

# TW Hydrae association membership analysis based on Gaia DR1

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**Abstract.** Taking advantage of the positions of the first Gaia data release, GDR1, in 2016 and of others from the literature, we have calculated new proper motions for the stars traditionally investigated as members of the TW Hydrae association (TWA). In recent works we could notice the great sensibility that the membership and trace-back analysis present in relation to the proper motion data. As a consequence we felt motivated to review the proper motion data of these objects aiming to work with more accurate and realistic data based on the excellent positions of GDR1. The results presented below give a panorama of the significant differences that we have found between the proper motion here determined and those used in previous works.

**Resumo.** Aproveitando as posições Gaia publicadas no primeiro "data release", GDR1, em 2016 e outros dados encontrados na literatura, calculamos novos movimentos próprios para as estrelas que tradicionalmente são discutidas como membros ou não membros da Associação TW Hydrae. Em trabalhos recentes pudemos constatar a grande sensibilidade que a análise de pertinência e a determinação da idade por trace-back apresentam em relação aos dados de movimento próprio. Isso nos motivou a fazer uma revisão desses dados para esses objetos, no sentido de obter movimentos mais precisos e realistas com a utilização das excelentes posições do GDR1. Os resultados apresentados a seguir, dão um panorama das diferenças significativas que pudemos encontrar entre os movimentos aqui determinados e aqueles utilizados em trabalhos precedentes.

**Keywords.** Astrometry – Proper motion – Stellar association

## 1. Introduction

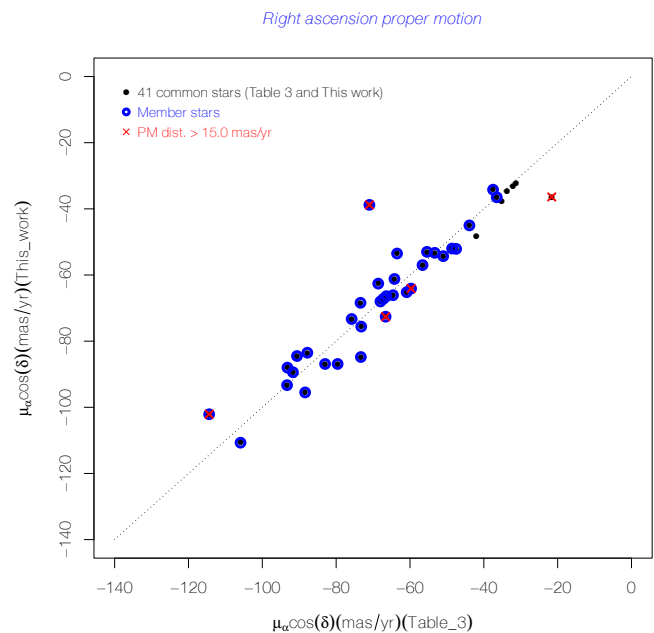
TW Hydrae is a very young ( $\approx 8$  million of years) and relatively nearby ( $\approx 60pc$ ) stellar association. With its approximately 30 known members, among them planetary systems, brown dwarfs, etc., this association is an excellent target to stellar evolutionary studies (Weinberger et al., 2013; Ducourant et al., 2014).

As a consequence of the new astrometric data reality due to the publication of the first data release of the Gaia spatial mission (Gaia Collaboration, 2016a,b), we have started a proper motion data review for those objects traditionally investigated as members of this association. It is precisely on these objects that many current works are based, including that by ourselves (Ducourant et al., 2014).

More accurate proper motions are fundamental to the membership analysis and to a more realistic trace-back age determination. The existent proper motion astrometric catalogs: PPMXL (Roser et al., 2010), SPM4 (Girard et al., 2011), UCAC4 (Zacharias et al., 2013), etc., even globally good, locally, they present many inconsistencies and could be very bad (Teixeira et al., 2014).

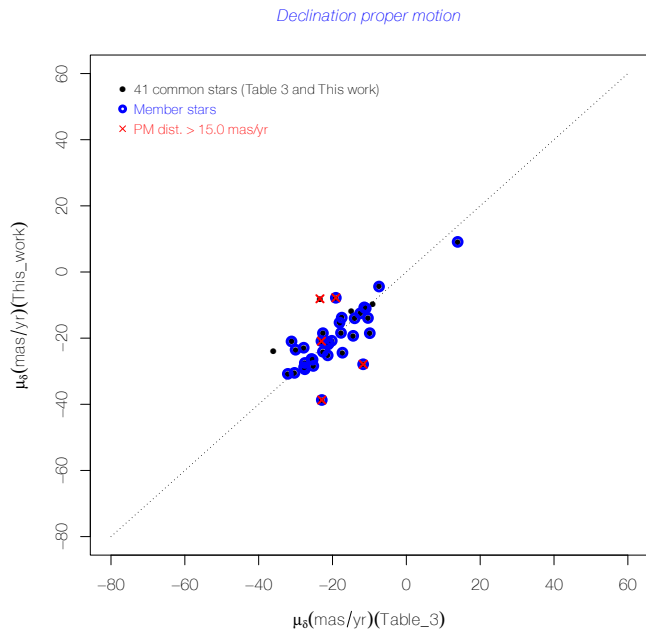
Thus, in possession of the Gaia positions and those from other catalogs we obtained the results partially resumed in Figures 1 and 2 below. In these figures we show the proper motion differences in both coordinates as obtained in this work in relation to those used (Table 3) by Ducourant et al. (2014). As we can see, for many stars we found proper motions significantly different. Of course, these differences have important consequences to the study of this association. In these figures, we show in red those star for which we have obtained distances in the phase space greater than 15 mas/yr.

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**FIGURE 1.** Comparison between the right ascension proper motions determined here and those used (Table 3) by Ducourant et al. (2014).

Analysis Consortium (DPAC, <https://www.cosmos.esa.int/web/gaia/dpac/consortium>). Funding for the DPAC has been provided by national institutions, in particular the institutions participating in the *Gaia* Multilateral Agreement.



**FIGURE 2.** Comparison between the declination proper motions determined here and those used (Table 3) by Ducourant et al. (2014).

## References

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