On Barium stars and the s process in AGB stars

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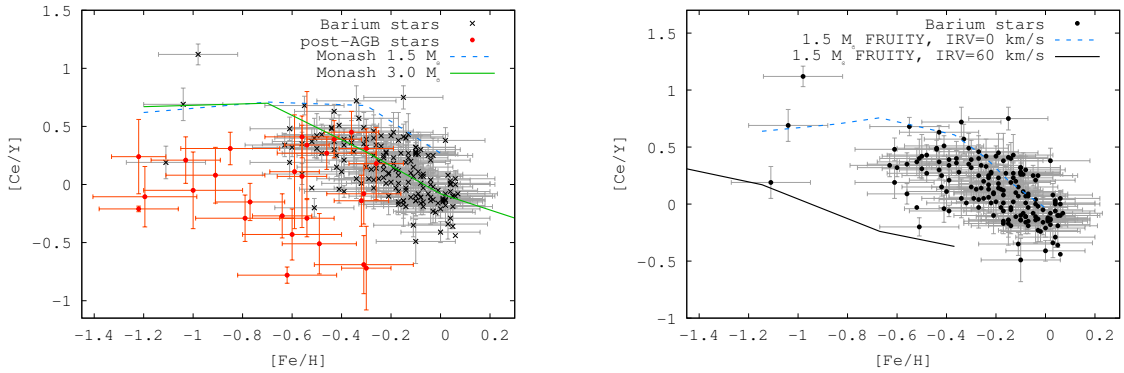
Barium stars belong to a binary system where the companion star has evolved through the AGB phase and transferred elements heavier than Fe produced by the slow neutron-capture process onto the secondary star, which is now observed. A new large set of homogeneous high resolution spectra of Ba stars makes it now possible to meaningfully compare the observational data with different AGB models and with other observations. The Ba star data shows an incontestable increase of the hs-type/ls-type element ratio (for example, Ce/Y) with decreasing the metallicity, but when comparing with post-AGB observations there is a clear difference between the two datasets (see Fig. 1a). The trend in the Ba star observations is predicted by non-rotating AGB models where ^{13}C is the main neutron source (see Fig. 1b). This poses the question if the post-AGB stars show the signature of the i process or somehow represent a different AGB population. Observations of the cores of red giant stars and of white dwarfs (the ancestors and the progeny of AGB stars, respectively) inferred via asteroseismology from Kepler observations show low core rotational velocities, which is in agreement with the results from the Ba star data and may derive from coupling between the core and the envelope.



(a) (b)

Figure 1: (a): [Ce/Y] ratios as a function of metallicity for Ba (from [1]) and post-AGB stars (from [2], and references therein) as a function of metallicity. Model predictions for two stellar masses from [3] are shown for comparison. (b): [Ce/Y] ratios as a function of metallicity for Ba stars from [1] and model predictions for a 1.5 solar mass AGB model with and without initial rotation (from [4]).

References

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