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Reducing Uncertainty of Neutron Capture Reaction Calculations for Stellar Nucleosynthesis HANNAH LITTLE, TOSHIHIKO KAWANO, MICHAEL BERTOLLI, Los Alamos National Laboratory — Astrophysicists believe that all elements on Earth are derived from nucleosynthesis in stars, a process of creating new atomic nuclei from neutrons and protons that already exist. While one ultimate goal is to see the actual distribution of elements in stars line up with experimental results, thereby supporting the hypothesis, many necessary reaction rates cannot be measured empirically and thus we must rely on theoretical calculations to come up with data. Neutron capture reactions play a big role in nucleosynthesis, and the statistical Hauser-Feshbach model is often adopted to calculate the neutron capture rates. My objective is to reduce the uncertainty of the calculations by adjusting different parameters, such as the gamma-ray strength and the level densities. For a certain set of nuclides for which Maxwellian Averaged Cross Sections (MACS) have been experimentally determined, I found better descriptions of the gamma strength function and the level density parameters that well fit the experimental MACS values. By continuing to adjust parameters to make the calculation results align with experimental values, we expect the calculation will become more accurate so that we can extrapolate and calculate quantities that cannot be measured.

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