTERS

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2- UNAM

We present an updated Catalog of Open clusters, that contains fundamental parameters of open clusters and candidates obtained from previous catalogs and from recently published papers. The open cluster system is of great value for the

study of The Galaxy dynamics, because these objects span a relatively wide range of ages, that can be determined with more precision than any other spiral arm tracer. They are key objects to understand the motion of spiral arms and moving groups of stars, to derive the rotation curve and to test models of large-scale star formation. The new catalog contains 1567 objects versus 1151 provided by the Lynga Catalog (1981); in addition it provides new data like proper motion and radial velocities for known clusters. The proper motions, that were not included in previous catalogs, are largely based on the data included in the Tycho2 catalogue (Hog et al. 2000), the FONAC Catalogue (Kislyuk et al. 1999) and observations at the Valinhos CCD Meridian Circle (VMC). Among the clusters currently listed in our catalog, 37 percent have estimates of distances, reddening and ages. Concerning the data on kinematics, 18 percent have mean proper motions determinations, 12 percent mean radial velocities, and 9 percent have both information simultaneously. The catalogue is made up of one list with all important global parameters given for each object in a simple and compact form. The incompleteness of the catalog point out to the observers that a large effort is still needed to improve the data on kinematics. Our group is presently working hard in this direction.

PAINEL 161

CHEMICAL EVOLUTION OF THE GALACTIC BULGE

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Kinematics and abundances of stars in the galactic bulge have been intensively studied in the last years, however many aspects of its formation and evolution are still open questions. Concerning bulge formation and evolution, three different models can be used to describe them: monolithic, secular or hierarchical. As each of them has particular characteristics in the metallicity distribution, a sample of abundances and abundance rates for bulge objects can be used to investigate which of these possible scenarios is predominant. In the case of the bulge, heavy elements like iron or magnesium are generally used to model the evolution; however a different approach can be made using abundances of light elements derived from planetary nebulae. In this work we report preliminary results from a chemical evolution model aimed to investigate the three different scenarios for the bulge evolution. To compare model outputs with observational data, we use chemical abundances of a planetary nebulae sample observed by us in the last three years (see Escudero and Costa 2001, A&A 380, 300). This sample represents quite well the abundances for the intermediate age population of the bulge, in which concerns light elements like helium, oxygen, nitrogen, argon and sulfur. (Work supported by FAPESP)

PAINEL 162

STAR FORMATION IN THE LARGE MAGELLANIC CLOUD

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We present deep photometry (V~26.5) in V and I bands obtained with WFPC2/HST for 6 fields in different regions within the LMC located from 1.5° to 6° away from its centre. Color-magnitude diagrams and luminosity functions are presented for each field, both corrected for photometric completeness effects. The color-magnitude diagrams and luminosity functions are in the range $1.5<M_{555}<7$ for all fields, this faint magnitude limit being 2.5 mag fainter than the oldest population turn-off ($\tau > 10Gy$). Field to field variations are observed and analysed: the closest fields from the LMC bar have a more populated main sequence in the range $M_{555}<2.5$, whose width is greater than expected from uncertainties in photometry; this suggests formation of younger stars in these fields when compared to the others. Constraints on the star formation history are currently being obtained by comparing observed color-magnitude diagrams and luminosity functions to synthetic ones. These latter are created from a mixture of stellar populations with different ages, metallicities and mass functions. The method of constructing the sinthetic diagrams is presented and tested. We use star formation models from Vallenari et al. 1996, Holtzman et al. 1997, 1999 and Geha et al. 1998 for that purpose.

PAINEL 163

THE GALACTIC ROTATION CURVE FROM PLANETARY NEBULAE

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We have determined the galactic rotation curve on the basis of a large sample of disk planetary nebulae for which accurate radial velocities and statistical distances are available. A recent catalogue of radial velocities containing almost 900 objects has been considered, and statistical distances determined using four different methods have been taken into account. From such data, the rotation curve was determined assuming a simple model for the circular rotation of the disk. Average curves have been adjusted to the data points, which show a remarkable similarity for all sets of distances. The curves present a relatively flat minimum near the solar neighbourhood with some indication of rising velocities at larger galactocentric distances. The fact that planetary nebulae comprise a mixed population formed by stars in a relatively wide mass interval is apparent from the dispersions of the circular velocities relative to the average rotation curve. It is shown that the dispersions are very well correlated with the average scale heights relative to the galactic plane, in the sense that objects farther away from the plane show larger deviations. The derived rotation curve is clearly more appropriated to intermediate

population objects such as PN and OH/IR stars than the curves usually adopted, which are determined by young objects. (CNPq)

PAINEL 164

A NEW MAP OF THE GEM PROJECT AT 2.3 GHz FROM OBSERVATIONS IN BRAZIL AND COLOMBIA

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The Galactic Emission Mapping (GEM) project is an international collaboration to obtain the all-sky distribution of Galactic synchrotron radiation between 408 MHz and 10 GHz. Knowledge of the spectral index of this foreground contaminant will improve the accuracy of the measurements of the Cosmic Background Radiation. Here, we present a 60% partial map of the absolute sky brightness at 2.3 GHz obtained from nearly 600 hours of observations with the portable scanning radiotelescope of the GEM project in Colombia in 1995 and in Brazil in 1999. The experiment uses a thermally controlled total power radiometer at the focal plane of a double-shielded 5.5 m parabolic reflector. In order to clean the data from artificial radio frequency interference, we apply a rejection algorithm based on a normally distributed signal amplitude per pixel. The gain calibration relied on a 2-D Gaussian fit of the main beam pattern (1.2°×1.0° HPBW) to the peak signal during Moon scans and the linear part of the gain susceptability was obtained from the antenna temperature profile of a known cold sky region as a function of ambient temperature of the receiver front-end amplifier. Since ground coontamination was found to be significant in the Brazilian data, we also subtracted the mean azimuth profile of all the scans. We present our results in a zero-order baseline calibrated map with a pixel resolution of 1.4° and a sensitivity of 15 mK.

PAINEL 165

H AND J 2MASS PHOTOMETRY AND INTEGRATED SPECTROSCOPY OF RUPRECHT 3

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2- Observatório Astronômico de Córdoba, Argentina

We present a preliminary study in J and H 2MASS photometry and integrated spectroscopy from CASLEO (Argentina) of stars in Ruprecht 3, which was

previously catalogued as an open cluster. The distinction betwen an open cluster and a remnant is not obvious both observationally and theoretically. We consider a cluster remnant as a poorly populated physical concentration of stars with enough members to show evolutionary sequences in the colour-magnitude diagram. We want to discuss the nature of the poorly populated compact stellar group Ruprecht 3. The integrated spectrum remarkably resembles that of a moderately metal rich globular cluster. The distribution of the object stars in the colour-magnitude diagram is compatible with that of a 1.5 Gyr old open cluster or older, depending on whether the bluer stars are interpreted as turnoff or blue stragglers, respectively. Although a globular cluster remnant cannot be ruled out, the integrated spectrum resemblance to that of a globular cluster probably reflects a stochastic effect owing to the few brighter stars. The preliminary study indicates that the data for Ruprecht 3 are compatible with expectations for an intermediate age open cluster remnant.

PAINEL 166

OPEN CLUSTER METALLICITIES AND THEIR DISPERSIONS

Joao Francisco C. Santos Jr., Leandro C. de Carvalho
DF/ICEx/UFMG

Open cluster overall metallicities and their internal dispersions were estimated for a sample of 35 objects. The analysis is based on the optical intermediate-dispersion spectra of 116 evolved stars. Equivalent widths for H, Mg and Fe absorption features were calculated and compared to those calculated on spectra of different stellar libraries with the purpose of estimating the stellar fundamental parameters. Preliminary metallicity estimates for clusters with 7 or more stars observed are: -0.13±0.21 (NGC3114), -0.24±0.11 (NGC5822), -0.11±0.07 (IC4756). Although the clusters NGC3114 and IC4756 show similar metallicities, the former has a larger dispersion and it is younger suggesting a conection between evolutionary state and the chemical homogeneity of the stellar population.

PAINEL 167

THE EMBEDDED STAR CLUSTERS IN THE NEBULAE NGC2327 AND BRC27 IN CANIS MAJORIS R1

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We employed J,H and K_s photometry from the 2MASS Catalogue to study the embedded star clusters in the nebulae NGC 2327 and BRC 27 in the molecular

cloud Canis Majoris R1. We made use of colour-colour and colour-magnitudes diagrams of the sample objects in conjunction with those of the Trapezium cluster used as template, together with theoretical isochrones. The fundamental parameters were derived for the clusters. The distances found for NGC 2327 and BRC 27 were 1.2 kpc which are compatible with previous distances for the complex. The estimaded ages are based mostly on the number of stars with anomalous colours, supposedly of types Herbig AeBe and TTauri. Both embedded clusters have ages of ≈1.5 Myr. The results suggest the birth of a physical pair of star clusters in CMaR1.

SAB

INSTRUMENTAÇÃO

PAINEL 168

THE STATUS OF THE MARIO SCHENBERG GRAVITATIONAL WAVE DETECTOR

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1 - INPE/MCT
2 - IF/USP
3 - ITA
4 - UNICAMP
5 - CEFETSP
6 - UNIBAN
7 - LEIDEN
8 - Instituição não informada

The first phase of the Brazilian Graviton Project is the construction and operation of the gravitational wave detector Mario Schenberg at the Physics Institute of the University of Sao Paulo. This gravitational wave spherical antenna is planned to feature a sensitivity similar to the large laser interferometers detectors at the 3.0-3.4 kHz frequency bandwidth, and to work not only as a detector, but also as a testbed for the development of new technologies. Here we present the status of this detector.

PAINEL 169

SKY CONDITION ANALYSIS WITH AN "ALL-SKY CAMERA"

Diógenes Antunes Becker, Antônio Kanaan,
André Luiz Amorim, Roberto Cid Fernandes Jr.
UFSC

Using a CCD camera (SBIG/ST8E) and a 35mm photographic lens we developed an "all-sky camera" to be used as a judge by the brains of our robotic telescope. The idea is to use these images to decide whether the night is photometric, spectroscopic, or unusable. This will certainly make the use of the telescope much more efficient. To operate the system we are building a sky atlas with our camera under photometric conditions. All images are taken in integer minutes of sidereal time. When the camera is working in "robot" mode it compares the current image to one in the atlas (the atlas must be made with the exactly same equipment) and decides what the conditions of the night are. Based on this result the queue administrator computes the list of objects to be observed. Current tests with our system show an rms scatter of around 0.02 magnitudes for bright stars. In addition to determining sky conditions we are also able to measure extinction coefficients to a 1% precision.

PAINEL 170

MOPS: A DUAL CHANNEL MICROWAVE RADIOMETER FOR SOUNDINGS OF ATMOSPHERIC OPACITY AND WATER ABUNDANCE

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MOPS, the Microwave OPacity Sounder, is a passive, ground-based microwave radiometer that is currently under development at IAG. It consists of two independent Dicke receivers that detect the thermal atmospheric emission at 22.2 and 31.6 GHz. The atmospheric opacity at this frequencies will be determined by elevation scans (tipping curve). Furthermore the total water column amount will be retrieved. Due to different sensitivities of the channels to emissions caused by water vapor and cloud liquid water, a separation of both constituents is possible. *MOPS* is intended to provide data about the atmospheric attenuation in order to assess the quality of existent or potential radio astronomical observation sites. Besides the application in astronomy the collected data are beneficial in the field of meteorology and remote sensing. The poster will describe the hardware of *MOPS* and will explain the employed measurement and calibration methods. In addition results of first operational tests of subsystems will be presented.

PAINEL 171

CONCEPTUAL DESIGN FOR THE SOAR TELESCOPE ECHELLE SPECTROGRAPH

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2 - Members of the Virtual Institute MEGALIT

As part of the Brazilian collaboration on the 4.2m SOAR telescope second generation instruments, a multi-institutional team proposed the construction of a Échelle Spectrograph with UV capability. In view of its high image quality and moderately large collecting area, SOAR will be able to yield high quality spectroscopic data for a large variety of objects of astrophysical interest. Besides, it can provide important data on objects that would supplement the samples of faint targets observed with Gemini. Another point that should be explored in SOAR is the UV capability, not available in most of the present high-resolution spectrographs. The proposed spectrograph will be a cross-dispersed échelle fed by the Nasmith focus. It will work on a quasi-Littrow configuration with white pupil, covering the spectral region from 3000 to 8500 Å (in 2 shots) at R = 50,000 (with a 1 arcsec slit - up to R = 70,000 with narrow slit or image slicer). Overall instrument efficiency is intended to peak at 25% in 6500 Å and 10% in 3200 Å. We present an overview of the spectrograph conceptual design, a brief report on the status of the project, and discuss the schedule for the funding and construction as well as the scientific aims.

PAINEL 172

A MATHEMATICAL MODEL FOR THE MECHANICAL BEHAVIOR OF MARIO SCHENBERG GRAVITATIONAL WAVE DETECTOR

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2 - Universidade Bandeirante de São Paulo - UNIBAN

Gravitational waves are local perturbations on space-time curvature, which travel through it with speed of light. A passing gravitational wave excites quadrupolar vibrational modes of elastic bodies and makes them to oscillate. The monitoring of the oscillations will able us to detect gravitational waves directly and will provide important informations about astrophysical sources features. Some research groups are constructing instruments to work as gravitational waves detectors. In this work, we present a mathematical model for the mechanical behavior of the "Mario Schenberg", the Brazilian spherical gravitational wave detector. The physical parameters that affect this behavior are found by application of a linear elastic theory. The model gives us the

ressonance frequencies of the system when six i-modes mechanical resonators are coupled on the antenna surface according to the arrangement suggested by Johnson and Merkowitz: the truncated icosahedron configuration. That configuration presents special symmetries, which make possible to derive an analytic expression for monitoring the channel modes that are a direct measurement of tensorial components of the gravitational wave. By using this model, we also simulate how the system behaves under a gravitational sinewave quadrupolar force, and find the relative amplitudes that result from a gravitational wave excitation. The mechanical ressonator becomes the signal stronger than ≈170 times. We found i+1 degenerated quintuplets plus i no-degenarated ressonance frequencies that cover 3.0-3.4kHz bandwidth with sensibility enough to detect signals with $\tilde{h} > 10^{-22} Hz^{-1/2}$. An analytic expression to estimate instrumental noise contribution to the system movement is also presented. This work was supported by CAPES and FAPESP 01/14527-3.

PAINEL 173

SEARCH FOR VARIABILITY IN CLUSTERS USING A ROBOTIC TELESCOPE

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Departamento de Física/UFSC

This is a continuation work on developing a robotic telescope at UFSC. Using our prototype robotic telescope we are observing five open clusters trying to confirm, and possibly discover, variable stars in these fields. To achieve this we have cycled through the five clusters all night long, in a sequence given by our scheduling software, approximately one hour per cluster, using CCD photometry. These measurements are the first real test of our robot in trying to do real astronomical observations. These observations are of great value in determining the reliability of the whole system, and gives us hints on the next steps to be followed. These observations will be carried with crescent frequency as the robot evolves, until it is fully autonomous. In this presentation we also discuss details of the whole system, showing how all the observatory components have been implemented and how they talk to each other.

PAINEL 174

THE R=50k OPTICAL CAMERA FOR THE GEMINI bHROS (BENCHMOUNTED HIGH RESOLUTION OPTICAL SPECTROGRAPH)

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2 - IAG/USP

As part of a strategic effort by the Brazilian astronomical community to take an active part in the development of scientific instrumentation, Brazil has proposed to develop a (comparatively) low-resolution optical camera system for the Gemini bHORS (R=150k) spectrograph. It will enable astronomers to obtain spectra with a resolution R=50k, an option which is not only particularly interesting for a significant fraction of the Brazilian Gemini users, but also for many astronomers from other partner countries. The brazilian participation in the Gemini Observatory and the SOAR project have strengthened their development capabilities and this particular initiative has the funding support for the design phase of the project by a grant from the Brazilian government within an encompassing effort to strengthen scientific and technological progress, backed by the Millennium Institute MEGALIT. The bHROS is a benchmounted reconfiguration of the Gemini HROS with a fiber-fed cross dispersed R=150k capability. The bHROS construction is underway by the University College London (UCL). The R=50k camera that we proposed is an interchangeable enhancement module recovering the R=50k capability, impacting a large range of science originally targeted for HROS. We present the optical and mechanical conceptual design for the R=50k module, the predicted efficiency and discuss the funding and construction perspectives.

PAINEL 175

DATA REDUCTION SOFTWARE FOR IFU SPECTRA

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2 - IAG/USP
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As part of the Brazilian collaboration on the 4.2m SOAR telescope project we are building an Integral Field Unit Spectrograph (SIFUS), whose prototype (Eucalyptus) is being commissioned at the 1.6m telescope of the Pico dos Dias Observatory (Brazil). As the fiber spectra are tightly packed on the CCD (FWHM=3 pixels, spacing between spectra = 3 pixels), special procedures are required for data reduction. We present the first beta version of the data reduction software being developed for the Eucalyptus and SIFUS spectrographs.

In this contribution we would like to stress data calibration, observing and data reduction procedures to help prospective users in understanding all the steps necessary for acquiring good data. A complete step-by-step data calibration, object observation and data reduction sequence is presented. We also discuss in some detail the core of the software, which is based on deconvolution of Gaussians to allow for the decontamination of fibers by their neighbors.

PAINEL 176

PRODUCING COSMIC MICROWAVE BACKGROUND RADIATION ANISOTROPY MAPS USING A GENETIC ALGORITHM: PERFORMANCE AND RESULTS

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Anisotropy maps supply the angular distribution of the temperature of the Cosmic Microwave Background Radiation (CMB).The aim of this work is to study the feasibility of applying genetic algorithms to the production of CMB anisotropy maps. Genetic algorithms are techniques of search and optimization inspired in the principles of the natural selection. The main characteristics of these algorithms are variable encoding, intrinsic data parallel processing and random search operators. A specific genetic algorithm was developed and applied to several simulated time-ordered data sets to generate CMB maps. The time-ordered data is a set of temperature differences from distinct regions in the sky. This work presents maps generated by a genetic algorithm, as well as estimates of its performance to produce CMB maps. The required CPU time to obtain a map is proportional to a power law of an arbitrary precision. The RAM memory requirement is proportional to the number of pixels map in the map. The coefficient of correlation was used to compare the genetic algorithm and a traditional method for CMB map making technique. This work was supported by CAPES.

PAINEL 177

IMAGING SPECTROPOLARIMETRY WITH THE LNA IFU SPECTROGRAPH

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We have employed a polarimetric module with the Integral Field Unit (IFU) Eucalyptus spectrograph of the LNA Observatory with the goal of providing a facility imaging spectropolarimeter. The module contains a rotating achromatic halfwave plate and a double calcite prism. This arrangement provides two perpendicularly polarized images of a non-extended source that are imaged on the IFU. The method allows for the effect of different fiber sensitivity and it can be used in non-photometric nights. Data of polarized and unpolarized standard stars have been gathered in order to ascertain the spectropolarimeter performance. Our preliminary results and the limiting polarimetric accuracy of the setup will be presented. FAPESP, CAPES and CNPq support this research.

PAINEL 178

THE NUMERICAL MECHANICAL TEST-FACILITY FOR THE SCHENBERG DETECTOR

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FAPESP (São Paulo State Foundation for Research)- Process number (01/12606-3)
INPE - Instituto Nacional de Pesquisas Espaciais- Brazilian National Institute for the Space Research

The GRAVITON group is building the first Brazilian gravitational wave prototype detector. This detector, named MARIO SCHENBERG, will have the following characteristics: a) geometry: spherical; b) mass: 1.15 ton; c) diameter: 65 cm; d) mechanical Q: about 20 million. The detector will be sensitive in the range of frequency 3100-3300 Hz. In this work, the vibrational isolation system, the thermal link and the transducer mechanical structure were conceived and analysed by numerical techniques. To the numerical analyses, the conceived systems were represented by finite element models and the corresponding dynamical equations were solved using the Msc/Nastran software. In order to study the overall system behavior and the noise influence over the detector, we performed the integration of the numerical models for the several mechanical systems (vibrational isolation system, thermal link, transducers and the resonant mass). The integrated numerical analysis showed that we can expect a 280 dB

attenuation to the real system. The use of this numerical test-facility will represent a valuable tool to implement the SCHENBERG detector.

PAINEL 179

A PROGRAM FOR SCHEDULING THE OBSERVATIONS OF A ROBOTIC TELESCOPE: FIRST RESULTS

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The scheduling program is the soul of any automate/robotic telescope. Here we report the first results of a program developed for queue scheduling the night observations of a telescope. This is the first prototipe of a more elaborated code intended to be used at the small robotic telescope being developed by the Astrophysics group at UFSC. The implemented algorithm is very simple: we construct a quality function Q which takes into account the scientific/technical grade of each observing run, the airmass of the target(s) at the proposed observing time, and the seeing & sky coverage level required and/or acceptable for each run. The code then computes the value of Q for all possible arrangements of the set of input observing runs and sort the results by decreasing Q value. Here we present and discuss simulations performed (i) to refine the relative weights of the different terms of the quality function, (ii) to investigate the sensitivity of the function Q to changes in the input parameters, (iii) to check the reliability and consistency of the derived best schedule for various input parameters, and (iv) to test the computational performance of the code as a function of the number of input runs.

PAINEL 180

NEW DATA ACQUISITION UNIT FOR THE ACUSTO-OPTICAL SPECTROMETER OF THE ITAPETINGA RADIO TELESCOPE

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The Optical spectrometer is a spectrum analyser that uses optical technology to determine the spectrum of frequencies of the radiometer installed in the radio-telescope of the Itapetinga. The old system of acquisition of data, UAM (Memory Accumulation Unit), is not working well, being necessary its substitution for a new system. Using the new technologies of the Analogical Digital converter (Sigma-delta convert and digital filter) and Field Programable Gate Array (FPGA), it is possible to do the substitution of old UAM for a new system that

was designed to generate the control signals and to read and to pre-process the data of the acusto optical spectrometer. The control and the transfer of data of this unit is made through the parallel port of a computer. This new system will be more efficient and flexible than the old. The new project and the first tests of this new system are presented here.

PAINEL 181

AN IDL CODE FOR RECONSTRUCTION OF OBJECT IMAGES USING THE WAVELET TRANSFORM

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We introduce an IDL code for the reconstruction of object images based on the *à trous* wavelet transform. The motivation behind its development was the high adaptability of the wavelet technique to the identification of faint objects superposed to much brighter ones, and the lack of open source solutions designed for astronomical applications. In fact, the wavelet transform is a simpler and more adequate solution than Fourier techniques, providing information on the extension and the flux of the object while keeping track of its position on the image. It is also superior to the fitting of empirical models to the light profile of the object, since it is not susceptible to the choice of the local background. The *à trous* algorithm produces a new set of images with the same dimensions as the original one containing the wavelet coefficients. Each image emphasizes only the structures with a characteristic scale, that changes by a power of two from image to image. The original image is easily reconstructed by adding the extracted images of the coefficients along with a heavily smoothed residual image. The coefficients are then clipped using a significance level defined for each image. In order to identify, extract and reconstruct an object, we have adopted a vision model that consists in the generation of a connectivity map among significant structures, thus defining a tree. The tree is used to reconstruct the image of the object from which properties are derived. We show a series of tests to demonstrate the applicability and efficacy of the code.

PAINEL 182

INFRARED POLARIMETRY AT LNA

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We have adapted the IR Camera at the LNA Observatory in order to perform imaging polarimetry. We will present the first results with this setup for point sources. We have gathered standard star data with the H filter and compare them with the literature. The results are consistent and a good signal to noise ratio was obtained. Fast integrations were done in each half-wave plate position including dithering. The data reduction steps will be presented, with the future goal of standardizing the process in mind. Special care to be taken during data acquisition will be pointed out. The reduction process includes an adaptation of a specific purpose software developed for optical polarimetry data by the Polarimetry Group at IAG. We also included preliminary results of IR polarimetry of stars in the line of sight toward the Musca dark cloud. This research is supported by FAPESP and CNPq.

PAINEL 183

STATUS OF THE DEVELOPMENT OF THE PROTOTYPE OF BRAZILIAN DECIMETRIC ARRAY

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The Brazilian Decimetric Array (BDA) is being developed at INPE as a international collaborative program. Initially, the BDA will operate in a tuneable frequency range of 1.2 - 1.7 GHz and finally its range will be extended to 2.7 and 5.0 GHz. The largest planned baselines for the initial phase of BDA is 256 144 m (E-W and S directions, respectively) and those will be extended to 2.2 1.1 km in the form of a "T". The array will be installed at -22º 41' 19" S (latitude) and 45º 00' 22" W (longitude). Here, we present the results of developments concerning the prototype of BDA (PBDA). The PBDA will initially operate in the frequency range of 1.2 - 1.7 GHz only with a five-antenna array. (i) The antennas employ 4-meter parabolic dishes with alt-azimuth mounting, the accuracy of pointing and tracking of the first prototype antenna will be presented. (ii) Radiation diagram, cross talk of crossed log periodic feeder, gain, and phase stability's of the PLO type receiver, operating in the above frequency range will be presented. (iii) Solar observations in transient mode of the two elements interferometer will be presented.

PAINEL 184

22 / 48 GHz MULTI-BEAM SPECTROGRAPH

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The 22 / 48 GHz Spectrograph is a focal plane array with three receivers at 48 GHz and one at 22 GHz, for regular solar campaigns at the ROI's (Rádio Observatório do Itapetinga) 13.7 m antenna. The 48 GHz receiver system was built at ROI/Bern University to determine the position of solar flares, with high spatial resolution. We added the 22 GHz receiver to allow spectral analysis of solar flares. Solar flares are transient manifestations that occur in active regions that appear in higher number on the solar disk in the maximum solar cycle activity. In general, 22 and 48 GHz emissions of solar flares are optically thin, allowing the analysis of the non-thermal emitting electrons. The 22 GHz receiver horn was installed below the polarization grid, in order to observe the horizontal polarization that reflects on the grid and it is directed to this direction. Thus, the 48 GHz receivers detect the vertical polarization of the electromagnetic radiation and the 22 GHz receiver detects the horizontal polarization. The Spectrograph's first tests had been concluded; where we checked the digital controls, calibration system, gain analysis, 22 and 48 GHz beam pattern. We also included the first results of the Spectrograph's solar observations, presented here in 22 and 48 GHz solar maps, and position analysis of a solar flare, occurred in October 14, 2001, at NOAA Active Region 9661.

PAINEL 185

ON THE MECHANICAL COUPLING BETWEEN TRANSDUCERS AND RESONANT MASS FOR SCHENBERG DETECTOR: STRUCTURAL AND DYNAMICAL ANALYSIS.

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The mechanical coupling between the transducers and the resonant sphere is an important experimental aspect in a gravitational wave detection. We can expect that the gravitational signal will have always a very small amplitude. Thus, the tunning between the sphere and transducer resonance frequencies have to be as perfect as possible. According to this, the design of the transducers become a very crucial matter in a gravitational wave detection experiment. In order to create a numerical tool to design the SCHENBEG detector transducers, we conceived an integrated Finite Elements Models of the sphere and the transducers. This numerical model allows us to analyse the reciprocal influence between the sphere and transducers resonances. The corresponding dynamical equations were solved using the Msc/Nastran software. Using this analysis procedure we have obtained the better coupling by tunning the quadrupole sphere resonances at frequencies 3146 Hz (2 modes), 3174 Hz (2 modes) and 3183 Hz (1 mode).

MECÂNICA CELESTE

PAINEL 186

THE PARABOLIC THREE-BODY PROBLEM

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In this communication we present an analytical model for the restricted three-body problem, in the case where the perturber is in a parabolic orbit with respect to the central mass. The equations of motion are derived explicitly using the so-called Global Expansion of the disturbing function, and are valid for any eccentricity of the massless body, as well as in the case where both secondary masses have crossing orbits. Integrating the equations of motion over the complete passage of the perturber through the system, we are then able to construct an algebraic mapping for the change in semimajor-axis, eccentricity and inclination of the perturbed body. This mapping is compared with numerical solutions of the exact equations. The model is shown to be very precise as long as the encounter does not end in a quasi-collision between both bodies. If such near-miss does in fact occur, the map is unable to reproduce the singularity and thus underestimates the effects of the passage. Finally, several possible applications are discussed. Among these, we mention the stability of asteroidal satellites due to perturbations of background bodies, and the dynamical evolution of Charon due to the effects of Kuiper-belt obejcts.

PAINEL 187

DEBRIS PERTURBED BY RADIATION PRESSURE: RELATIVE VELOCITIES ACROSS CIRCULAR ORBITS

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It is widely know that there is a large amount of space debris and meteoroid particles around the Earth. The objects larger than 10 cm can be tracked by

radars and others means allowing the satellites/ships to be maneuvered to avoid collisions. However, the detection and the attendance of the orbital dynamics of objects smaller than 10 cm (particles) is very difficult. These particles can be generated by explosions of larger objects, collisions between large objects, or simply for the reaction of the oxygen in the wall of an object could generate the escape of paint pieces. The importance of studying the dynamics of these particles is that they can have relative high speeds and their effects in a collision could cause damages and even compromise the space missions. In this present work we considered a dynamical system of micronmeter size particles around the Earth subject to the effects of radiation pressure. Our main goal is to study the evolution of its relative velocity to the circular orbits that it crosses. Firstly, it is considered that the particle is initially in circular orbit. The effect of the radiation pressure produces variations in its eccentricity, resulting in a change in its orbital velocity. The results show that the variation of the radial distance and the relative velocity can be divided in three parts: secular, long period and short period. For the radial distance the secular variation is constant, because the semi-axis is constant. The long period variation presents a configuration that repeats with period inferior to the orbital period of the Earth. And, finally, the short period variation presents points of local maxima and minima for the variation of the width of the radial distance. When considering the variation of the relative velocity we have that the secular behavior and of long period are similar to those obtained for the variation of the radial distance. However, for the short period variation, we have a larger number of local maxima and minima in comparison to the radial distance. The relative velocity for particles initially geostationary of size 5,0 micronmeter is around 4,0 km/s.

PAINEL 188

REDUCTION TO THE CENTRE MANIFOLD IN THE RESTRICTED THREE BODY PROBLEM

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The aim of this work is to describe the dynamics in a vicinity of the equilibrium point by a reduction to the centre manifold. We have concerned our attention to the inner libration point L_1 in the restricted three body problem considering the Earth-Moon system. The linearization of the Hamiltonian around L_1 shows that the local behaviour near this point is of type saddle x centre x centre. A linear and symplectic change of variables was used to put the Hamiltonian in a desired form. To perform the canonical transformation it was necessary to put the Hamiltonian in terms of homogeneous polynomials and its purpose is to kill the

monomials with different exponent. Although this procedure is not convergent but it produces very good approximations to the dynamics. This method is similar to a normal form computation, which objective is to remove some monomials from the expansion of the Hamiltonian in order to have an invariant manifold tangent to the elliptic directions of second order Hamiltonian. In our experiments we just have considered the fourth order Hamiltonian.

PAINEL 189

USE OF A POWERED SWING-BY IN TWO-DIMENSIONS TO TRANSFER A SPACECRAFT BETWEEN THE EARTH AND A HALO ORBIT

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The Swing-By maneuver is a very popular technique used to decrease the fuel expenditure in space missions. The standard maneuver uses a close approach with a celestial body to modify the velocity, energy and angular momentum of the spacecraft. There are many important applications very well known, like the Voyager I and II that used successive close encounters with the giant planets to make a long journey to the outer Solar System; the Ulysses mission that used a close approach with Jupiter to change its orbital plane to observe the poles of the Sun; etc. In this paper, a different type of Swing-By maneuver is studied, where we are allowed to apply an impulse to the spacecraft during its closest approach with the celestial body. This type of maneuver increases very much the alternatives available to mission designers to meet the requirements of many missions. Equations are derived to give us the change in velocity, energy and angular momentum as a function of the three independent parameters (required to describe the standard Swing-By maneuver) and the two other parameters that belongs to this particular model are added: the magnitude of the impulse applied and the angle that this impulse makes with the velocity of the spacecraft. All those equations are derived assuming that: a) the maneuver can be modeled by the "patched conic" model (a series of Keplerian orbits); b) that the impulse is applied during the passage by the periapse and; c) that it changes the velocity of the spacecraft instantaneously; d) the motion is planar everywhere. After that, this powered Swing-By is compared with a different maneuver, where the impulse is not applied during the close approach, but just after the spacecraft leaves the sphere of influence of the celestial body. In that way, the best position to apply an impulse in the spacecraft is investigated: during the close approach with the celestial body or after that, in a two steps maneuver. Those maneuvers are then recalculated, using the more realistic dynamics given by the restricted three-body problem and the results are compared. The results show that, for the

majority of the cases studied, the powered Swing-By is a better choice. Next, the maneuvers are reproduced under the dynamical model give by the restricted three-body problem. The differences between the results are shown. It is possible to conclude that the two-body problem gives a better approximation in the interval $-90^0 < \alpha < 90^0$ and that this approximation increases in quality when the magnitude of the impulse increases. This type of maneuver will be used to transfer a spacecraft between the Earth and a Halo orbit in the Sun-Earth system, using a swing-by in the Moon to save fuel.

PAINEL 190

THE MARS EFFECT ON THE DIFFUSION OF ASTEROIDS IN THE 3:1 RESONANCE

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For a long time it was believed the direct gravitational effect of Mars would not be enough to remove asteroids from the 3:1 resonance. In fact the jumps in eccentricities, promoted by the heteroclinic entanglement between the low and high eccentricities' regions of the three-body problem's fase space, seems to be more efficient. With the use of the maps of variances (the so-called *s-Maps*) [see Klafke, 2002: *PhD Thesis*, IAG/USP] we can observe the effects of Mars directly on the plan of initial conditions and test those conjectures. The *s-Maps* consist in to represent the standard deviation of the action variables as function of the initial conditions. Since the full numerical integrations including Jupiter, Saturn and Mars are costly we just consider the contributions of Jupiter, necessary because of the resonance, and that of Mars. The results are represented in form of the *s-Maps* for the maxima of averaged semimajor-axis and mean averaged eccentricities. Although Mars doesn't interfere directly on the fase space structure of the 3:1 resonance, the *s-Maps* show that its inclusion produces a completely stochastic region above the collision curve (e~0.3) but a systematic escape of that critical region is not observed. On the other hand, the eccentricity presents variations reaching values close to the unit even leaving of initial conditions below e~0.2. This happens because the averaged eccentricities are excited at first by the resonance with Jupiter and so for the frequent dynamical collisions with Mars. Nevertheless, the whole region in which that occurs is small, with just a couple of the initial conditions leaving the zone of low eccentricity and reaching values higher than e~0.4.

PAINEL 191

THE EFFECT OF SATURN MASS ACCRETION IN COORBITAL SATELLITES

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During the beginning of the Solar System, amongst the processes that had marked the formation and the evolution of the Solar System, that culminated on its current configuration, the effect of the planetary migration and the mass accretion of the planets are distinguished. The mass accretion of the planets and the Sun during the formation of the Solar System also produced radial migrations. Particularly, in coorbital systems, the effect of mass accretion and planetary migration of Jupiter, had marked the stability of trojan asteroids in tadpole and horseshoe orbits, as studied by Fleming & Hamilton (2000, Icarus 148, 479. 493). In their results the mass accretion of Jupiter from 10 terrestrial masses to the current value implies in a reduction of about 40 percent in the angular amplitude of oscillation for tadpole orbits, while the radial migration from 6.2 to 5.2 UA produced an increase of 4 percent in this amplitude. In the work of Fleming & Hamilton the asteroids are considered to have a negligible mass, while in the present work the goal is to investigate the effect of the mass accretion in the formation of the coorbital satellites of comparable masses. The main example considered is that of the coorbital satellites Janus and Epimetheus of the saturnian system. In this system one of the satellites is about five times more massive than the other satellite, what compels to abandon the restricted model of three bodies. In this case, even without the mass acretion of Saturn, both satellites are disturbed by each other presenting oscillations around their respective equilibrium points, shaping a horseshoe type orbit in a rotating coordinate system. Initially we numerically simulated only the system SaturnJanus-particle, linearly increasing the mass of Saturn from 20 terrestrial masses to its current value (approximately 95 terrestrial masses) in aprroximately 10 thousand years. We compared with the results given by Fleming & Hamilton for the case of mass accretion of the main body in the restricted three-body problem. We also considered different initial conditions and added the cases where the particle presents horseshoe orbit. We noted initial conditions of the system where the transition tadpole-horseshoe orbit occurs. After that we numerically simulated the same mass accretion model of Saturn, however in the case considering the satellites Janus-Epimetheus, and we compared the results with the previous ones, identifying the changes produced by the change from a particle to a massive body.

PAINEL 192

A STUDY ON THE DIFFERENT APPROACHES OF SPHERE OF INFLUENCE

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The concept of sphere of influence is related to the technique of gravity assist maneuver (Brouke, 1988), that is, the region where the gravity attraction of a body on the other body is predominant, in relation to the gravity attraction of other bodies. In this work, we studied the different approaches of concepts of influence of spheres. According to Prussing and Conway (1993), Roy (1988) and Kaplan (1976) the concept of sphere of influence is related to the region where a body, being disturbed by other bodies, has its movement strongly influenced by one of those bodies. According to the definition of Yamakawa (1992) the critical distance (the limit of the sphere of influence) defines the border where the energy of the two body problem, in the restricted three body problem, is still negative, what is one of the conditions for the gravitational capture. For Huang and Innanen (1983) it is the region whose limit is established by the stability of the prograde orbits. In our work, we developed a technique to characterize the sphere of influence to be used in problems of the Swing-by type, where we numerically monitored the energy of two body problem during a close approach process between a particle and a certain planet. Thus, the sphere of influence is dependent on the relative speed between the bodies. Therefore, we determined values of spheres of influence empirically. In a comparison with the approaches found in the literature we determined the conditions in which the several models are valid. The numerical results show that for the case where the orbits of the planet and the particle are similar any theoretical model of sphere of influence is unsatisfactory.

PAINEL 193

ATTITUDE SIMULATION OF A RECOVERABLE SATELLITE

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To perform scientific and technological experiments under low gravity conditions, a recoverable orbital system is under development at the Instituto de Aeronáutica e Espaço (IAE-CTA). The system is based on a capsule shaped platform, which after satelization will remain in orbit for the time needed to complete the experiments, afterwards being returned to Earth, where it will be recovered at ground. After the initial separation from the launcher, the vehicle

will describe a ballistic trajectory, during which perturbations due to the separation event will be absorbed or amplified depending on the platform attitude and atmospheric characteristics. Since the vehicle will have no control system for motion into the atmosphere, any displacement of the nominal attitude can produce significant dispersion of landing point. The paper includes an analysis of the attitude precision problem for the ballistic reentry disturbed by the atmosphere. The results make possible to preview the attitude configuration at the parachute opening moment and consequently project safety devices. Besides the common initial reentry conditions, we also consider the influence of possible problems due to the separation process. The results show that big angles of attack are found due to a platform rotation on the yaw axis. The critical consequence is that the aerodynamic torque is not enough to absorb the oscillation, once the flight duration inside the atmosphere is small (50 seconds). So, depending on the relative position of the separations devices that have operation problems, the angle of attack can be greater than 65 degrees at the parachute opening.

PAINEL 194

ANALYTICAL STUDY OF THE GRAVITATIONAL FIELD AROUND NON-SPHERICAL CELESTIAL BODIES

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In the last years several asteroids had their form identified using images from space probes (the NEAR-Shoemaker spacecraft, for example) or through the indirect radar data determination. In a general way, these asteroids were shown to have forms quite different from spherical. The polyhedral method is well suited to evaluate the gravitational field of an irregularly shaped body such as asteroids, comet nucleus, and small planetary satellites. With the minimum effort, that method can incorporate important surface features, such as large craters and ridges. Expressions in closed forms are developed for the gravitational potential and for the acceleration due to polyhedron with constant density. Results are developed in closed forms, instead of an infinite-series expansion, and involve only elementary functions (arc-tangent and logarithm). The technique of determination of the gravitational field through polyhedron is studied starting from the literature that already exist and, starting from the expressions for the polyhedron, we develop an algorithm to illustrate the equipotential surface of a non-spherical body, whose field has not been certain yet. The results that will be shown consist of sets of analytical equations that give the potential due to different geometrical forms.

PAINEL 195

ON THE GAS DRAG EFFECT IN GRAVITATIONAL CAPTURE

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The gaseous planets possess satellites with near circular orbits and close to the equatorial plane. These satellites are called regular and must have been formed in the same region where they are currently. However, there are other satellites, called irregular, with eccentric orbits far from the equatorial plane, some with retrograde orbits, these satellites must have been formed far of the region where they are find currently. It is widely accepted that these satellites were captured. Many mechanisms could have caused such captures. In this work the gas drag is considered. When the giant planets were forming the solid core attracted part of the existing gas in the solar system, forming a gas envelope around the planet. The planetesimals that had passed close to these planets, and had passed inside of this extended atmosphere, had suffered a drag due to the gas so that could accomplish the capture, transforming this planetesimal into a satellite of the planet. However this hypothesis is not simple, therefore it depends on the density profile of the gas around the planet, or the size of the planetesimal, it also depends on the entry angle on the gas envelope, and it also depends on the closest distance that the planetesimal can get from the planet. In the present work these dependences are shown and discussed leading to the conclusion that the gas drag is not so relevant to the gravitational capture. This work was sponsored by Fapesp (98/15025-7).

MEIO INTERESTELAR

PAINEL 196

STARLIGHT POLARIZATION TOWARDS THE INFRARED VOID IN THE LUPUS DARK CLOUDS

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We present the preliminary results of a polarimetric investigation towards the infrared void in the Lupus dark clouds. The observational data were collected with the IAG 60 cm telescope at Observatório do Pico dos Dias (LNA/MCT – Brazopolis – Brazil) using CCD frames in the B band. The target stars comprise 130 objects selected from the *Hipparcos* catalog. We have chosen stars having trigonometric parallaxes $\pi_H \geq 0.004$ arcsec ($r \leq 250$ pc) and a ratio of the observational error to the parallax $\sigma_{\pi_H}/\pi_H \leq 1/3$. The latter condition was chosen in order to give us confidence in the estimated distances. The analysis of the obtained polarization confirms the existence of an area cleared of dust close to the dark cloud known as Lupus 1. The distance to the interstellar clouds surrounding that void may be directly derived from the obtained distance *vs.* polarization diagram. Our preliminary results support the nowadays most accepted value of ~150pc as this distance.

PAINEL 197

A MODEL FOR THE CHEMICAL EVOLUTION OF THE GALAXY: INFALL VERSUS REFUSES

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For a long time models for the chemical evolution of the Galaxy have been improved to fit a set of constraints such as the distribution of the G-dwarfs and their age-metallicity relation. The two-infall model of Chiappini, Matteucci and Gratton (ApJ 477, 765) successfully reached these goals assuming an ad hoc infall. This poses the problem of finding adequate physical processes to explain the “amount of infall”. One of these processes could be the refuses effect (Rocha-

Pinto, Arany-Prado & Maciel 1994, ApSS 211, 241), that is, the evaporation of volatile elements resulting from the formation of planets. Such an effect has very similar consequences as the infall since it also dilutes the interstellar matter. In this work we have introduced the refuses effect on the model of Pagel & Tautvaisiene (1995, MNRAS 276, 505) which can be handled analytically. The Pagel & Tautvaisiene model uses a two phase production approximation which accounts for the delayed production of iron by Type Ia supernovae. The Galaxy begins with a short phase described by the one zone approximation, for which no evaporation was considered, since metal planets are unlikely to form in stars from low metallicity interstellar matter. The long second phase has been taken from the Clayton standard models with arbitrary parameters for the strength of infall. We show that the introduction of refuses allows one to assume smaller rates for the infall, with similar results. This suggests the usage of refuses as one of the sources of the necessary dilution of interstellar matter so as to fit the observational constraints.

PAINEL 198

PHOTOABSORPTION AND DISSOCIATIVE PHOTOIONIZATION IN PLANETARY NEBULA

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The detection of C4H2, C6H2 and benzene (C6H6) in the direction of the planetary nebula CRL 618 has been recently reported [1]. The chemistry in CRL 618 has been strongly modified by the photons coming from the hot central star and it seems that such C-rich planetary nebulae are the best organic chemistry factories in space. Therefore, the knowledge of photoabsorption, photoionization and photofragmentation processes in the UV and X-Rays regions, is extremely important. Mass and photoabsorption spectra have been obtained for the C6H6 and C6D6 molecules, using time-of-flight mass spectrometry and synchrotron radiation, recorded at selected photon energies from 21.21 to 290 eV. The experimental set-up was performed at the National Laboratory of Light Synchrotron (LNLS), Brazil. Light from a toroidal grating monochromator (TGM) beamline (12-310 eV) intersects the effusive gaseous sample inside a high vacuum chamber. New branching ratios for the ionic dissociation have been determined. The excellent signal-to-noise ratio has also allowed for the observation of rearrangement fragments H2 and D2 in photoionization studies of the C6H6 and C6D6 molecules. The present results also show that C4H2, C6H2 are products of the benzene dissociation and these fragments can be contributing for the strong features detected in CRL 618. As part of a systematic quantitative

study of the angle dependence of valence-shell electron impact excitation of molecules [2], we have also determined the absolute photoabsorption cross-sections for the benzene (5 - 50 eV). [1] Cernicharo J; Heras A M.; Tielens, A. G. G. M., Pardo J R., Herpin F, Guélin M; Waters L. B. F. M,(2001) Ap. J., 546, L123
[2] H. M. Boechat-Roberty, J. D. Freitas, D. P. Almeida, and G. G. B. de Souza, (2002) J. Phys. B: At. Mol. Opt. Phys 35, 1409

PAINEL 199

A STUDY OF GALACTIC SPIRAL STRUCTURE TRACERS

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We used different samples of young objects, like HII regions, Pulsars, Open Clusters, Cepheids, and Supernovae, in an attempt to trace the positions of the spiral arms of the Galaxy, to determine the rotation velocity of the spiral pattern, and to verify how the star-formation rate depends on the galactic radius. Although similar studies have been done about three decades ago, in this work we use a broader approach that considers variations in the accepted parameters (rotation curve, the distance of the Sun from the galactic center, etc.). The HII regions are found to be the best tracers, since they clearly trace the galactic structure, as can be seen in the longitude-velocity diagrams. We used the kinematic distances of HII regions, in order to plot their position in the galactic plane. The difficulty of this method is the distance ambiguity (2 solutions), in the first and fourth quadrant. In order to resolve the ambiguity we used a series of criteria, like the fact of having a visible counterpart (which favors the near solution), the height with respect to the galactic plane, the presence of absorption lines with velocity higher than that of the HII regions (which favors the far solution), the absolute luminosity, and others. In most cases different criteria point towards the same solution (near or far) so that the choice can be made with a large probability of being correct. When we compare the HII regions and Open Clusters, we verify that the very young Open Clusters confirm the arms defined by the HII regions. This also happens with the Cepheids. However the Cepheids are also present in a structure not delineated by the HII regions. For the Pulsars, we verify that some of them are present in a region close to the galactic center, where the spiral arms are supposed to start. We present the resulting map of spiral arms.

PAINEL 200

INTERNAL VARIATION OF ELECTRON DENSITY IN EXTRAGALACTIC HII REGIONS

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An observational study on the electron density distribution in H II regions belonging to the galaxies M 33, NGC 2366, NGC 2403, NGC 4214, NGC 4449 and NGC 4656 is presented. The electron densities were derived from the [S II]λ6716/λ6731 emission line ratio measured with long slit spectrophotometry with high signal-to-noise, dispersion of 0.71 Å pxl^{-1} and spatial resolution of 1.32". The observations were performed with the IDS Cassegrain spectrograph attached to the 2.5 m Isaac Newton telescope at the Roque de los Muchachos Observatory, La Palma, Canary Islands. The studied objects have shown low electron densities near to the [S II] ratio saturation limit. The median value of the [S II]λ6716/λ6731 ratio was 1.39, which corresponds to an electron density of 35 cm^{-3}. Three of the studied objects, NGC 595, NGC 2403 II and NGC 4656 I, have shown [S II] ratios homogeneously scattered around the low density saturation limit. The same was verified for NGC 4449, with the exception of the central and brightest part corresponding to the H II region CM 22, where density values up to 800 cm^{-3} were measured. Systematic electron density variations of low amplitude were found in NGC 2366 I and NGC 2403 I. These variations are compatible with radial gradients with the density decreasing from the centre to the outskirts. The central regions of the galaxy NGC 4214 have shown the largest mean density in this sample with N_e = 130 cm^{-3}. NGC 604 has shown fairly homogeneous [S II] ratio distributions along three different directions, with values significantly above the mean only detected at the brightest region of this object. Partly, the homogeneity of the measurements of the [S II]λ6716/λ6731 ratio may be apparent due to the low electron densities of the studied H II regions.

PAINEL 201

ELECTRON TEMPERATURE FLUCTUATIONS IN PLANETARY NEBULAE

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At the present, the subject of internal variations of the electron temperature in HII regions and planetary nebulae has gained a renewed interest, mainly because temperature fluctuations have been invoked to explain the huge discrepancies between the abundances derived from recombination and forbidden lines. Many works comparing these abundances show that temperature fluctuations considerably higher than those predicted by standard photoionisation models are needed to solve this problem. However, there are few direct observational studies of the internal variations of the electron temperature in these objects. In this work, we report the initial results of a study on the internal variation of the electron temperature in planetary nebulae. We obtained long slit spectrophotometric data of high signal-to-noise ratio in the 4000-5100 Å range with the Boller & Chivens Cassegrain spectrograph attached to the 1.52 m telescope of the European Southern Observatory (ESO). We used the [*OIII*](λ4959+λ5007)/λ4363 ratio to estimate the electron temperature in different positions in each nebula and to evaluate the magnitude of the temperature fluctuations.The preliminary results indicate sytematic spatial variation of electron temperature in some planetary nebulae.

PAINEL 202

JET-ISM CLOUD INTERACTIONS: 3D SIMULATIONS OF THE HH 270/110 JET SYSTEM

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The Herbig-Haro (HH) jet HH 110 is the best observed example of a possible HH jet/dense (interstellar medium) ISM-cloud collision. Reipurth et al. (AJ, 311, 989, 1996) have interpreted the rather unique, collimated but chaotic structure of HH 110 as the result of a deflection of the faint HH 270 jet through a collision with a dense (invisible) cloud. We here present high resolution fully 3D, gasdynamic simulations of jet/cloud collisions, aiming to model the HH 270/110 system. From the results, we obtain predictions of $H\alpha$ and H_2 1-0 s(1) emission line maps, which qualitatively reproduce some of the main features of the corresponding observations of HH 110. We find that the model that better reproduces the structures corresponds to a jet that was deflected at the surface of a cloud ~ 1000 yr ago, and now is digging a tunnel directly into the cloud. This model removes the apparent contradiciton between the jet/cloud collision hypothesis and the lack of detection of molecular emission in the crossing region of the HH 270 and HH 110 axes.

PLASMAS E ALTAS ENERGIAS

PAINEL 203

EVALUATION OF MAGNETAR-SUPERNOVA REMNANTS ASSOCIATIONS, CONSIDERING ENERGY INJECTION BY MAGNETAR SPIN-DOWN

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Most of the proposed associations between magnetars and supernova remnants suffer from age problems. Usually, supernova remnants ages are determined from an approximation of the Sedov-Taylor phase relation between radius and age, always considering the energy of the explosion as 10^{51} erg. Those ages do not agree with the characteristic ages of the associated magnetars. Though, by taking into account the energy injected on the supernova remnant by magnetar spin-down, the resulting faster expansion can improve matching ages, thus removing one of the criticisms against those associations. As other pulsar-supernova remnants proposed associations suffer from the same problems, we argue that not only supernova remnants ages can be overestimated, but also characteristic ages of pulsars and magnetars are not a good estimate of their actual ages. We have been doing simple numerical simulations of supernova remnants expansion, with internal magnetars, and applied it to the observed objects. We analyze all proposed associations case-by-case, addressing the likelyhood of each one, according to this new perspective, not limited by explosion energy anymore, neither by characteristic ages.

PAINEL 204

ALFVÉN WAVES PROPAGATION IN DUSTY STELLAR WINDS

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In many situations a space and astrophysical plasma coexist with dust particles. These particles are charged either negatively or positively depending on their surrounding plasma environments. This system of such charged dust, electrons,

and ions forms a so-called dusty plasma. A self-consistent study of different modes of propagation in a dusty plasma presents several difficulties. One of these is that the equilibrium charges on dust grains are determined by ambient potentials and if wave phenomena modify these potentials, so the grain charge will be affected. In the presente work, we study the effects of the dust particles on the propagation and absorption of the Alfvén waves in the stellar winds. We describe the dusty plasma in the framework of kinetic theory including the effect of capture of plasma electrons and ions by the dust particles. We have shown that the presence of dust particles with variable charge modifies the plasma properties and affects the propagation and absorption of the Alfvén wave in such plasma systems.

PAINEL 205

NUMERICAL CALCULATIONS OF THE PROPERTIES OF ALFVÉN WAVES

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It is widely recognized that Alfvén waves are responsible for the propagation of low frequency eletromagnetic disturbances along the ambient magnetic field in magnetized plasmas. Presently, there is signifcant interest in understanding how the large energy content of a long wavelength Alfvén wave can be transferred to ambient plasma particles. These topics are connected with several areas of contemporary plasma astrophysical research including magnetic reconection, solar corona heating, stellar winds, etc. Particularily in space plasmas Alfvén waves play a major role in many naturally occurring interactions. For example, changes in the auroral current magnitude and spatial configuration, or changes in the magnetospheric configuration, involve propagation of information by Alfvén waves. Alfvén waves may play a fundamental role in the solar wind and winds of late-type stars (Jatenco-Pereira and Opher, 1989b, 1989c). Alfvén waves may also be active in driving the winds of early-type stars (Jatenco-Pereira and Opher 1989a). In the Wolf-Rayet stellar winds, Alfvén waves is also important (cf. dos Santos et. al, 1993a, 1993b). We are elaborating a parallel numerical code for studying the propeties of nonlinear Alfvén waves in astrophysical plasmas. The code is being implemented in a Beowulf cluster built on a pc plataform. In the first studies we analized a number of numerical techniques that have been implemented in parallel algorithms to evaluate the behavior of electric and magnetic fields involved in the problem. Among these different methods is the variational method and the variational method with finite-element, finite-volume, finite-difference, and the finite difference on time domain - FDTD

methods. Our studies indicate that the FDTD method compared with the others offers more accuracy, memory requirements, computing efficiency, flexibility and versability. The FDTD method requires minimum preprocessing before applying it to solve our problem. The goal of this investigation is to understand the properties of Alfvén waves, in particular nonlinear waves. Particular properties being investigated are creation of electric currentes and mode conversion.

PAINEL 206

ACCRETION AND THE POSITION OF Be/X-RAY SOURCES IN DPP DIAGRAM

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In this work the relation between spin period (P_{spin}) and orbital period (P_{orb}) of neutron stars accreting matter from the envelope of a Be star companion is investigated. We use the model of Be envelope of Poeckert-Marlborough(1978) and data from the literature to establish a quantitative analysis of the problem. The hypothesis of equilibrium spin (P_{eq}=P_{spin}), in which on the average centrifugal repulsion at the magnetospheric boundary equals gravitationally induced infall, is considered. The diagram spin period-orbital period (dpp) has been shown to be a tool of forecast and diagnostic in high-mass x-ray binaries, since these systems occupy different positions in dpp according to the mass transfer process. Using the dpp, we suggest the type of mass transfer process which occurs in the binary systems having P_{spin} and P_{orb} determined (37 sources), as well as the luminosity class of some optical counterparts with unknown classification.

PAINEL 207

EXCESS OF POSITRONS OVER ELECTRONS IN THE EARTH'S ENVIRONMENT

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Possible physical mechanisms that permit formation of excess of positrons over electrons at energies above 10 MeV in the near Earth's environment are examined as due to nuclear interactions between protons and neutral atoms. We examined proton sources such as the inner radiation belt, and primary and secondary cosmic rays for the interactions in exosphere. The decays of the reaction products $\pi^{\pm}\rightarrow\mu^{\pm}\rightarrow e^{\pm}$ are considered for the fluxes of positrons and

electrons. The geometry of the Earth's magnetic field permit these decay leptons to produce excess of positrons over electrons at altitudes of ~500 km. An experiment the Alpha Magnetic Spectrometer (AMS), with sophisticated detector system, on board the space-shuttle Discovery, has observed in the equatorial region of the Earth large excess of positrons with e^+/e^- ratios of ~ 3. Our estimates of the ratios with Monte Carlo simulations and SHIELD code calculations of nuclear reactions in matter are in agreement with the observations of the AMS experiment.

PAINEL 208

GENERALIZED HYDRODYNAMICAL SHOCK STRUCTURE IN THE PRESENCE OF COSMIC RAYS

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We investigate the time asymptotic structure of an hydrodynamical shock wave modified by the backreaction from diffusive acceleration of cosmic-rays. The basic theory previously developed by Axford et al. (1977, 1982) and Drury and Voelk (1981) for a polytropic gas is generalized to the case of an imperfect fluid, independent of the specific equation of state adopted. By including viscosity and heat conduction, we obtain new general junction conditions as first integrals. By numerically integrating the equations we obtain the profiles for the velocity and pressure of the background gas as well as the one for the cosmic ray pressure. We compare and discuss the results of our calculations with previous studies in the literature.(W. I. Axford, E. Leer, G. Skadron, Proc. 15th. Int. Conf. on Cosmic Rays (Plovdiv) **11**, 132 (1977); W. I. Axford, E. Leer, J. F. McKenzie, Astron. Astrophys., **111**, 317 (1982); L. O'Drury, H. J. Völk, Astrophys. J., **248**, 344 (1981)).

PAINEL 209

DISPERSIVE EFFECTS IN RELATIVISTIC OUTFLOWS

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In this work we delineate the physical picture for the propagation of electromagnetic oscillations in moving plasmas. We present calculations devoted to describe the dispersive features of the radiation which is propagating inside of

a magnetoactive plasma. A classical and a relativistic treatment have been employed. We have deduced that if the outflow is moving with small velocities, the general motion of plasma does not affect the propagation of transverse electromagnetic waves. The waves are refracted according to the ordinary refraction law deduced for non-moving magnetoactive plasma. The global movement does not change the dispersion relations and the shapes of the corresponding curves are maintained unaltered. Under a relativistic formulation for moving magnetoactive plasma, we have derived the equations, which describe the propagation of electromagnetic waves into a moving medium. The flow velocity affects the plasma dispersion properties and it is responsible for new dispersion branches; transverse and longitudinal perturbations. The dispersive curves exhibit unusual regions where the electromagnetic perturbations have or not propagation. The ordinary and extraordinary electromagnetic modes, which belong to magnetoactive plasma, are modified and described by new relations of dispersion whose points of resonance also are in explicit dependence with the plasma velocity. The results presented in this work, may be applied in order to incorporate suitable corrections to the dispersive models, developed to explain the anomalous features of the observed lines or continuum radiation, associated with astrophysical relativistic outflows, which are present in blazars, relativistic jets in AGNs, quasars and microquasars.

PAINEL 210

A MODEL FOR THE INNER ENGINE OF GAMMA RAY BURSTS

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Based on the possibility of a transition to strange quark matter inside neutron stars, we show that the influence of the magnetic field expected to be present in neutron star interiors has a dramatic effect on the propagation of a laminar deflagration, generating a strong acceleration of the flame in the polar direction. This results in a strong asymmetry in the geometry of the just formed core of hot strange quark matter which will resemble a cylinder orientated in the direction of the magnetic poles of the neutron star. We show here that this geometrical asymmetry gives rise to a bipolar emission of the thermal neutrino-antineutrino pairs produced in the process of strange quark matter formation. These neutrino-antineutrino pairs annihilate into electron-positron pairs just above the polar caps of the neutron star giving rise to a relativistic fireball, thus providing a suitable form of energy transport and conversion to gamma-emission that can explain short gamma ray bursts. We compare various features of our model with recent observations of gamma ray bursts.

PAINEL 211

QCD PREDICTIONS OF PROTON-PROTON AND PROTON-ANTIPROTON SCATTERING AT COSMIC RAYS ENERGIES

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We have studied the proton-proton and proton-antiproton systems, describing its high-energy data in terms of nonperturbative QCD parameters, provided by the model of the stochastic vacuum, and relating the energy dependence of the observables with radius dependence. The energy dependence of the total cross section and the forward slope parameter can both be accounted for by a slow variation of the radius associated with the transverse wave function of the colliding hadrons. In our analysis, we take into account all available data on total cross section and slope parameter in proton-proton and proton-antiproton scattering, which consist mainly of the 23-63 GeV measurements in CERN-ISR, of the 541-546 GeV measurement in CERN-SPS and in Fermilab, and of the 1800 GeV information from the E-701 Fermilab experiment. In this description the proton-proton and proton-antiproton total cross sections and slope parameters were represented in terms of the hadronic radius, which we have parametrized as function of the logarithm of the energy ranging from 23 GeV to 1800 GeV. This parametrization allows us to predict values of the observables at energies so high as that of LHC and that of Fly's Eyes and Akeno cosmic rays experiments. Our extrapolations predict values of the slope parameter B(14TeV)=20 GeV**2, of the hadronic radius Sp(14TeV)=1.2 fm, and a cross section equal to 93 mb at the same energy. The extrapolation of these quantities for 30 TeV of cosmic rays are B(30TeV)=21 GeV**2, Sp(30 TeV)=1.24 fm and a total cross section of 101 mb.

PAINEL 212

NEUTRINO INTERACTIONS IN HOT AND DENSE MATTER REVISED

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We have revised the study of the charged and neutral current weak interaction rates relevant for the determination of neutrino opacities in dense matter found in neutron stars. We have calculated the differential cross section and mean free paths for interacting, asymmetric and strange nuclear matter in the mean field approximation. The new contribution in this topic is about the calculation of medium polarization tensor. The only known generalization of the polarization

functions to the case of different baryons in the polarization loop have been made by the ansatz that the general form of the polarization tensor should be a sum of longitudinal and transverse components. Such an approach (which is valid in vacuum under the assumption of isotopic invariance of nucleons) is invalid for a system of interacting baryons, because in a medium the isovector current, caused by conversion of the baryon $B_1 \circledR B_2$, is not conserved. We have taken this into account in the present calculation.

PAINEL 213

COLLISIONAL ALFVENIC HEATING IN PROTOSTELLAR ACCRETION DISKS

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Accretion disks are powerful reservoirs of energy which are created during the process of formation of a star and that could also be found in Active Galactic Nuclei and binary systems. An instability whose ingredients are the presence of a magnetic field and differential rotation was proposed some time ago by Balbus & Hawley (1991, ApJ, 376, 214) in order to explain the transportation of angular momentum in the different kinds of accretion disks. This mechanism, known as Balbus -Hawley instability (IBH), requests a minimum coupling between the magnetic field and the gas. However, when the traditional heating sources, such as viscous dissipation and passive heating, are unable to assure the necessary ionization degree in order to IBH work, the damping of Alfvén waves can be an important alternative (Vasconcelos et al. 2000, ApJ, 534, 967). In this work, we examine collisional damping of Alfvén waves as a heating source for accretion disks around classical T Tauri stars using the standard and the layered models (Gammie, 1996, ApJ, 457, 355). We show this mechanism is able to increase the temperature and the ionization degree of the disk. We also analise its consequences for the fate of IBH and also if other instabilities are necessary in order to accretion proceeds in protostellar accretion disks.

PAINEL 214

NEUTRINO-DRIVEN WAKEFIELD PLASMA ACCELERATOR

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The processes envolving neutrinos are of paramount importance in a variety of astrophysical phenomena. Neutrinos are produced in the core of any stars and in very high explosive astrophysical situations such as in gamma ray bursts. Recently, many authors have been proposing that the shock expansion mechanism in the supernova, for example, is due to the energy-momentum transfer from the neutrino burst to the surrounding plasma which envolves the core of the star. It is well known that a neutrino, propagating through a plasma medium, can get an effective eletric charge during the interaction with the plasma due to the charged and neutral currents associated with the weak force (exchange of $W^{\pm}$ and Z^{0} bosons, respectively). These permit a coupling between the neutrinos and the plasma medium through the weak Fermi interaction. During the interaction, the neutrinos exchange energy-momentum with the generated plasma waves which can drive the stalled shock of a Type II supernova. In the present work, a classical fluid description is used to investigate the nonlinear interaction between a neutrino burst and a relativistic collisionless cold unmagnetized plasma. It is shown, for typical supernova parameters, that during the interaction a large amplitude electron plasma wave is created in such a way that charged particles trapped in this wave can be accelerated to high energies. This result can be applied to understand charged particle accelaration in stars and in extreme astrophysical environments such as those in gamma ray bursts.

PAINEL 215

DEVELOPMENT OF MULTIVARIATE MASS COMPOSITION DIAGNOSTIC TECHNIQUES FOR ULTRA HIGH ENERGY COSMIC RAY OBSERVATIONS AT THE PIERRE AUGER OBSERVATORY.

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The output parameters from the ground array of the Auger South observatory, were simulated for the typical instrumental and environmental conditions at its Malargue site using the code sample-sim. Extensive air showers started by gammas, protons and iron nuclei at the top of the atmosphere were used as triggers. The study utilized the air shower simulation code Aires with both

QGSJet and Sibyll hadronic interaction models. A total of 1850 showers were used to produce more than 35,000 different ground events. We report here on the results of a multivariate analysis and neural network approach to the development of new primary composition diagnostics.

PAINEL 216

ASTROPHYSICAL JETS: NUMERICAL SIMULATIONS

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We present in this work a series of numerical simulations where from a Keplerian accretion disc an astrophysical jet is generated. These simulations were made using the MHD finite difference code ZEUS-3D which we modified considering our specific problem. The initial conditions of the model consist by an accretion Keplerian disk and its corona in pressure equilibrium with the coronal base. We study the behavior of the emerging jet introducing perturbations in the velocity field of the accretion disk. Introducing a sinusoidal perturbation in the ejection velocity as a temporal function and using different values for the period of the perturbation, we obtained the formation of regularly spaced structures along the jet axis. For small values of the period, the structures tend to dissipate along the jet; for median values, they tend to persist and for large values, they tend to fragment into smaller substructures. The generation of jets was also studied introducing in the velocity field of the disk, a random temporal perturbation with amplitude proportional to r^{α}, where r is the radial distance and α is a input parameter (equal to -3/2, -1, -1/2, 0, 1/2, or 1). The gas is continuously ejected from the disk surface with a velocity of 10^{-3} the Keplerian velocity (v_K) added to the perturbed component with a chosen maximum value at r_i of 10 times the continuous ejection velocity. The simulated region correspond to $80r_i$. Introducing a random perturbation with different radial slope (i.e., values of α), we observed the formation of periodic structures along de jet axis. The distance of the axial separation of the structures was found to be about $11r_i$. For a negative slope (i.e., negative values of α), the density structures are well defined near the jet axis. For positive slope decollimation of the jet occurs.

SAB

RELATIVIDADE E GRAVITAÇÃO

PAINEL 217

POSSIBLE GRAVITATIONAL WAVE SOURCES FOR THE BRAZILIAN ANTENNA SCHENBERG

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The Schenberg Gravitational wave (GW) antenna will operate in a frequency band ranging from 3.0 - 3.4 kHz. In this bandwidth, there are some important astrophysical sources of GWs, namely: core collapse in supernova events; neutron stars going into hydrodynamical instability; quakes and oscillations of neutron stars (e.g., f, p, and w modes); excitation of the first quadrupole normal models of 4 M¤ black holes; coalescence of neutron stars and black holes in binary systems. "Exotic" sources such as: sub-millisecond rotating bosonic, or strange stars, and inspiralling of mini-black holes can also be spectulated. We here present the characteristic amplitudes and frequencies, as well as the event rates and detectability of some of these GW sources.

PAINEL 218

NULL DUST SOLUTIONS OF 5D EINSTEIN FIELD EQUATIONS COUPLED WITH COSMOLOGICAL CONSTANT

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Gravitational collapse of a realistic body has been one of the most thorny and important problems in Einstein's theory of General Relativity. Due to the complexity of the Einstein field equations, the problem even in simple cases, such as, spacetimes with spherical symmetry, is still not well understood, and new phenomena keep emerging. On the other hand, a scenario, so-called braneworld has been proposed lately, motivated by the possibility of resolving the large difference in magnitudes between the Planck and electroweak scales (the so-called hierarchy problem), in addition to possibly solving the long-standing cosmological constant problem. According to this scenario, the Standard Model

physics is confined to a three (spatial) dimensional hypersurface (often referred to as a 3-brane) in a larger dimensional space, while gravity propagates in the whole bulkspacetime. Motivated by the above considerations, we shall present several classes of solutions of the 5D Einstein field equations coupled with null dust fluid and cosmological constants, and shall give a brief study on their physical and geometrical properties in the context of gravitational collapse and braneworld scenarios.

PAINEL 219

ON THE THICKNESS OF A RELATIVISTIC SHOCK WAVE

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The relativistic theory of an ideal hydrodynamical shock wave was originaly developed by Tau (1948) and later formalized by Lichnerowitz (1967) (see also Landau and Lifshitz, 1959). Since then a number of investigators have applied Taub's equations to a variety of problems in relativistic astrophysics (Thorne, 1973). On the other side, the theory of dissipative relativistic fluids in the so-called Eckart's formulation (1943) was completely developed only after Weinberg's contribution involving the bulk viscosity dissipative mechanism (Weinberg 1971). In this work we consider a relativistic dissipative fluid which developes a shock wave, and discuss its structure and thickness with basis on the Eckart formulation. The junction conditions and the non linear equations describing the evolution of the shock are derived. The corresponding Newtonian limit is also discussed in detail. As happens in the non-relativistic case, the thickness is inversely proportional to the discontinuity in the pressure, but new terms of purely relativistic origin are also present. (A. Taub, Phys. Rev. **74**, 328 (1948); L. D. Landau and L. Lifshitz, Fluid Mechanics (1959); C. Eckart, Phys. Rev. **58**, 919 (194); A. Lichnerowitz *Relativistic Hydrodynamics and Magnetohydrodynamics*(1967); K. S. Thorne, Astrophys. J. **179**, 897 (1973); S. Weinberg, Astrophys. J. **168**, 175 (1971)).

PAINEL 220

BOUNDS ON THE DEFICIT SOLID ANGLE PARAMETER FROM RADAR ECHO DELAY

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Gravitational interaction is usually described by the general relativity theory (GRT). The major achievements of the theory are the perihelium shift of the Mercury planet, the deflection of starlight, and the radar echo delay in the sun field which agree with the Einstein values with an accuracy of one per cent (an overview is given by Will (1985). All these successful analyses have been carried out in the context of the original static and spherically symmetric Schwarzschild line element. On the other hand, some authors have suggested that the most simple exact solutions of Einstein's equations can easily be generalized to include topological defects, like strings and monopoles. In the case of strings, for instance, the spacetime is geometrically constructed by removing a wedge, that is, by requiring that the azimuthal angle around the axis runs over the range $0<\phi<2\pi b$. For very small effects the parameter b itself may be written as b=1-[epsilon], where [epsilon] is a small dimensionless parameter quantifying the so called conical defect. For [epsilon]=0, the spherically symmetric line element is recovered whereas for a conical defect generated by a cosmic string one has [epsilon]=$8G\mu/c^2$, where μ is the mass per unit length of the string. Similarly, the same happens if instead of an azimuthal deficit angle there has a deficit solid angle which may be interpreted as the sort of defect produced by a global monopole. In this context, we analyze the radar echo delay in the Schwarzschild field modified by the presence of a global monopole. This simplified analysis provides an upper limit on the value of the solid angle defect parameter, or equivalently, on the symmetry-breaking scale η of the monopole.

SAB

SISTEMA SOLAR

PAINEL 221

DYNAMICAL EVOLUTION OF THE EARTH-MOON SYSTEM

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Since ancient observations of eclipses, astronomers concluded that there was a secular acceleration of the Moon. E. Halley, in 1695, tried to explain this phenomenon relating it to the gravitational perturbation of other planets. In 1787, P.S. Laplace announced that he had an explanation in terms of the action of the Sun on the lunar orbit. Nevertheless, in 1853, J. Adams showed that Laplace's model was not in agreement with the observations. The philosopher E. Kant, in 1754, was the first one to suggest that the tides should be the cause of the variations on the Earth's rotation (lengthening of the day) and of the secular acceleration of the Moon. Several authors have given a global treatment to the problem by considering the angular velocity of Earth's rotation variable linearly with respect to time. However, if we consider this model, we have as a point of maximum approximation between the Moon to the Earth two billion of years ago. We propose a model with the angular velocity of Earth's rotation variable exponentially with respect to time, based on recent data. Three differential equations describe the dynamics of three variables, namely, the Moon's orbital means radius, the eccentricity of the orbit, and the inclination of the Moon's orbital plane with respect to the inertial plane. This model gives a point of maximum approximation consistent with the modern theories concerning the Earth-Moon system formation and paleonthological observations. Our model may be extended for any planet-satellite system in which the interaction with other celestial bodies may be ignored.

PAINEL 222

DETERMINATION OF 16 SMALL ASTEROIDS ROTATIONAL PERIODS

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The rotational properties of small asteroids give us important informations about collisional evolution in Main Asteroid Belt. Although these properties are very well known for the largest asteroids, there are not so many informations for the remaing.In this work we present results from long-term observational campaign at the OPD-LNA, to determine the rotational period of small asteroids. The photometric observations reported here have been performed from 1997 to 2000, at the Observatório do Pico dos Dias (OPD-LNA) on a 0.6m telescope. All the observations were carried out using CCD cameras in the V band. The images were reduced using APPHOT, a routine of IRAF package, and calibrated using standarts methods with bias and dome flat-field images. Flux calibration was performed using standarts stars from Landolt Catalog. Once obtained the asteroid light curves, we used a Fourier analysis of the data to determine the rotational periods. In the present work, 44 asteroid light curves were analysed. From these, we obtained 16 rotational periods and 11 indications. It was not possible to determine a rotation period or even an indication for the others. Among the asteroids for which we determined a rotational period, all are smaller than 50 km and 8 belong to some dynamical family. The longest rotation period was of 18 hours for 2880 Nihondaira and the shortest one was of 2.9 hours for 1619 Ueta. Some light curve amplitudes allow us to identify very alongaded bodies, for example, 1403 Idelsonia. The light curve of this asteroid has an amplitude of 1.12 magnitude. The obtained periods together those from literature were used to make an updated statistical analysis of the rotation period distribution in the Main Belt. This analysis still shows that most of the small asteroids have a rotational period similar to that of the larger ones. This result can indicate that the collisional evolution in the Main Belt did not affected substantially the original distribution.

PAINEL 223

SPECTRAL PROPERTIES OF MARS-CROSSERS AND NEAR-EARTH ASTEROIDS: RESULTS OF THE S3OS2 SURVEY

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ON/MCT

In recent studies, Mars-crossers and Near-Earth objects have been recognized as potential sources for the meteorites recovered on Earth. Near-Earth asteroids are divided into three classes, following their orbital parameters: the Atens have

semimajor axes smaller than that of the Earth, the Apollos have orbits that cross the Earth's orbit, and the Amors pass inside the Mars orbit but do not cross the Earth one. Nowadays, it is widely accepted that Near-Earth asteroids are fragments of larger objects of the main belt that, probably after a collision, were injected into a resonance. Later encounters with the terrestrial planets could then remove these bodies from the resonances and convert them into Near-Earth asteroids. On the other hand, an asteroid is a Mars-crosser when its current osculating perihelion distance is greater than 1.3 A.U. and its orbit intersects that of Mars. The Mars-crossing population have unstable orbits and can, through close encounters with the planet, evolve to Earth-crossing orbits. Recent dynamical works (Migliorini et al. 1998; Michel et al. 2000) suggested that the Mars-crosser population can account for an important fraction of the multikilometer Near-Earth asteroids. As the relationships among these classes of bodies are not at present completely understood, the study of these objects from a spectral reflectance point of view can help us to impose additional constraints on the origin of these populations. In order to increase the knowledge about the compositional distribution of these objects, we observed 22 Mars-crossers and 12 Near-Earth asteroids as part of our Small Solar System Objects Spectroscopic Survey (Lazzaro et al. 2001), carried out at the ESO (La Silla, Chile). We have obtained 57 spectra for the Mars-crossers and 27 for the Near-Earth objects from November 1996 through September 2001 in the wavelength 4900-9200 Å. Most of the objects fall in the "S-complex", including the S, Sa, Sk, Sl, Sq and A classes, as introduced by Bus (1999). We show that the spectra of these objects resemble that of some ordinary chondrite meteorites. In spite of the small number of objects, we found also in our sample members of the C, Ld, V and X classes.

PAINEL 224

ON THE CHEMISTRY OF CS AND NS IN COMETARY COMAE

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The most fundamental scientific reason for studying comets is to retrieve information on their origin, relationship to interstellar and interplanetary material and implication for the formation of the Solar System or Cosmogony. The determination of the basic parameters of the nucleus and its activity and composition is desirable in order to establish a consistent data base for comparative studies of comets and it is vital for the safety and success of the space missions. The objective of the present work is to contribute to the establishment of a unique description of the physical-chemical nature of the nucleus. We study the carbon monosulfide (CS) - which is the only sulfur

compound that persistently appears in cometary ultraviolet spectra and, therefore, seems to play a key role in sulfur photochemistry in cometary comae - and the nitrogen monosulfide (NS) - the first cometary molecular species to contain both nitrogen and sulfur atoms - which was recently observed by Irvine et al. (2000) in comet Hale-Bopp. The determination of the abundance of each such species helps to constrain the chemistry and physics of comets and hence their place and mode of origin in the nucleus. With this purpose in mind we have developed a multifluid chemical model of cometary comae (Boice 1990) with gas-phase chemical kinetics and gas dynamics to predict molecular abundances variation in a sensitive manner with cometocentric distances at a heliocentric distance of 1 AU to study the abundances of CS and NS, using a detailed photo and chemical reaction network with more than 100 species and over 1000 reactions. We conclude that the CS abundances in comets does not seem to vary much with the cometocentric distance. In particular, if NS is the daughter of an unknown long-lived parent molecular species, its production rate and abundance should be much larger than the obtained values.

PAINEL 225

BRAZILIAN ASTROBLEMES AND SIMILAR STRUCTURES

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Brazil shows several ring features resembling meteoritical craters, after a bibliographical research we presented bellow the better known structures: Araguainha Dome 15º35‘S 42º49‘W; diameter: 30 km; age: 235 m.y. Serra da Cangalha 8º04‘S 35º42‘W; diameter: 12 km; age: < 300 m.y. Vargeão - 25º40‘S 42º10‘W; diameter: 11 km; age: 116 (+ ou -) 16 m.y Riachão: 6º35‘S 35º39‘W; diameter: 3 km; age: < 200 m.a. São Miguel do Tapuio 4º38‘S 31º23‘W; diameter: about 20 km; age: < 120 m.y. Besides these five impact craters, there are the following geological features, that need more evidences of shock metamorphism in order to be accepted as meteoritical craters: Colônia 23º 38‘E 35º 32‘W; diameter: 3 km; age: < 80 m.y. Inajah: 8º30‘S 41º 0‘W; diameter: 5 km; age: unknown. Jarau: 45º 33‘W 30º12‘S; diameter: 4.4 km; age: 116 (+ ou -) 16 m.y. Piratininga: 22º 30‘S 39º10‘W; diameter: 12 km; age: 116 (+ ou -) 16 m.y. Several others circular features visible on satellite or airplane image were also identified, but were not studied indeed.

PAINEL 226

STUDY OF STRONG METEOR SHOWER PROPERTIES AND THEIR INFLUENCE ON THE IONOSPHERE

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We analyze the data of seven strong meteor showers obtained from the SKYiMET radar (INPE - Cachoeira Paulista, Brazil) operating at 34.7 MHz. The meteor data were obtained during the years 1999-2001. Properties of these showers such as the influx as a function of the altitude and time (for more than 1,800 meteors daily including non-shower meteors), the velocity distributions (from 10 to 65 km/s, including non-shower meteors), the life-time distributions (around tenth of a second, including non-shower meteors) and their radiant positions are determined. Information about the variability of Total Electron Content (TEC) in the ionosphere was derived from the Global Positioning System (GPS) satellite network during the period of the meteor showers for 1999 and 2000. From these data we investigate whether meteor showers have any significant impact on the upper atmosphere (above 80 km).

PAINEL 227

ON LONG TERM EVOLUTION OF STELLAR "OORT CLOUDS"

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Several catalogues are now avaliable allowing us to foresee the velocity vector of many nearby stars in a reasonable surrounding volume. With this we may study close stellar passage statistics and also their consequences over structures of planetary systems that are more exposed to external perturbations, that is, the "Oort Cloud" and, possibly, the external part of the "Kuiper Belt". Using this statistics, we perform several direct numerical integrations over all possible "Oort Clouds" around stars in order to understand their long term dynamical evolutions and also their longevities. In order to take in account real cases with more than single stars, we also suppose "Oort Clouds" around binary and multiple stars systems. We take, as an example of binary and multiple stars systems, the parameters of α Centaury A and B, as binary, and include Proxima Centaury to simulate multiple star systems. Our preliminary conclusions are that: if the binary is not too wide, then the existence and the evolution of the stellar "Oort Cloud" will not differ a lot from the single stars; but if the system is

wide, or there is another star present like Proxima Centaury in α Centaury, then the "Oort Cloud" structure is strongly endangered or it is completely unstable.

PAINEL 228

A NUMERICAL MODEL FOR THE FRAGMENTATION OF RUBBLE-PILE ASTEROIDS

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Rubble-pile asteroids are formed by gravitational reaccumulation of fragments generated by a collision. There are several evidences for their common existence in the Asteroid Belt, such as the high collision probabilities among the asteroids, the absence of fast rotators and the low bulk densities. Therefore, collisions and fragmentations are important processes for the evolution of the asteroids, not being restricted to rubble-piles, but also critical for the determination of the rotational properties of the general population and the formation of the observed asteroid families. A few numerical studies have been performed to model collisonal events, based mainly in hidrodynamical models. We developed a new model for collisional fragmentation of rubble-pile asteroids. This model differs from the preexisting ones mainly by being based on direct numerical integrations of the Euler-Lagrange equations of motion for the fragments that constitute the rubble-pile, and considering the complete motion of each fragment, allowing to study their rotation. The asteroids are represented by a set of ellipsoidal fragments of gaussian density, that interact to each other only by their mutual gravitation and by their contact forces. We have worked on extensive tests of the model and the software developed for its integration. These tests consisted in physical systems for which there is a known analytical solution, and have indicated that the models works correctly, with a high precision. We are also working in the inclusion of a Raylegh dissipation function, to account for friction, and that has the properties of preserving the angular momentum and vanishing for rigid-body movement. We present a brief description of the model, the results of the physical tests perfomed and discuss the possibilities for its application.

PAINEL 229

NEAR-INFRARED OBSERVATION OF THE COMET C/2000 WM1 LINEAR IN THE PRE-PERIHELION PHASE

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Near-infrared photometry allows one to obtain important information about color characteristics of comets. Infrared imaging provides spatially resolved information that is not available at optical wavelengths, such as the characteristic dust temperature, the particle size, the albedo of the dust grains, and the amount of dust in the coma. We observed the new bright comet C/2000 WM1 LINEAR with the infrared camera "CamIV", attached to the 0.60-m Boller & Chivens telescope at Laboratório Nacional de Astrofísica (LNA/MCT), Minas Gerais, Brazil), on December 01-02, 2001, when the comet was in its pre-perihelion phase. The heliocentric and geocentric distances of the comet were 1.214 AU and 0.316 AU, respectively. The comet and a solar type standard star were observed with I (1040 nm, FWHM = 130 nm), J (1250 nm, FWHM = 285 nm) and H (1650 nm, FWHM = 290 nm) filters. The K filter was not available. Here we report our preliminary results on photometry and morphology, and make a comparison with the comets C/Bradfield (1974 C1), 26P/Grigg-Skjellerup (1982 IV), 65P/Gunn (1982 X), 1P/Halley (1986 III), C/Kohoutek (1973 E1), 59P/Kearns-Kwee (1981 XX), and 38P/Stephan-Oterma (1980 X). The I band extends from visual to near-IR and is used mainly with CCDs, besides our I filter is not standard. This fact made it difficult to compare our data with those for other comets. Although our data in the I band are rather scarce to draw any reliable conclusion we find that WM1 LINEAR seems to be similar to C/Kohoutek and redder than C/Bradfield. The J-H color is similar to those values for other comets, and seems to be fairly uniform and independent of scattering angle. Morphology is still under analysis.

PAINEL 230

OPTICAL SPECTROSCOPY OBSERVATION OF COMET C/2000 WM1 (LINEAR) IN THE PRE-PERIHELION PHASE

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High resolution spectra of comets allow the possibility to search for new cometary emissions and the presence of cometary luminescence continuum of nonsolar nature, to investigate the chemistry and subsequently the origin of comets, and to solve other actual problems of cometary physics. We report the preliminary results of identification of the high-resolution spectrum of comet C/2000 WM1 (LINEAR) obtained on Dec. 1, 2001 (UT) with FEROS installed on the 1.52-m telescope of ESO, La Silla, Chile. The heliocentric and geocentric distances of the comet was 1.230 AU and 0.318 AU, respectively. The CCD frames were processed with MIDAS computer programs. The Doppler shift was taken into account. For identification of emission lines we used wavelength tables from the papers of Cochran and Cochran, 2001 (A high spectral resolution atlas of comet 122P/de Vico, Icarus, in press), Brown et al. (AJ, 112, 1197-1202, 1996), Cosmovici et al. (AA, 114, 373-387,1982) and Churyumov and Chorny, (Proceedings of the International Conference ACM 1991, 117-120, 1992). We considered identification of cometary emissions to be valid if the difference between observed and laboratory wavelengths did not exceed ±0.01 nm. The identification reliability was verified using the known strongest cometary lines such as the lines of the Swan C2(0-0) band and others. Many emission lines of the molecules C_2, C_3, CN, CH, CH^+, NH_2, CO, CO^+, H_2O^+, and presumably C_2^- were identified in the spectral range 400-900 nm. The total number of identified emission lines is 4566: 2734 of C_2, 1195 of NH_2, 289 of CN, 158 of C_3, 60 of CO, 51 of H_2O^+, 50 of CH, 16 of CO^+, 8 of CH^+, and presumably 5 of C_2^-. It should be noted that there are many unidentified emission lines in the comet's spectrum. We determined the wavelengths for 21100 of them. One of the main peculiarities of the investigated spectrum is the presence of emission lines of the neutral molecule CO in the visible region (triplet bands, Asundi bands, and Herman bands). This is a very rare case of the detection of these emission lines in cometary spectra.

PAINEL 231

DISSOCIATIVE LIFETIMES AND FLUORESCENCE EFICIENCY FACTORS OF THE COMETARY MOLECULAR SPECIES $^{14}N^{32}S$

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Recently, Irvine et al. (2000) observed the nitrogen monosulfide radical (NS) in Comet Hale-Bopp, through the rotational transition J = 15/2 - 13/2, in the vibrational level v"= 0, of the fundamental electronic state $X^2\Pi_r$. This was the first time ever that this radical was observed in comets. With their observational data and considering an optically thin coma, Irvine et al.(2000) determined the colunar abundance in the coma and the production rate of this species. Until the present time, the dissociative lifetime of NS is unknown in literature. In order to determine the production rate of this radical they applied a Haser model, using lifetimes associated to the analogous isoelectronic species NO. Following Lie et al. (1984), the NS radical dissociates for λ = 2305.37 Å, which corresponds to the (v' = 0, v" = 0) vibrational band of the NS($C^2\Sigma^+$ - $X^2\Pi_r$) electronic system. Considering the rotational and vibrational constants (Huber & Herzberg 1979) for these electronic states we determine the associated r-centroids and Franck-Condon factors. With these values and the electronic transition moments, extrapolated from the values of Lie et al. (1984), we determine the spontaneous transition probabilities and the oscillator strengths of several vibrational bands of that electronic system for this molecular species. The Einstein's coefficient for absorption of the relevant vibrational band (0,0), combined with the solar fluxes (maximum and minimum), for λ = 2305.37 Åand heliocentric distance r = 1.0 AU, allowed us to determine the radical photodissociation rate in this electronic system and the concerning dissociative lifetimes. We also determine the g-factors of fluorescence efficiency. Finally, with the lifetimes and the g-factors of the NS radical, we re-evaluate the production rate of the species and compare our results with Irvine et al. (2000) finding a good agreement.

PAINEL 232

STATISTICS EVALUATIONS ON METEORITE FALL RATE

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Many Papers relating meteorite fall statistics were performed by Leonard & Slanin (1941), Mason (1962) and Hugues (1981). An updating of those statistic performed by Souza and Brandão at (Jornada de Iniciação Científica da UFRJ em 2001). Here a comparative work was done with the results obtained above and a pioneering paper of H. Pickering (1909) and not mentioned in any literature. An analysis of the results obtained a century ago and now shows that the number of falls during afternoons with a peak at 3: 00 PM was keep till today. As bodies moving in retrograde orbits been high velocities meteor rarely survive the atmospheric passage. The meteorites arriving from noon to midnight must overtake the Earth and be moving faster than it, lying outside the orbit of Earth, on the other end those arrived between midnight and noon be in direct orbit but also should be considered objects in internal orbit (like Athens) and been overtaken by Earth being more slowly than it. Considering the monthly rate of falls there is a peak on May and June and a node in November December, according to Mason these variation is due to the fact that is summer at northern hemisphere where more meteorites were recovered, so that there are many people outside home. But these variation was predicted by Pickering based on orbital effects.

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