UNBIASED STELLAR CENSUS IN OPEN CLUSTERS USING MULTI-WAVELENGTH PHOTOMETRY

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Abstract

We are looking for very low-mass members in open clusters with different ages placed at different distances. The main goal is to produce a reliable census for each of the clusters. To do this, we combine deep optical and infrared photometry coming from our own observing runs and from different public databases. We also characterize the stellar parameters of our targets. We present here the current status of the project.

1. Objectives

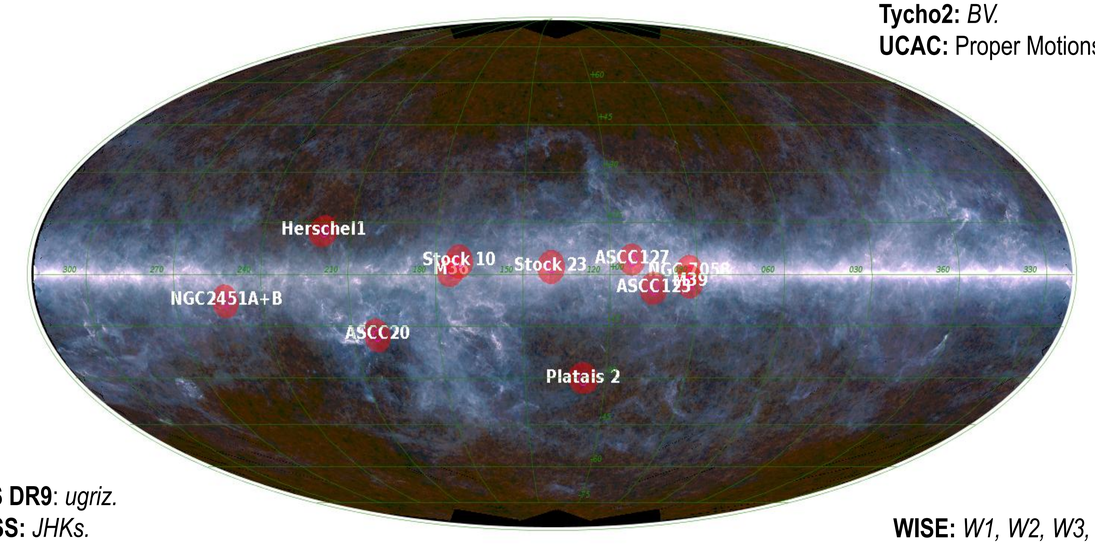
- Create a complete and reliable census of low-mass stars in several young open clusters.
- Extend the membership list down to the substellar domain. We study the Initial Mass Function (IMF) at the low-mass regime and the mass segregation in different environments.
- Provide complementary data for *Gaia*.

2. The sample

- The sample consists of eleven Open Clusters with ages ranging between 20 Myr to 400 Myr distances 190 pc - 1300 pc.
- For each cluster we have, at least, five photometric bands. The complete set of photometry is listed around the image.

Kitt Peak: *BV* (MOSAIC); *JKs* (NEWFIRM).
Canada-France-Hawaii-Telescope: *IZ* (CFHT12K).

INT-WFC: *Ugri* & *Hα*.
Tycho2: *BV*.
UCAC: Proper Motions & *BV*.



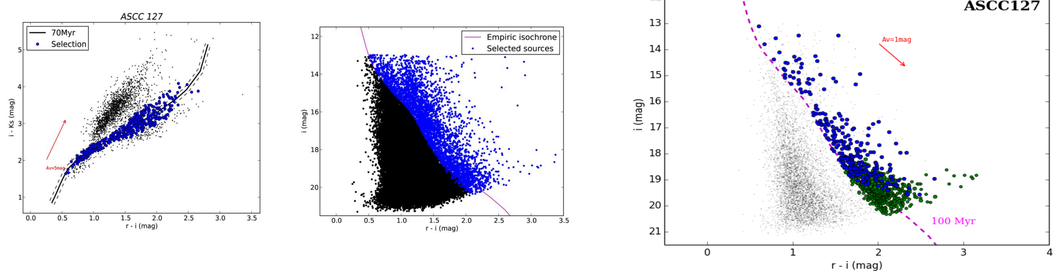
SDSS DR9: *ugriz*.
2MASS: *JHKs*.

WISE: *W1, W2, W3, W4*.

Merged images from the *Planck*/HFI instrument, in the frequencies 353 GHz, 545 GHz and 857 GHz for all sky. The clusters are plotted with red filled circles. The sizes of the circles do not correspond to the apparent sizes of the clusters.

3. Selection of candidate members

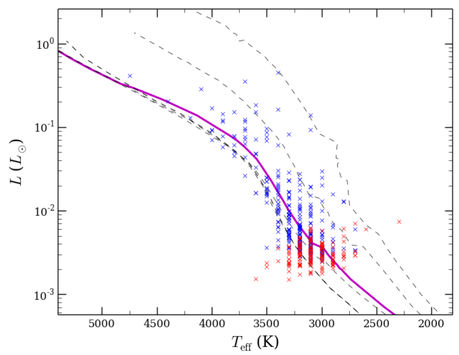
- We gather all the previous information of each cluster: distances, ages , *E(B-V)* and metallicity.
- Compile possible and probable members from previous works.
- Using different photometric bands, we construct several Colour-Magnitude Diagrams (CMDs) and Colour-Colour Diagrams (CCDs).
- We select possible candidates taking into consideration stellar evolutionary models (Baraffe et al. 1998; Siess et al. 2000; Allard et al. 2012) and previous membership (if that is the case).



Left & Middle figures: An example of the CMDs and CCDs built for the selection process for ASCC127.
Right figure: CMD (r-i, i) reaches the lowest mass in the cluster, and it shows the final selection. Blue filled circles are probable members in all CMDs and CCDs, green points are candidates that are not in all CMDs/CCDs. The magenta dash-line is a 100 Myr isochrone (Allard et al. 2012) shifted at the distance and *Av* of the cluster.

4. Stellar parameters

- Stellar Parameters, $L(L_\odot)$ and T_{eff}, of each candidate are estimated building its Spectral Energy Distribution (SED) with VOSA (Bayo et al. 2008). In this way we eliminate the uncertainties in the luminosities that appear when bolometric corrections are used. The T_{eff} does not depends on one colour.
- A Hertzsprung-Russell Diagram (HRD) is also used to reject non-members.



HRD for ASCC127. Crosses are the candidates, in blue those with photometric measurements in all bands, in red candidates with missing photometry. Dash-lines correspond to 1-10-100-1000-10000 Myr isochrones (Allard et al. 2012). The magenta line correspond to 100 Myr.

5. Current status and future work

- Release a complete census at the low-mass regime in eleven clusters.
- Confirm candidates with spectroscopy and derive spectral types (different campaigns).
- Derive the IMFs down to the substellar domain, and study the dependence on the models, distances and ages.

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