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The s-process nucleosynthesis in low mass stars: impact of the uncertainties in the nuclear physics determined by Monte Carlo variations

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We investigated the impact of uncertainties in neutron-capture and weak reactions (on heavy elements) on the s-process nucleosynthesis in low-mass stars using a Monte-Carlo based approach. We performed extensive nuclear reaction network calculations that include newly evaluated temperature-dependent upper and lower limits for the individual reaction rates. Consistent with previous studies, we found that beta-decay rate uncertainties affect only a few nuclides near s-process branchings, whereas most of the uncertainty in the final abundances is caused by uncertainties in neutron capture rates, either directly producing or destroying the nuclide of interest. Combined total nuclear uncertainties due to reactions on heavy elements are in general less than 50%.

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