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Characterization of Galactic carbon stars from Gaia EDR3

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The third early Gaia data release (EDR3) has improved the accuracy of the astrometric parameters of numerous long-period variables (LPVs) stars. Many of these stars are on the Asymptotic Giant Branch (AGB), showing either a C-rich or O-rich envelope and are characterised by high luminosity, changing surface composition, and intense mass loss, that make them very useful for stellar studies. In a previous investigation we used Gaia DR2 astrometry to derive the luminosity function, kinematic properties and stellar population membership of a flux limited sample of carbon stars in the solar neighbourhood of different spectral types. Here, we extend this initial study to more ample and recent surveys of Galactic carbon stars and related stars by adopting the more accurate EDR3 astrometry measurements. Thanks to a much larger statistics, we confirm that N- and SC-type carbon stars share a very similar luminosity function, while the J-type stars show luminosities (Mbol) fainter by half a magnitude in average. The carbon stars of R-hot type show luminosities all along the RGB, which favours the hypothesis of an external origin for their carbon enhancement. Moreover, a significant fraction of the R-hot stars have kinematics properties compatible with the thick disk population, in contrast with that of N-, SC-type stars which would belong mostly to the thin disk. We also derive the luminosity function of a large number of Galactic extrinsic and intrinsic (O-rich) S-stars and show that the latter have luminosities typically higher than the predicted onset of the third dredge-up (TDU) during the AGB for solar metallicity. This result is consistent with these stars being genuine thermal pulsing (TP) AGB stars. On the other hand, using the so-called Gaia-2MASS diagram we show that the overwhelming majority of the carbon stars identified in the LAMOST survey as AGB stars, are probably R-hot and/or CH-type stars. Finally, we report the identification of ~ 2660 new AGB carbon stars candidates, identified thanks to their 2MASS photometry, their Gaia astrometry, and their location in the Gaia-2MASS diagram.

Session

Stellar observations (photometry and spectrometry)

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