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Barium stars preserving the traces of slow neutron-capture process (12+3)

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Barium stars (Ba stars) have got special spectrum enriched in the elements of the slow neutron-capture process (s-process), created in asymptotic giant branch (AGB) stars. However, these stars have not reached the AGB phase yet, thus they preserve accreted material from an already evolved companion.

In this work, we have studied the elemental abundances of 55 Ba stars, comparing their observed abundances to the predictions of numerical AGB nucleosynthesis models. A detailed figure has been produced for each star, directly showing the observations and the estimations of the best-fitting models, transformed into the system of the Ba star. This method has given ideal fit in most of the cases, therefore proved to be a highly uncertain, but robust and inclination-independent mass-estimation method of these systems.

The mass distribution of the initial AGB mass has been derived, which is descriptive regarding the nature of these systems. For some stars, we have found that far less massive models describe the observations than previously estimated based on orbital parameters.

This algorithm provides a general algorithm for the detailed study of the system of Ba stars and can therefore be used to refine the AGB models and the still unknown details of mass transfer in these binaries.

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