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Post-AGB stars as tracers of the origin of elements and isotopes in the Universe.

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The chemical evolution of galaxies is governed by the chemical yields from stars, especially from Asymptotic Giant Branch (AGB) stars. Post-AGB stars are exquisite probes of AGB nucleosynthesis. Photospheric chemical studies of single post-AGB stars in the Galaxy and the Magellanic Clouds have shown an intriguing chemical diversity that ranges from stars that are extremely enriched in carbon and s-process elements to the discovery of the post-AGB stars with no traces of carbon nor s-process elements. For the Galactic post-AGB objects, the previous lack of accurate distances (luminosities and initial masses) jeopardised comparison with theoretical AGB models. However, the Gaia Early Data Release 3 (Gaia EDR3) astrometric data has allowed for a breakthrough in this research landscape: derivation of accurate luminosities (and hence initial masses) of the Galactic post-AGB stars. We found that while most known objects are in the post-AGB phase of evolution, we found a subset of low-luminosity objects likely to be in the post-horizontal branch phase of evolution, similar to AGB-manque objects found in globular clusters. We also investigated the observed bi-modality in the s-process enrichment of Galactic post-AGB single stars of similar T_{eff} and metallicities. We found that the two populations: the s-process enriched and non-enriched, have similar luminosities (and hence initial masses), revealing an intriguing chemical diversity. For a given initial mass and metallicity, AGB nucleosynthesis appears inhomogeneous and sensitive to other factors, which could be mass-loss, along with convective and non-convective mixing mechanisms. We have developed new post-AGB models tailored to the individual objects to investigate which parameters and processes dominate the photospheric chemical enrichment in these stars. In this contribution, I will present our research highlights and the updates in the field of post-AGB stars as tracers of AGB nucleosynthesis.

Session

Stellar nucleosynthesis

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