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Sensitivity of X-ray Burst Models to Uncertainties in Nuclear Processes[1] KARL SMITH, ALAN MATTHEW AMTHOR, RICHARD CYBURT, National Superconducting Cyclotron Laboratory, ALEXANDER HEGER, Los Alamos National Laboratory, EMILY JOHNSON, Dept. of Physics, Michigan State University, HENDRIK SCHATZ, National Superconducting Cyclotron Laboratory
— X-ray burst models simulate thermonuclear explosions on the surface of accreting neutron stars, offering new and exciting research in nuclear astrophysics. The underlying nuclear reaction sequence in the X-ray bursts is the rp-process, a sequence of proton captures and beta decays on proton-rich nuclei. We examine the sensitivity of current X-ray burst models within nuclear reaction rate uncertainties in terms of predicted X-ray light curves and final produced ashes. Many of the relevant reaction rates have significantly large uncertainties, which can greatly impact the results of X-ray burst models. We use an updated nuclear reaction network and run almost 800,000 simulations with a one-zone X-ray burst model to determine the impact of reaction rate variations. We also explore the validity of the one-zone approximation by comparing to a full 1D multi-zone model. Simple one-zone models are shown to be a useful tool for investigating nuclear physics influences on Type I X-ray bursts.

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