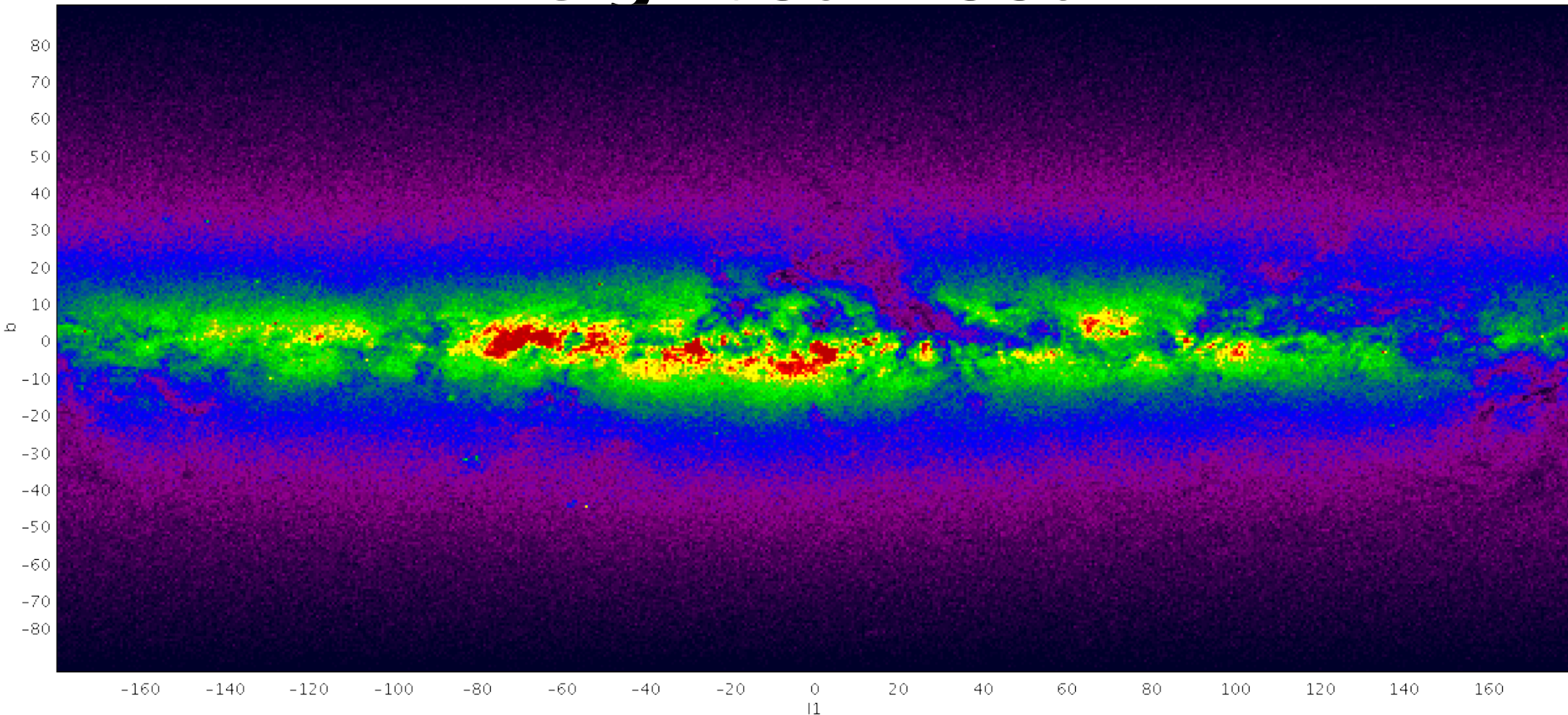# A pre-GAIA vision of the 100 millions stars in the solar neighbourhood
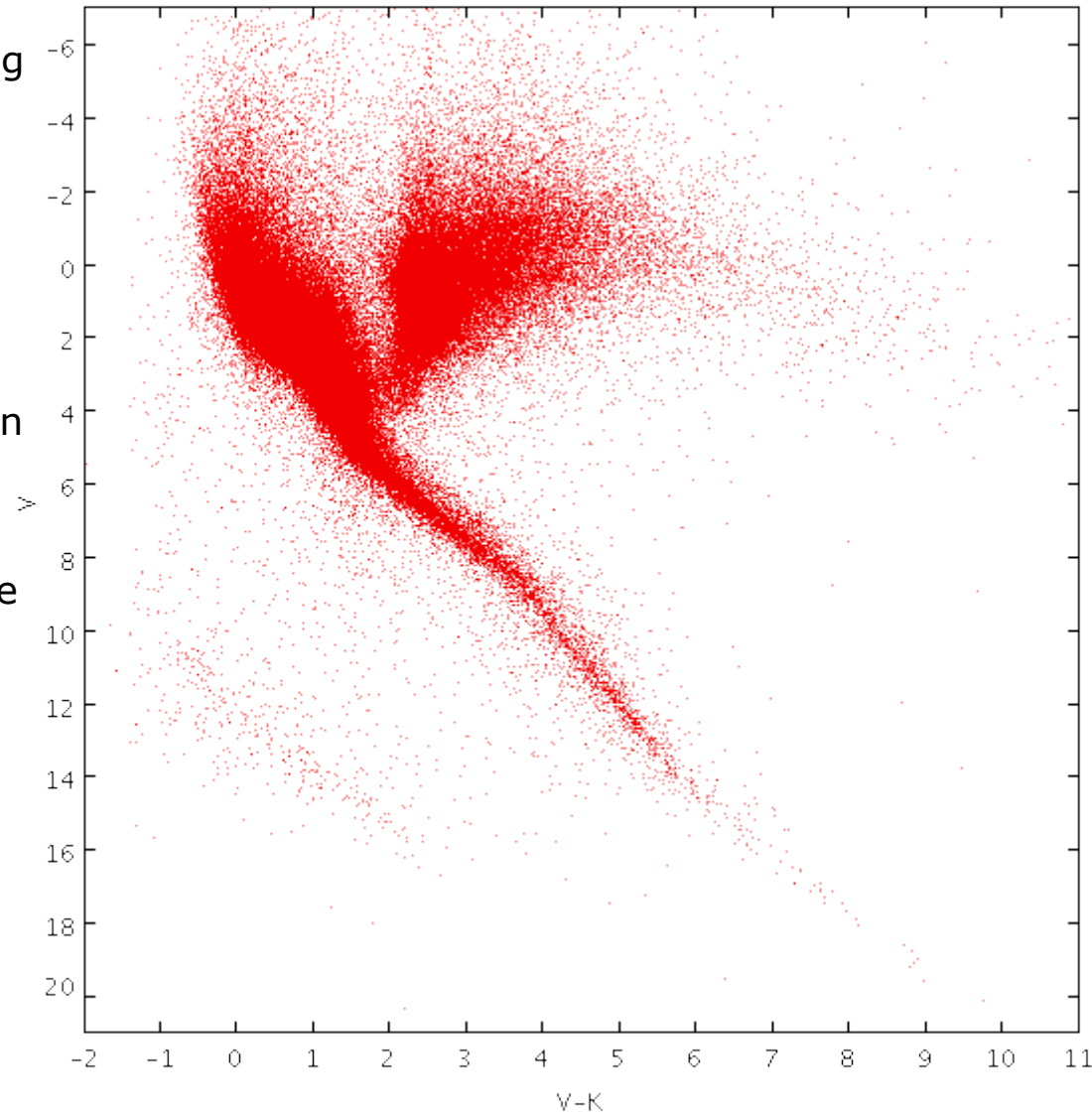
Barbieri M., Girardi L., Zaggia S.

Cassiopee OCA & INAF OAPD
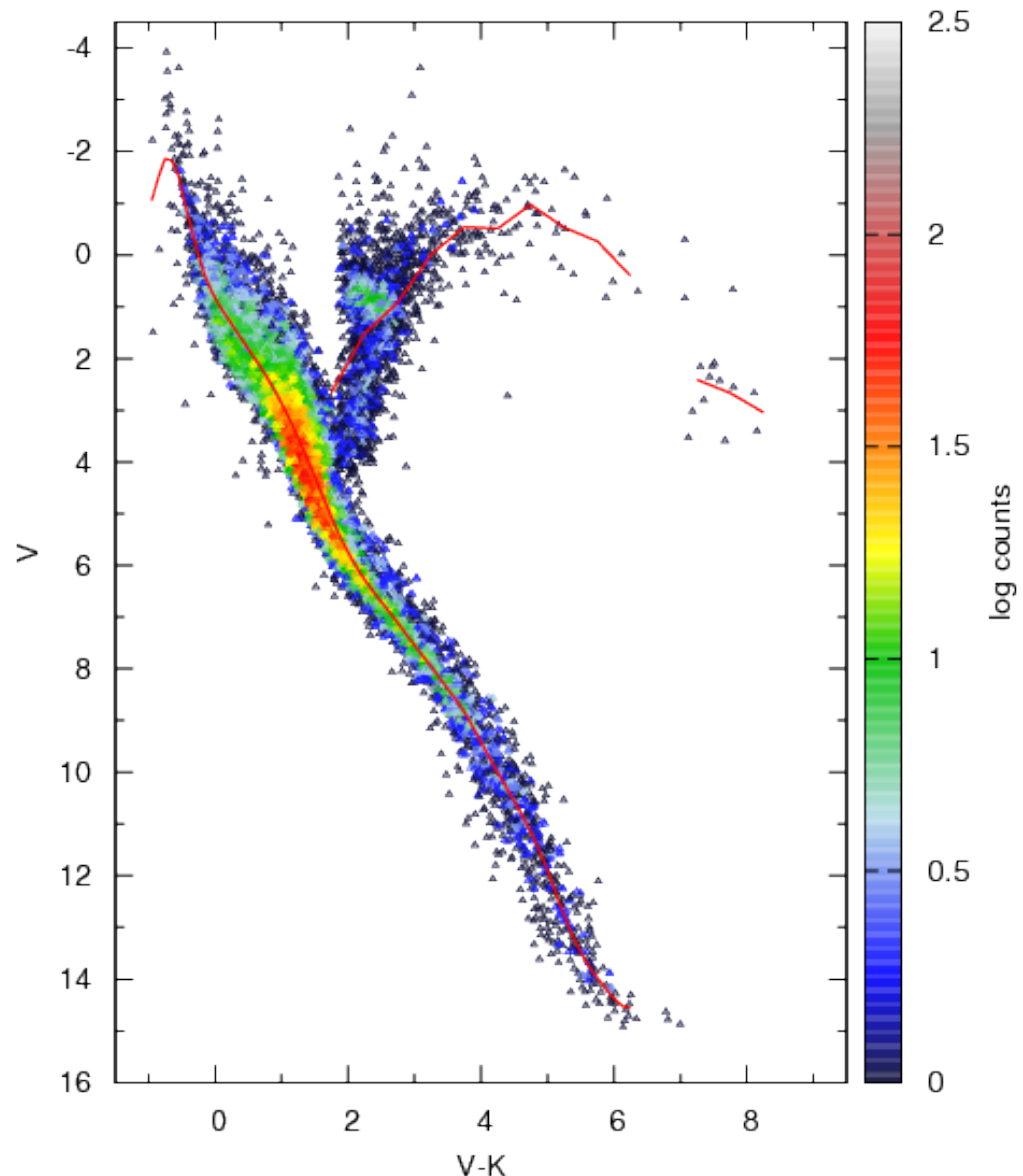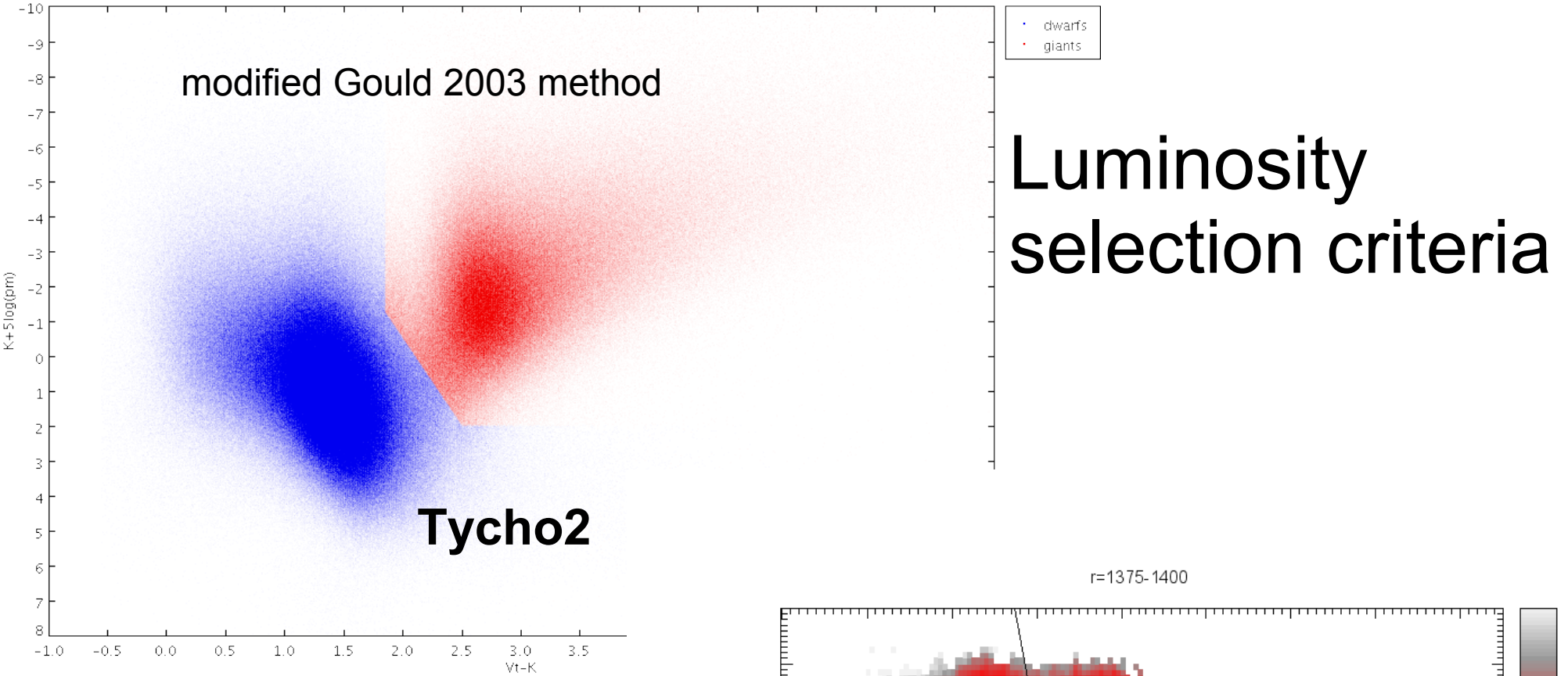
Hipparcos enlarged sample

- We expanded the Hipparcos catalog, merging it with Gliese, van Altena catalogs and with databases of brown and white dwarfs. The final catalog contains 121320 stars, 3000 more than Hipparcos concentrated in the regime of low mass stars. We correlated the resulting catalog with Tycho2, 2MASS and UCAC3.

- After dereddening of each star we derived the absolute magnitudes for the fiducial main sequence and for the giant branch, in many filters (U,B,V,R,I,J,H,K,B_T,V_T,r_U,B_J,R_F,I_N.)

- We adopted an extinction model in which the density decrease at increasing height on the galactic plane, and increase at increasing distance from the galactic center. The Value of A_V is normalized to the extinction at infinity provided by the Schlegel maps.

- A further correlation of this catalog with the spectroscopic database PASTEL provide a table of gravity against colors
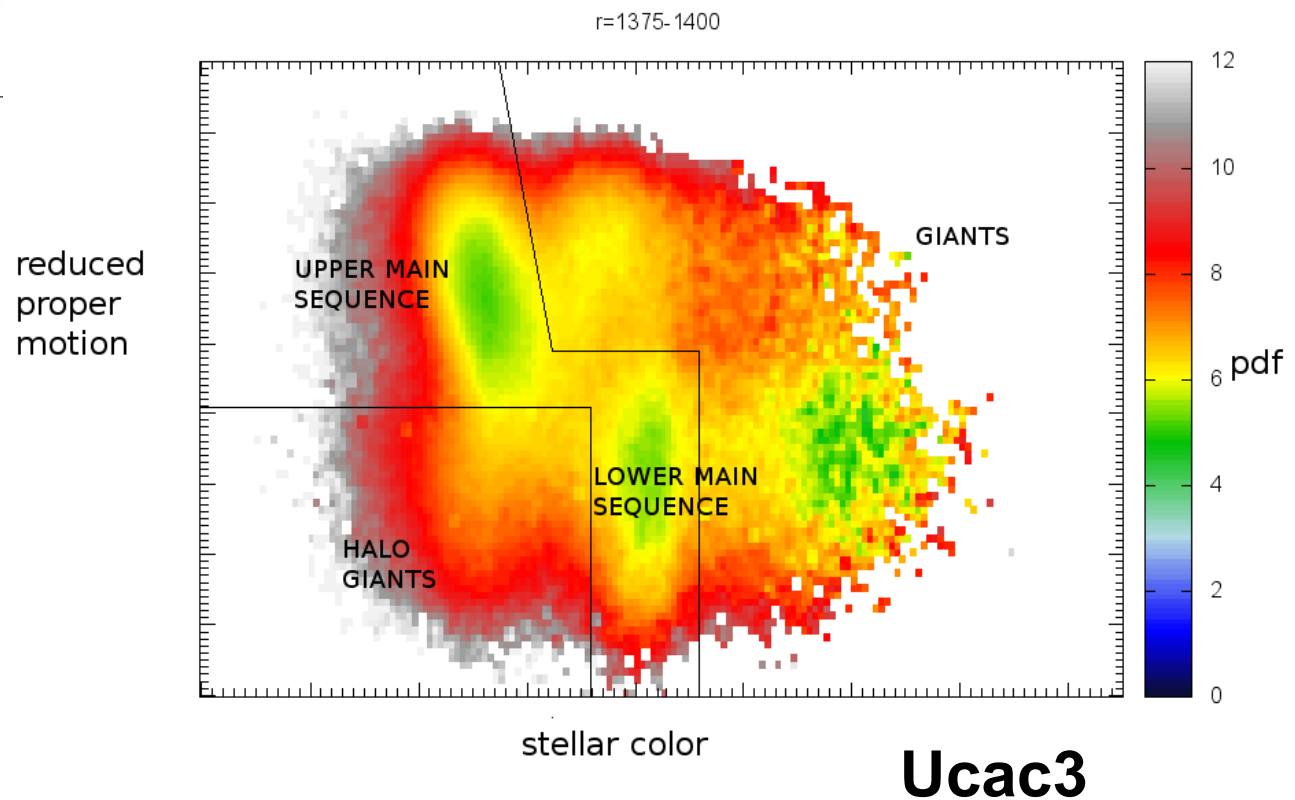
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modified Gould 2003 method

Luminosity
selection criteria

dwarfs
giants

K+5*log(pm)

Vt-K

Tycho2

Tycho2 is complete at V≈11, while UCAC3 is complete at V≈16, and they both contains proper motions (good proxies of distance / luminosity indicator). We supplemented the Tycho2 data with 2MASS (J,H,K), TASS (V,I) and UCAC3 (r) magnitudes.

r=1375-1400

reduced proper motion

UPPER MAIN SEQUENCE

GIANTS

LOWER MAIN SEQUENCE

HALO GIANTS

stellar color

pdf

12
10
8
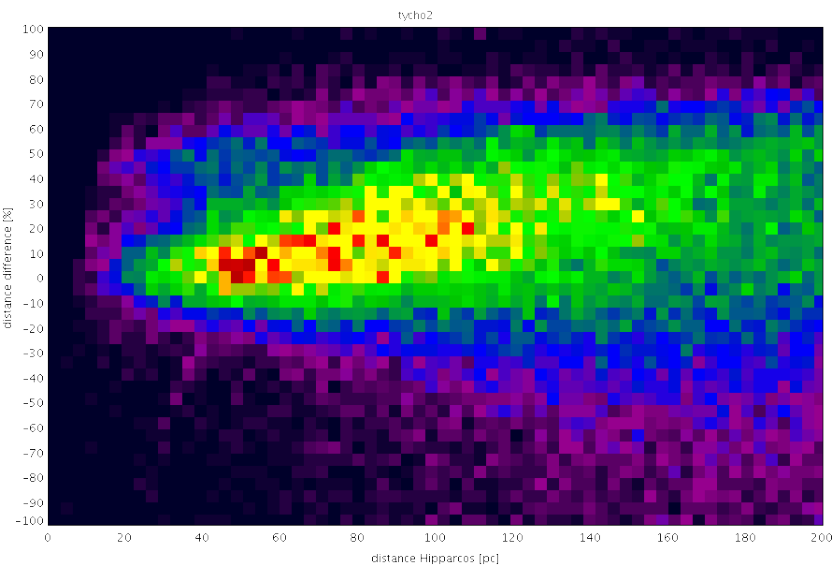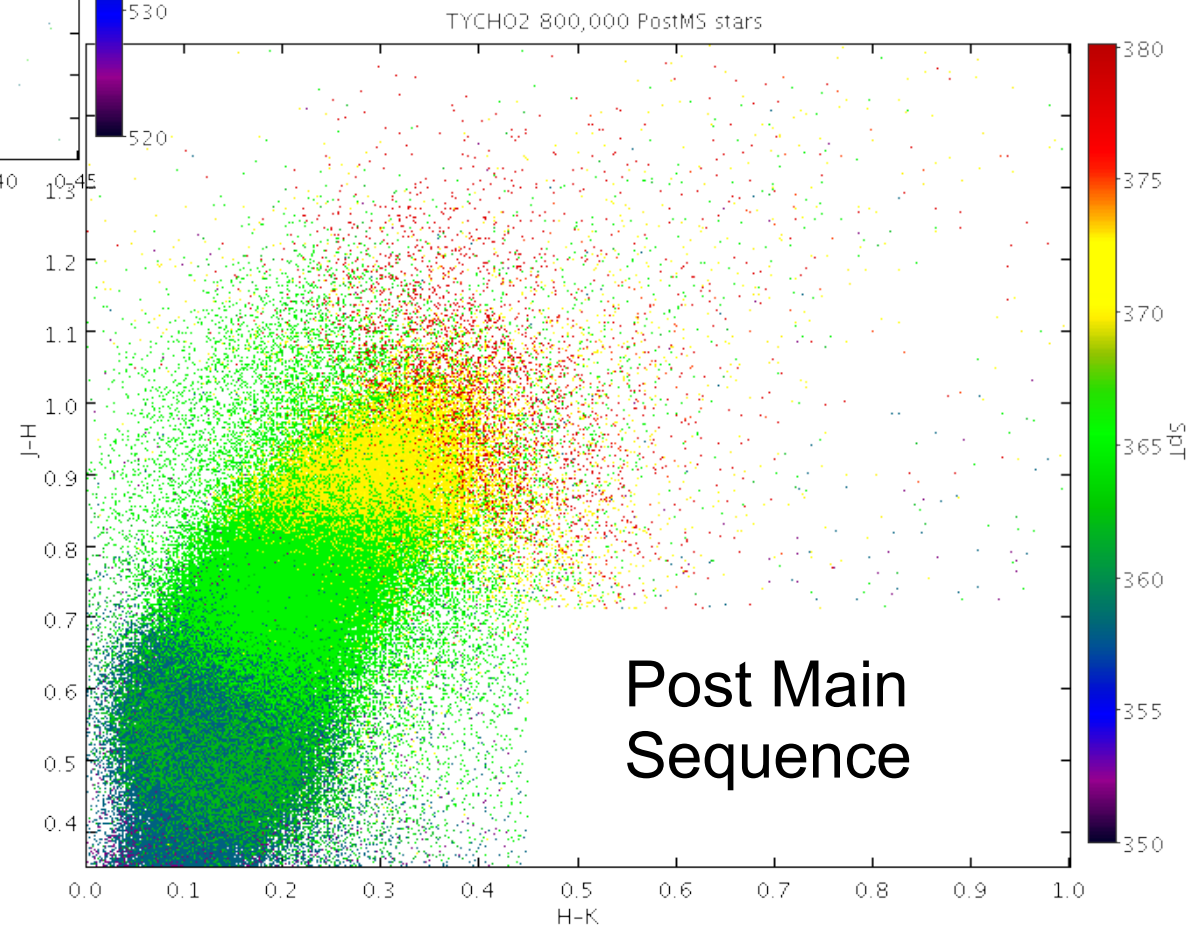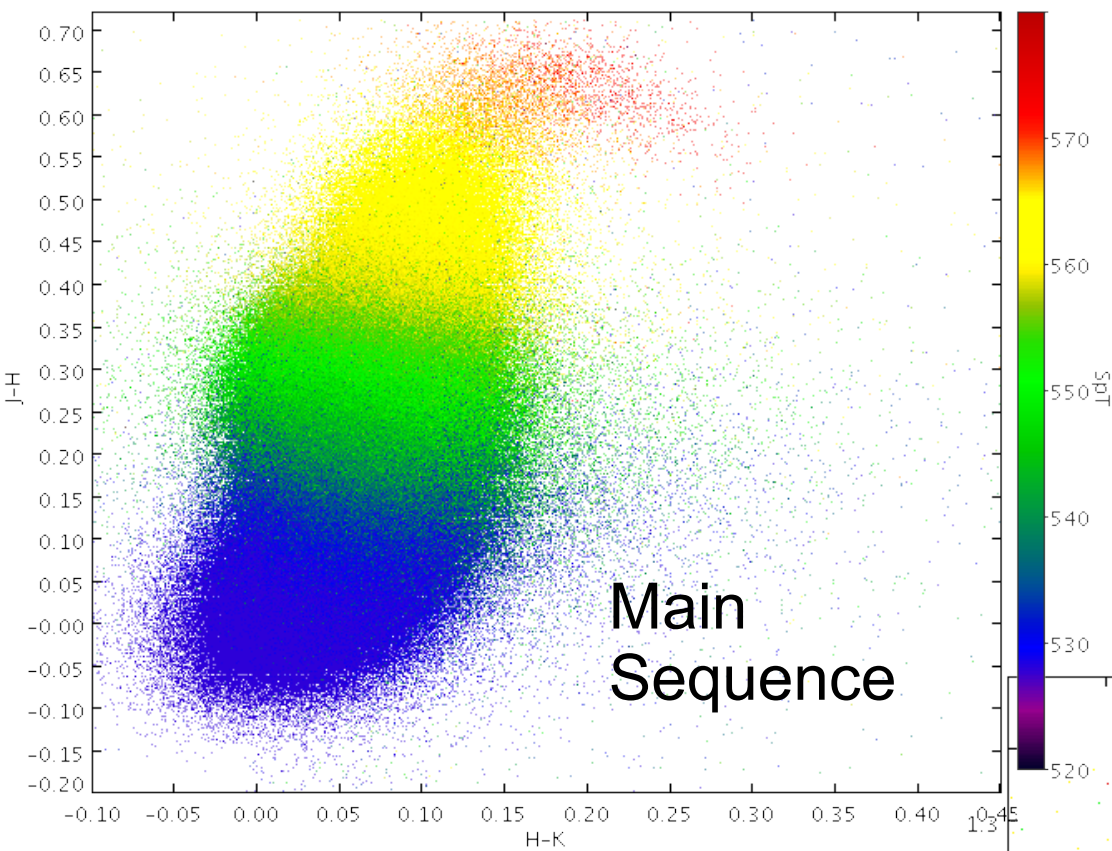6
4
2
0

Ucac3

Classification method

For each star of our 2 catalogs, and for each point of our fiducial sequences we formed the χ^2 for a grid of distances:

$$\chi^2 = \Sigma_i (\text{obs.col.} - \text{col}_0 - \text{C.E.})^2 +$$

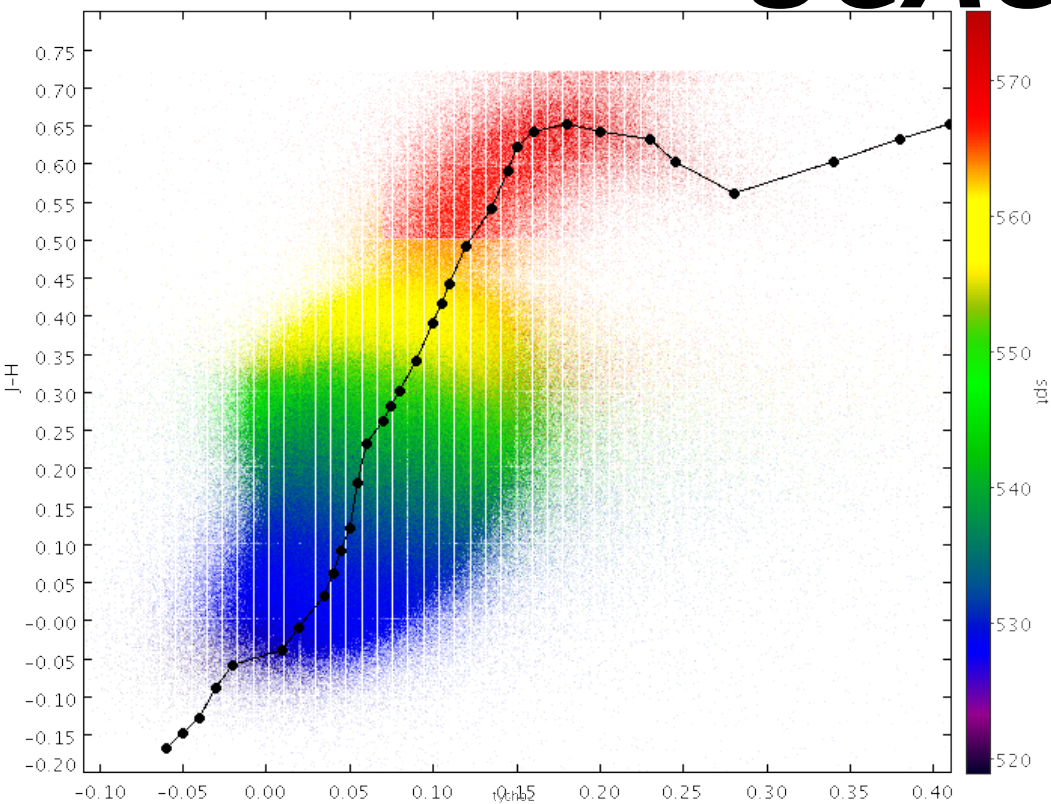$$(\text{K}_{mag} - \text{K}_{mag,0}) - 5\log(d) + 5 - \text{A}_k)^2$$

The "stellar template" and the distance that provide the minimum χ^2 are chosen as the nominal values for the stars, we use the χ^2 surface for determining the 3σ on absolute magnitude and distance.

Adopting a solar metallicity BC table we determined also the luminosity, radii and mass of the star.

TYCHO2 1.6million MS stars

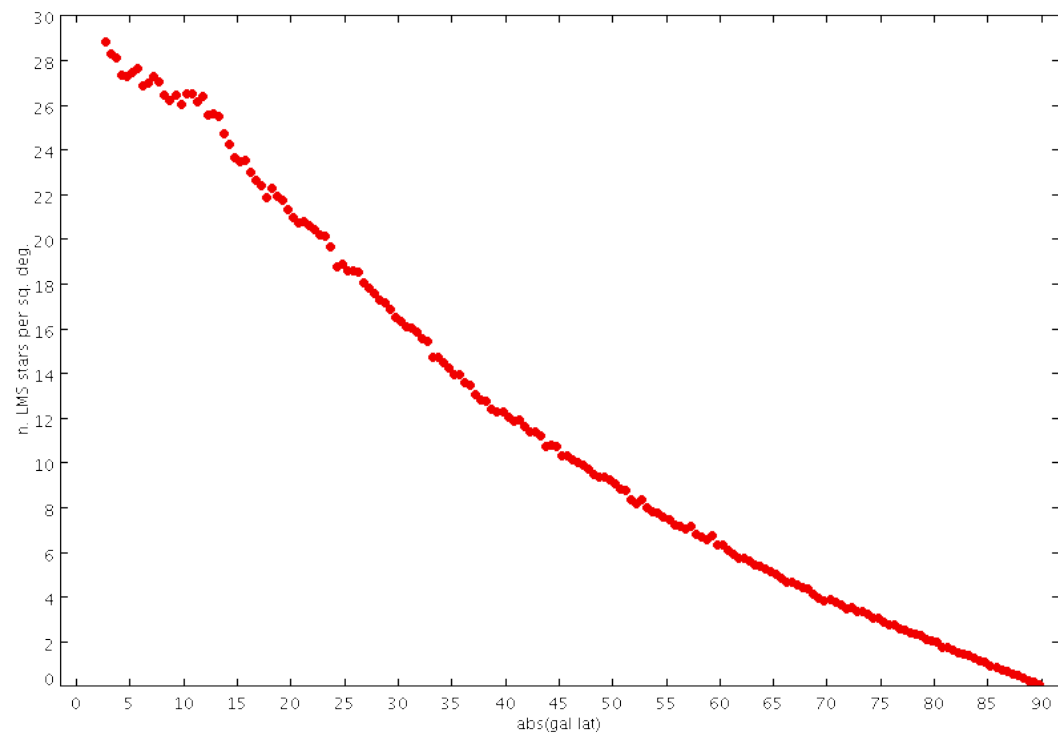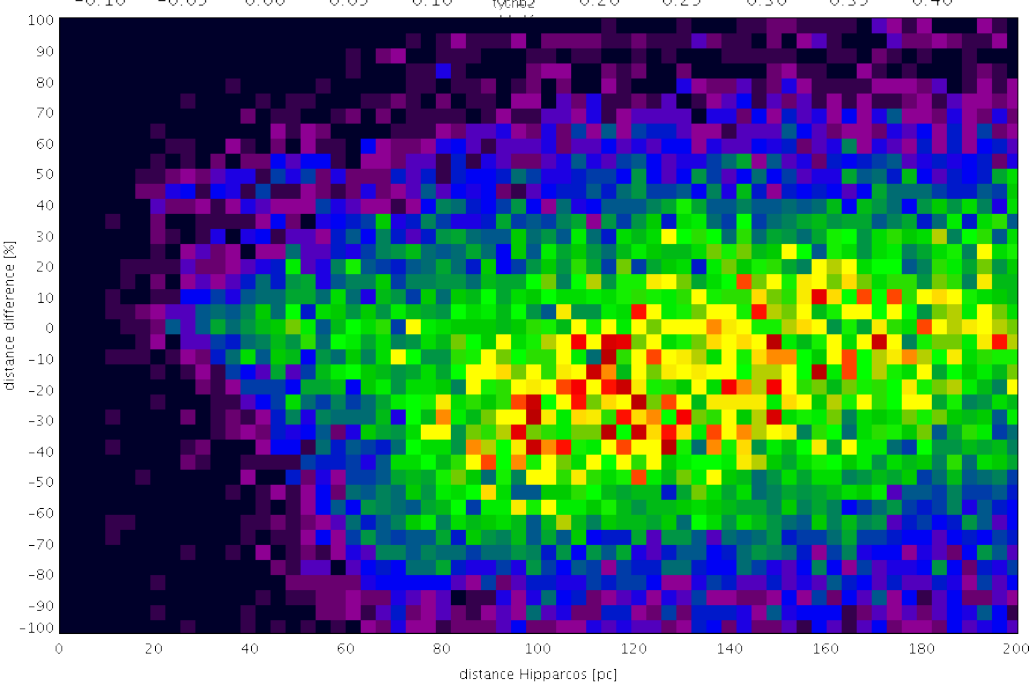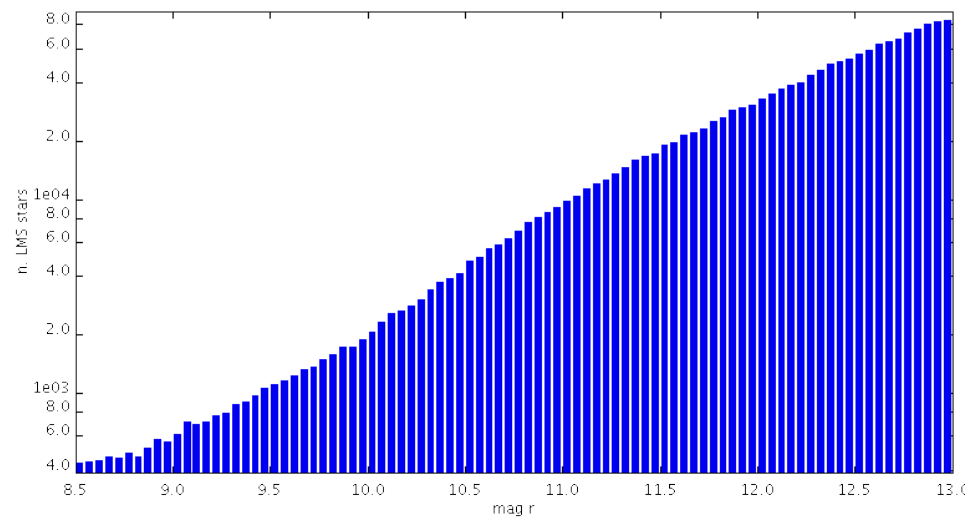Main Sequence

TYCHO2 800,000 PostMS stars

Post Main Sequence

tycho2

Tycho2 classification results

UCAC3 results

bright sample:

6 millions of stars brighter than R=13

Av in the galactic plane

Av in the meridian plane

Extinction maps from TYCHO2
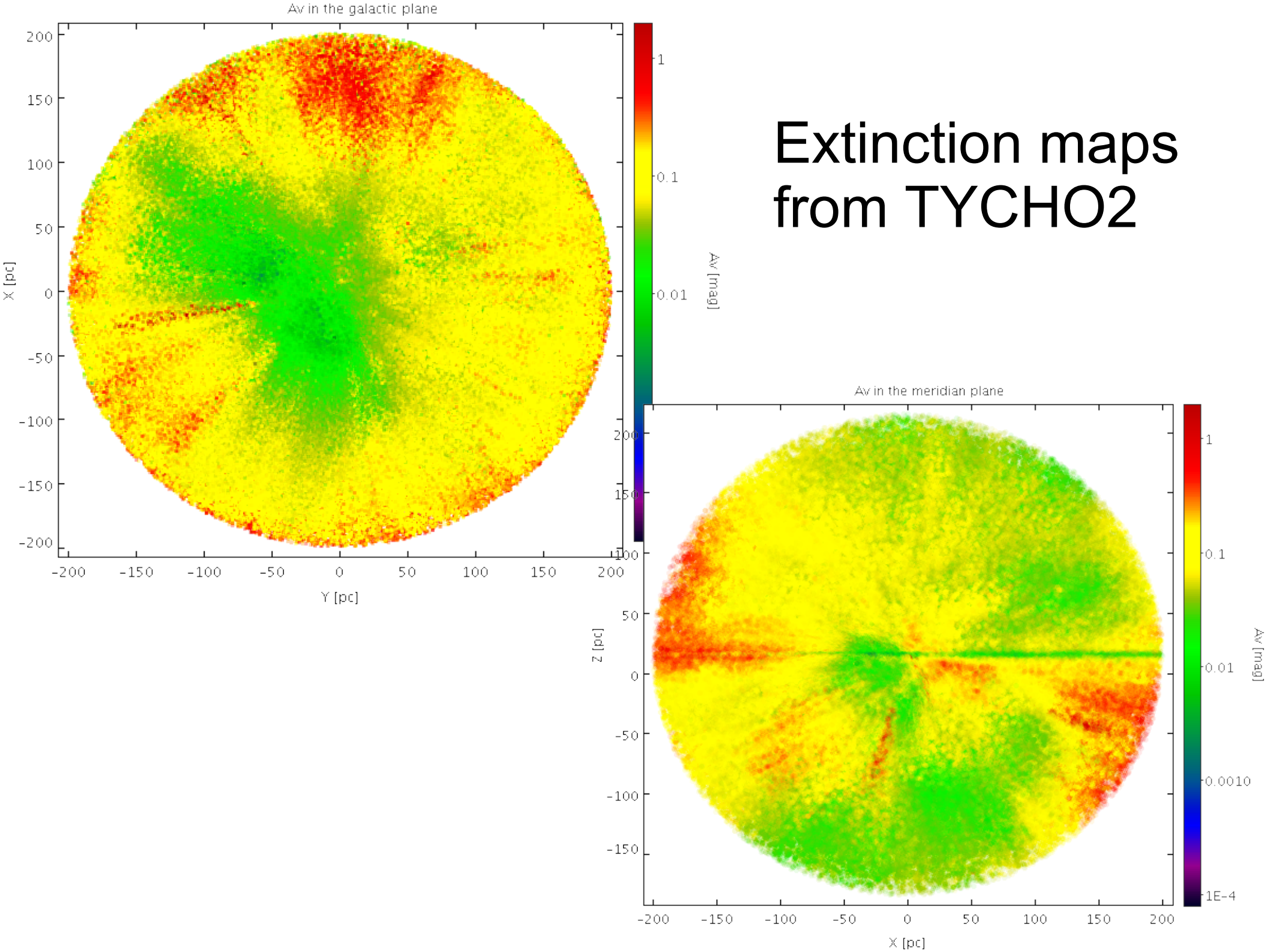
All sky distribution of the FGKM dwarfs with R<13
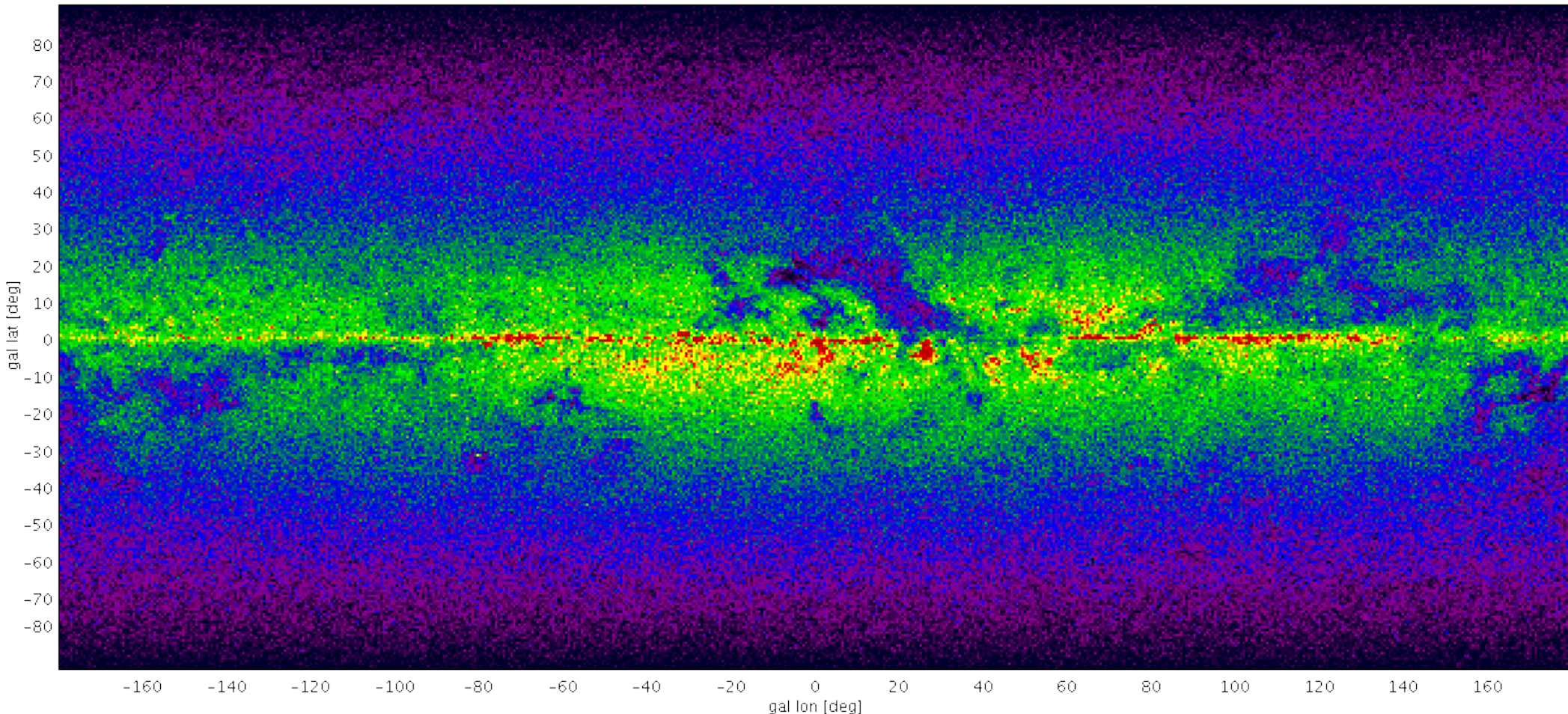
The catalogs *can* be exploited immediately by the PLATO community for estimating the stellar populations in the observable fields.

Data will be available upon request.