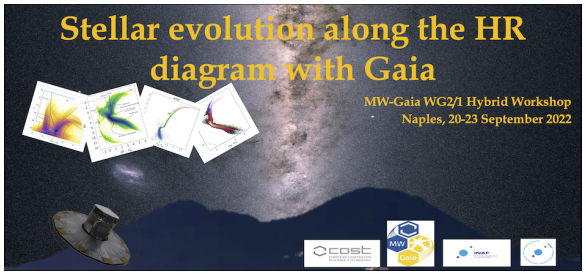

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Characterisation of Galactic carbon stars and related stars from Gaia DR3

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 diferent spectral types. Here, we extend this initial study to more recent surveys with a greater number of Galactic carbon stars and related stars by adopting the more accurate
DR3 astrometry measurements. Based on a much larger statistics, we confirm that N- and SC-type carbon stars share a very similar luminosity function, while the luminosities of J-type stars (Mbol) are fainter by half a magnitude on average. R-hot type carbon stars have luminosities throughout the RGB, which favours the hypothesis of an external origin for their carbon enhancement. Moreover,
the kinematic properties of a significant fraction of the R-hot stars are compatible with the thick-disc population, in contrast with that of N- and 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 luminosities of the latter are typically higher than the predicted onset of the third dredge-up during the AGB for solar metallicity. This result is consistent with these stars being genuine thermally pulsing 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 about 2660 new carbon stars candidates that we identified through their 2MASS photometry, their Gaia astrometry, and their location in the Gaia-2MASS diagram. The possible population membership of these new stars is briefly discussed.

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