OBSERVATIONAL CONSTRAINTS ON THE NUCLEOSYNTHESIS IN THE MORE MASSIVE AGB STARS

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Most of the stars (M < 8 solar mass) in the Universe end their lives with a phase of strong mass loss and experience thermal pulses on the Asymptotic Giant Branch (AGB). They are one of the main contributors to the enrichment of the interstellar medium and thus to the chemical evolution of galaxies. More specifically, the more massive (M > 4 solar mass) AGB stars are expected to form very different isotopes (such as ^{87}Rb, ^{7}Li, ^{14}N, ^{13}C, ^{41}Ca, ^{60}Fe, ^{26}Al) from the isotopes formed by lower mass AGB stars and Supernova explosions, as a consequence of different dominant nuclear reaction mechanisms. The discovery that the more massive AGB stars are sources of isotopes (like the long-lived radioisotope ^{87}Rb) that are not produced in lower-mass stars, confirmed for the first time that these stars produce heavy neutron-rich (s-process) elements via ^{22}Ne as neutron source [1,2]. The extreme Rb abundances and extraordinarily high [Rb/Zr] ratios observed, however, represent a challenge for theoretical AGB nucleosynthesis models [3,4]. Very recently, we have used more realistic model atmospheres for massive AGBs that include a gaseous circumstellar envelope [5]. The new Rb abundances and [Rb/Zr] ratios derived with these dynamical models significantly resolve the problem of the present mismatch between the observations of the more massive Rb-rich AGB stars and the theoretical predictions [5], providing fundamental constraints to the AGB nucleosynthesis models and nuclear physics.

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