

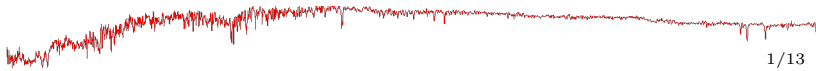


Stellar ages with LAMOST and Gaia

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Why care about ages

- ▶ Important for galactic studies:
 - ▶ age-metallicity relation;
 - ▶ thin-/thick-disk and halo ages;
 - ▶ initial mass function of field stars;



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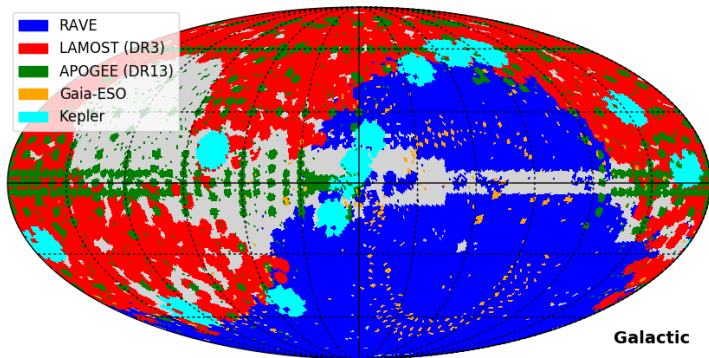


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- ▶ Many more...



Coverage



A **U**nified tool to estimate **D**istances, **A**ges and **M**asses from spectrophotometric data (Mints and Hekker (2017)).

$$L = \sum_{X \in (T_{\text{eff}}, \log g, [\text{Fe}/\text{H}])} \frac{(X_{\text{obs}} - X_{\text{PARSEC}})^2}{2\sigma_X^2} + \sum_{\lambda} \frac{(m_{\lambda} - M_{\lambda} - C_{\lambda}A_K - \mu_d)^2}{2\sigma_{m_{\lambda}}^2} - V_{\text{corr}}$$



- ▶ Work with PARSEC isochrones (working on addition of Dartmouth, Yale and MIST isochrones).
- ▶ Use 2MASS / AllWISE photometry.
- ▶ Split PDFs by evolutionary stage.
- ▶ Produce fits that can help to reconstruct full PDF.
- ▶ Process all large public surveys with the same tool
⇒ 2.5 million stars + new LAMOST data.



Probability density function

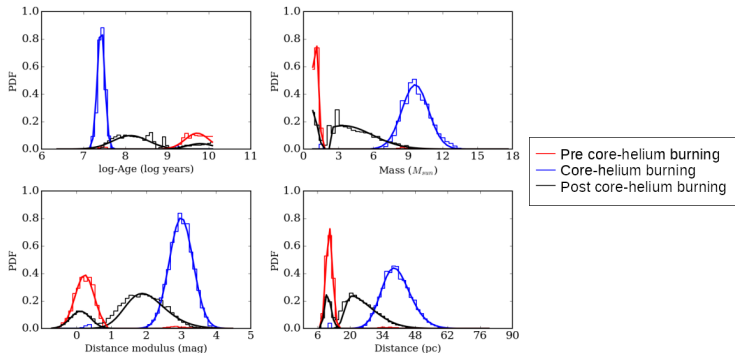


Table: TGAS overlap for different surveys. * - RAVE-on and LAMOST-Cannon were processed but not included into total, as they contain same stars as the main RAVE/LAMOST surveys.

Survey	TGAS overlap
APOGEE DR13	5,591
Gaia-ESO	67
GALAH DR1	7,919
GCS	12,011
LAMOST DR3	150,651
LAMOST-Cannon*	27,892
RAVE DR5	211,172
RAVE-on*	195,480
Total	387,411



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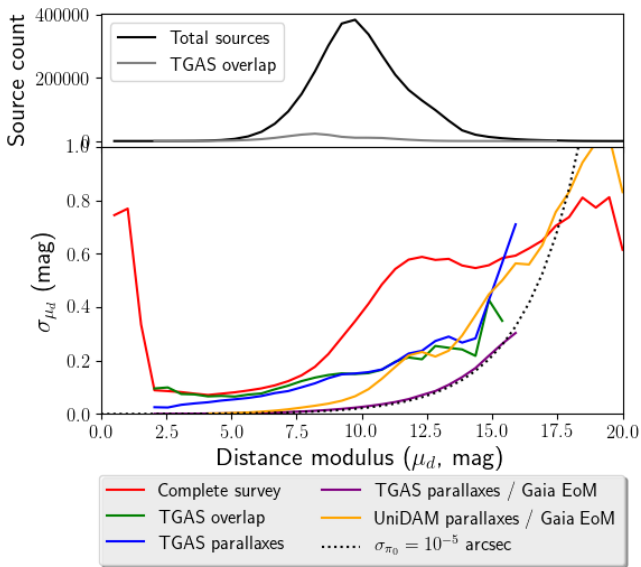
π_0 from Gaia, A_0 from Schlegel extinction map.



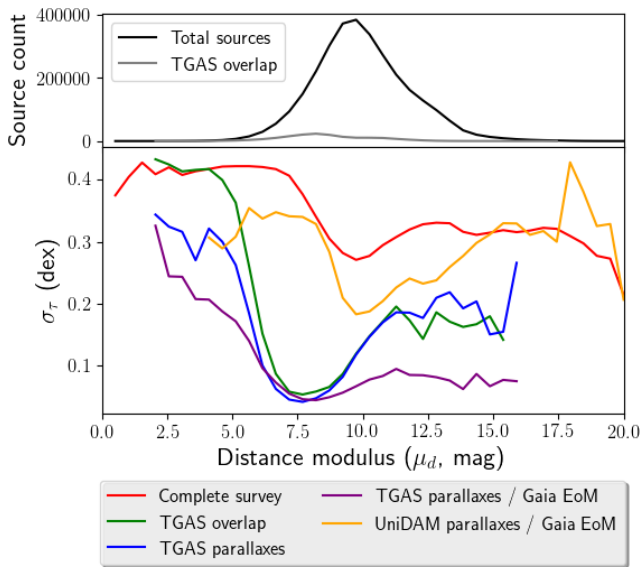
1. Complete survey;
2. TGAS overlap;
3. TGAS overlap, using TGAS parallaxes and TGAS uncertainties;
4. TGAS overlap, using TGAS parallaxes and Gaia EoM uncertainties;
5. Complete survey, using UniDAM parallaxes and Gaia EoM uncertainties;



Results for LAMOST DR3



Results for LAMOST DR3



Results

- ▶ Nearly 400,000 stars from TGAS with improved distances, ages and masses.
- ▶ Updated UniDAM version that is ready to work with Gaia DR2 parallaxes.
- ▶ We can expect $\log(\text{age})$ uncertainty as small as 0.06 dex with Gaia EoM data.

Catalogue and tool will be openly available upon submission of the paper.

