The impact of Gaia in Lithium Depletion Boundary ages

F. J. Galindo-Guil[1*], D. Barrado[2], H. Bouy[3], J. Olivares[3], A. Bayo[4,5], M. Morales-Calderón[2], N. Huélamo[2], , L. M. Sarro[6], P. Rivière-Marichalar[7], H. Stoev[8], B. Montesinos[2] and J. R. Stauffer[9]

[1] Centro de Estudios de Física del Cosmos de Aragón (CEFCA), Plaza San Juan 1, 44001 Teruel, Spain.
[2] Departamento de Astrofísica, Centro de Astrobiología (CAB, CSIC-INTA), ESAC Campus, Camino Bajo del Castillo s/n, 28692 Villanueva de la Cañada, Madrid, Spain.
[3] Laboratoire d'astrophysique de Bordeaux, Univ. Bordeaux, CNRS, B18N, Allée Geoffroy Saint-Hilaire, 33615 Pessac, France.
[4] Inst. Física y Astronomía, Fac. Ciencias, Universidad de Valparaíso, Gran Bretaña 1111, Valparaíso, Chile.
[5] Núcleo Milenio Formación Planetaria - NPF, Valparaíso, Chile.
[6] Departamento de Inteligencia Artificial, UNED, Juan del Rosal 16, 28040 Madrid, Spain.
[7] Observatorio Astronómico Nacional (OAN-IGN) - Observatorio de Madrid, Alfonso XII, 3, 28014 Madrid, Spain.
[8] Fundación Galileo Galilei - INAF, Rambla José Ana Fernández Pérez 7, 38712 Breña Baja, Santa Cruz de Tenerife, Spain.
[9] Spitzer Science Center, California Institute of Technology, Pasadena, CA 91125, USA.

*pgalindo at cefca.es , pgalindo at hotmail.cl

1. Introduction

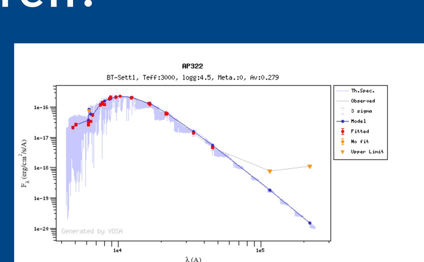
- The lithium depletion boundary, LDB, is a technique to asses the age of a stellar association, based on the existence or lack of the spectrum feature Li λ6708Å in M dwarfs.
- We revise former LDB ages in all the stellar associations consistently, taking advantage of the homogeneous Gaia parallaxes, and bolometric luminosity estimations that rely on SED derived from multi-wavelength photometry.
- Finally, we locate the LDB in a systematic and homogeneous way, and release a reliable age scale based on it.

2. Method

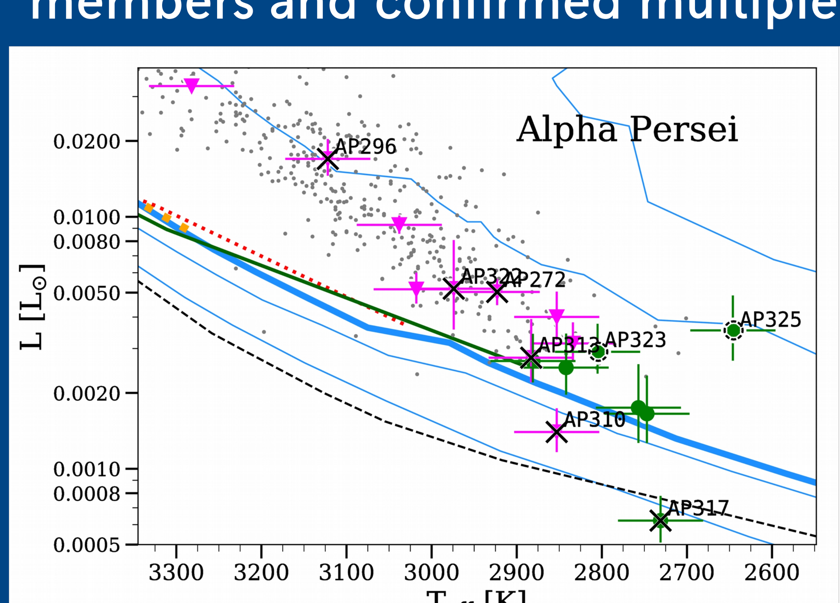
- Starting from previous works, we collected a list of sources with measured EW Li and close to the expected LDB.
- In addition, we gather all the available information related to A_V, metallicity and surface gravities.
- We show the method with Alpha Persei.

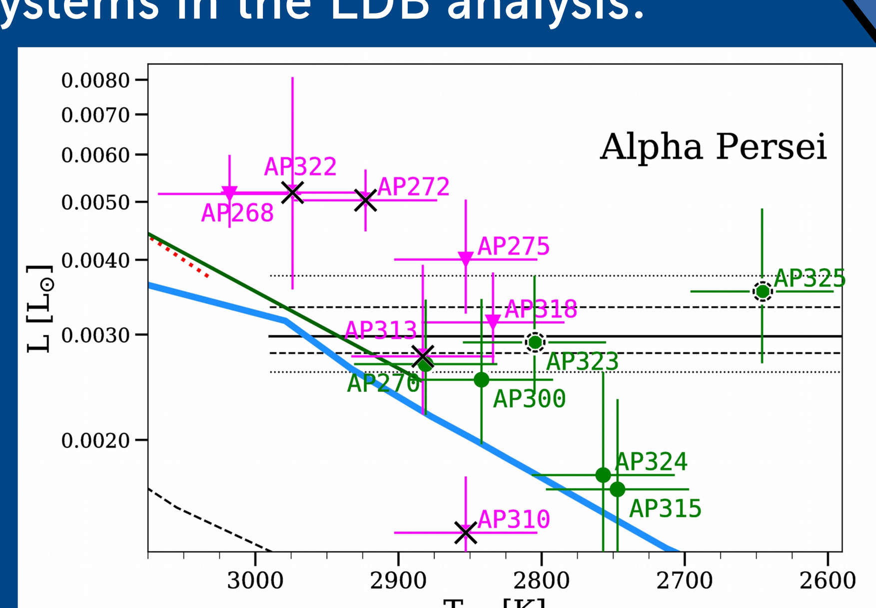
- We gather photometric data from literature and all-sky surveys:

- We built a SED with VOSA and obtain Ftot and Teff.
- We calculate individual distances for each object using *Kalkayotl* (Olivares et al. 2020) code, a sophisticated Bayesian approach.

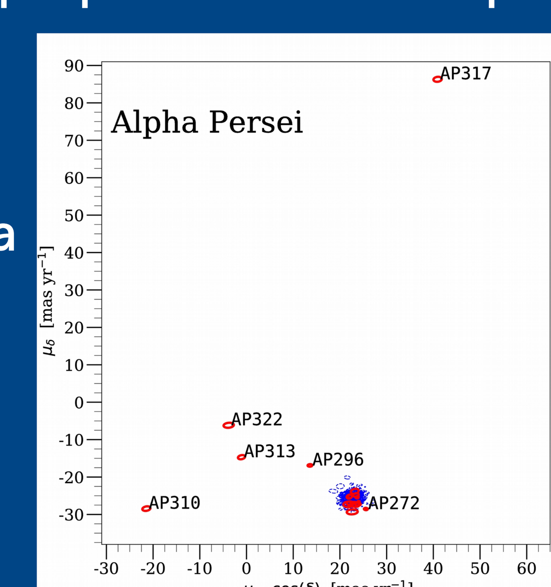


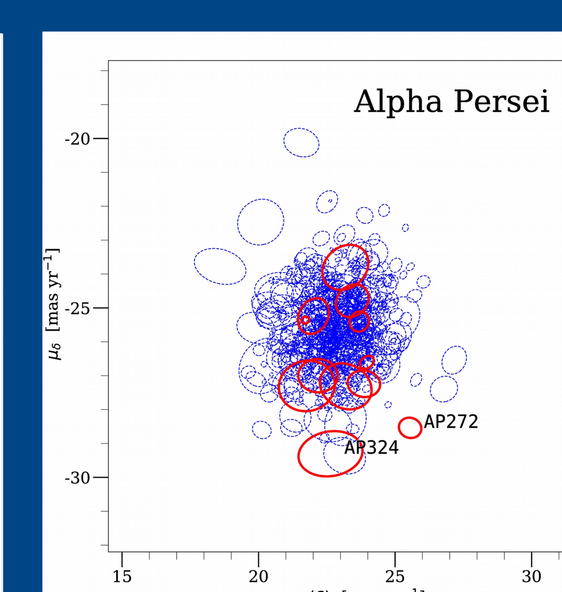
- We built a Hertzsprung-Russell diagram, and discard all the non-members and confirmed multiple systems in the LDB analysis.





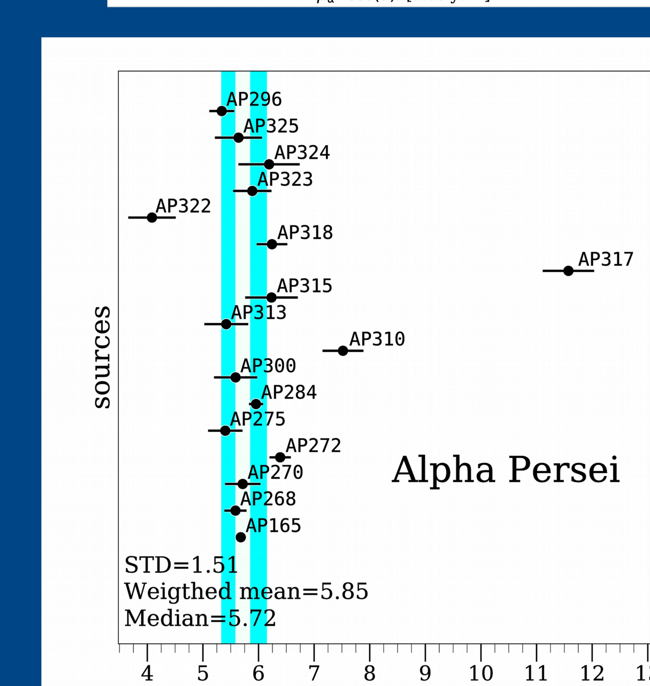
- Outliers based on proper motions and parallaxes from Gaia DR2.
- Vector-Point diagram after Gaia DR2.



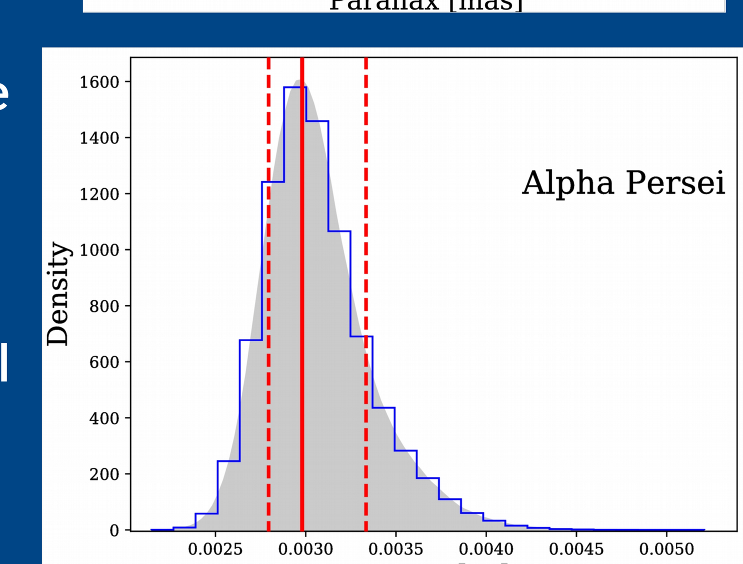


- Parallaxes after Gaia DR2.

Sources with EW Li measurements come from Zapatero Osorio et al. 1996, Basri & Martin 1999a, an Stauffer et al. 1999; and previous members from Gaia et al. 2018a.

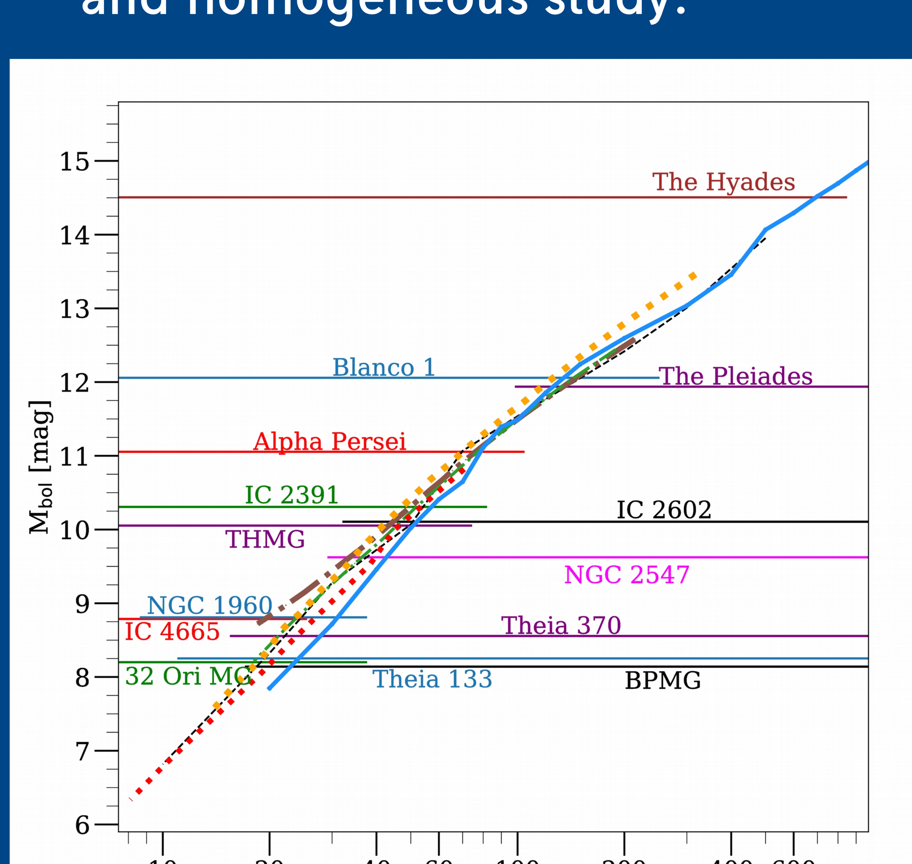


- To estimate the LDB and quantify the uncertainty associated, we used a jackknife method with a bootstrap re-sampling, considering the uncertainties in the Ftot and the distance.
- We calculated the LDB luminosity as the equal middle point between the bolometric luminosity of the faintest Li-poor object and the brightest Li-rich object.



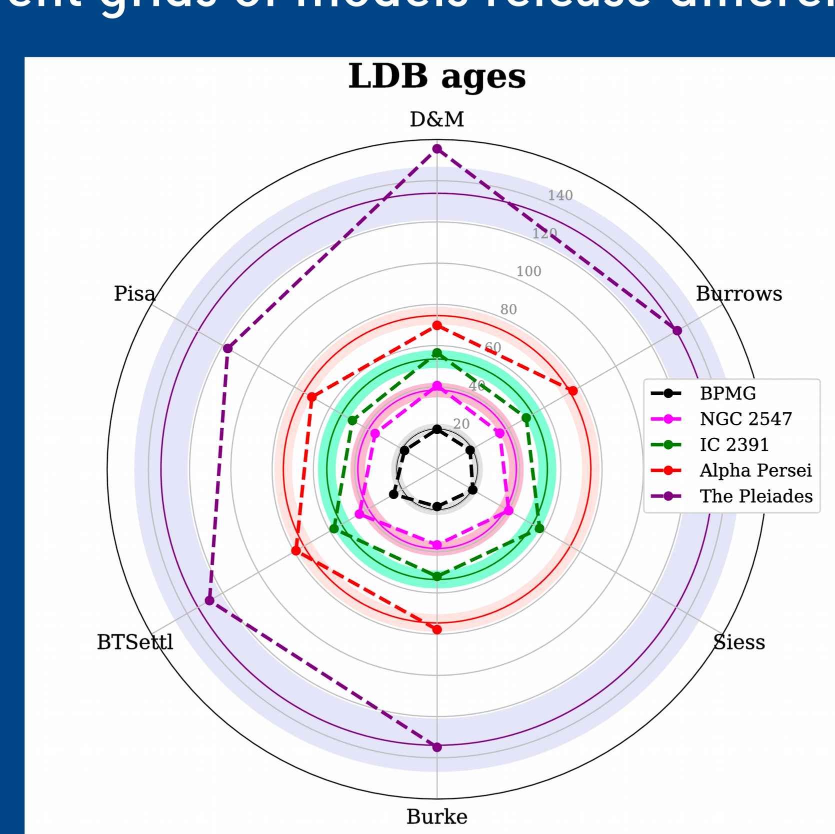
3. Results

- Location of the LDB for all studied stellar associations, in terms of M_{bol} in a systematic and homogeneous study.

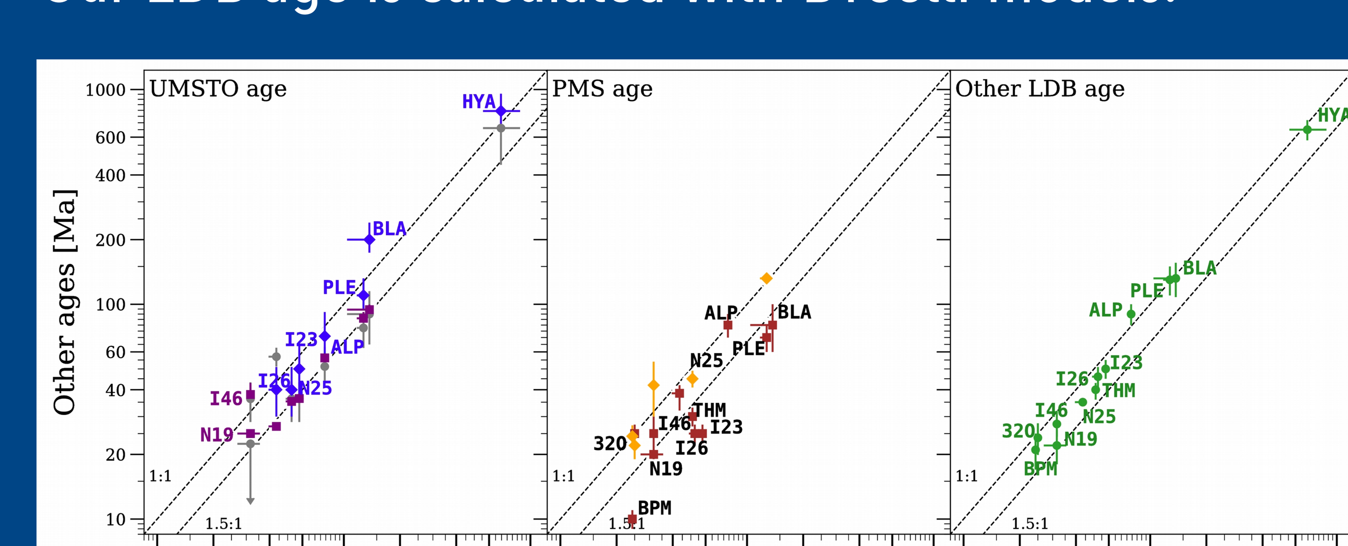


The lines that cross diagonally from the lower left corner to the upper right one correspond to different evolutionary LDB models.

- LDB ages estimated using several evolutionary grid models.
- Different grids of models release different ages.



- Comparison between different age scales versus our LDB age. The vertical axis represents age values calculated with different techniques (see Mermilliod 1981b; Gaia Collaboration et al 2018a; Bossini et al. 2019; Bell 2013, 2014 and 2015; and other references). Our LDB age is calculated with BTSettl models.



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