Non standard s-process in massive rotating stars. Yields of 10 - 150 Msun models at Z = 1e-3

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Context: recent studies show that rotation significantly affects the s-process in massive stars.
Aims: we provide tables of yields for non-rotating and rotating massive stars between 10 and 150 Msun at Z=1e-3 ([Fe/H] =-1.8). Tables for different mass cuts are provided. The complete s-process is followed during the whole evolution with a network of 737 isotopes, from Hydrogen to Polonium.
Methods: a grid of stellar models with initial masses of 10, 15, 20, 25, 40, 60, 85, 120 and 150 Msun and with an initial rotation rate of both 0 or 40 % of the critical velocity was computed. Three extra models were computed in order to investigate the effect of faster rotation (70 % of the critical velocity) and of a lower 17O(a,g) reaction rate.
Results: at the considered metallicity, rotation has a strong impact on the production of s-elements for initial masses between 20 and 60 Msun. In this range, the first s-process peak is boosted by 2-3 dex if rotation is included. Above 60 Msun, s-element yields of rotating and non-rotating models are similar. Increasing the initial rotation from 40% to 70% of the critical velocity enhances the production of elements with 40 < Z < 60 by 0.5-1 dex. Adopting a reasonably lower 17O(a,g) rate in the fast rotating model (70 % of the critical velocity) boosts again the yields of s-elements with 55 < Z < 82 by about 1 dex. In particular, a modest amount of Pb is produced. Together with s-elements, some light elements (particularly fluorine) are strongly overproduced in rotating models.

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Comments:

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