Lithium EW measurements

- UVEs: We have used the spectra provided by GES (DR4). Initial EWs (equivalent widths) of the Li (6707.83 Å) line and adjacent Fe (6707.43 Å) line were measured with the automatic tool TAME (Tool for Automatic Measurement of Equivalent Widths, Kang & Lee 2012). This tool allowed us to discard all spectra with EW(Li)<5 mÅ. We then did an individual analysis of each of the remaining spectra by measuring the EW(Li) and EW(Fe) values with the IRAF task split, using the TAME values for comparison purposes. With enough resolution EW(Li) and EW(Fe) can be measured individually, but in the case of lower resolution spectra only EW(Li) + Fe II can be measured. EWs were corrected as EW(Li)+EW(Fe) - EW(Fe) in those cases where the Li and Fe lines could not be resolved. EW(Fe) was estimated using the eyefowl driver within MODD code (Snedden 1973) as explained in Tabernero (2014) and Lanzafame et al. (2015).

- GIRAFFE: We have used the EWs (FeII corrected in the case of the WG12 clusters) from the spectra provided by GES (DR4).

For all the following analysis, we have used the recommended parameters provided by GES (DR4).

Cluster membership. Selection criteria

We present initial lists of candidate members for each cluster (using both the UVEs and GIRAFFE spectra), based on their radial velocities (given that cluster members must have similar RVs), and their position in the EW(Li) vs \( v_T \) and HR (logg vs \( T_{eff} \)) diagrams (criteria that discard additional outliers such as Lithium-rich giant stars). As an example we show here the case of NGC 6705:

EW(Li) vs \( v_T \): By plotting the lithium envelopes of IC 2602 (25-35 Myr), the Pleiades (78-125 Myr), and the Hyades (600 Myr) in a EW(Li) vs \( v_T \) figure, we can estimate age ranges for the cluster candidate stars. Given that the ages of the clusters we are studying are known, we can identify further outliers among the kinematic candidates in this way. It was some of these clusters we considered as present greater dispersions than others.

The position of the stars in the HR diagram (logg, \( T_{eff} \)) also helps to identify potential giant outliers (large \( \Delta \log g \), some of them LItch-rich giants (EW(Li) > 50 mÅ) — and other field contaminants. Apart from member candidates for each cluster, we have searched for LItch-rich stars in this fashion, making use of the PARSEC isochrones (Bressan et al. 2012), with 2-50 Myr and ages ranging from 1 Myr to 12 Myr.

Work in progress

We are working on a detailed analysis of the dependence of the lithium-age relation on other stellar parameters that can be derived from the UVEs and GIRAFFE spectroscopic observations such as the level of chromospheric activity (Hα), accretion indicators, rotation (v sin i), metallicity (Fe/H), and well as other parameters (photometric rotational period, etc.) from the literature. In addition, the age of each cluster will be revised using all this information, the lithium depletion bottom when it is possible or other methods.

For each cluster observed within GES, we plan on including all the EW(Li) provided by other authors (see poster in this meeting about IC 2391, IC 2002 and IC 4665 by Montes et al. and Master Thesis by Garrido Montes 2015). In addition, we will include in our analysis other well-known open clusters studied in the literature which will not be observed by GES, in order to have a larger age coverage. We are also studying in more detail some unknown Li-rich stars in the field of the clusters that are not members of these clusters and which could be possible new young field stars or LItch-rich giants.