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A unique mechanism to account for well known peculiarities of AGB star nucleosynthesis

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We present here the application of a model for a mass circulation mechanism in between radia- tive layers and the base of the convective envelope of low mass AGB stars, aimed at studying peculiar aspects of their nucleosynthesis. Until recently the observational evidence that s-process elements from Sr to Pb are produced by stars ascending the second giant branch could not be explained by self-consistent models, forcing researchers to extensive parameterizations. The cru- cial point is to understand how protons can be injected from the envelope into the He-rich layers, yielding the formation of 13C and then the activation of the 13C(α,n)16O reaction. On the other hand, a mass circulation mechanism in between the H-burning shell and the convective envelope is belived to account for the peculiar abundances of light nuclei (from 3He to 26Mg) observed in low mass AGB stars [1]. Also in this case, despite more than twenty years of studies, we still have not achieved a final statement on the physical process responsible for the mass transportation. The mixing scheme we present is based on a previously suggested magnetic-buoyancy process [2]. We show the "magnetic"mass transport to account adequately for both the formation of the main neutron source for s-processing in low mass AGBs [3] and the peculiar abundances of light nuclei observed in these stars. In particular our analysis results are focused on addressing the constrains to AGB nucleosynthesis coming from the isotopic composition of presolar grains recovered in meteorites [4,5]. We find that (i) n-captures driven by the magnetically-induced mixing can account for the isotopic abundance ratios of s-elements recorded in presolar SiC grains as well as (ii) the most extreme levels of 18O depletion and high concentration of 26Mg (from the decay of 26Al) shown by corundum (Al2O3) grains.

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