Abstract Submitted
for the DNP17 Meeting of
The American Physical Society

Nuclear Physical Uncertainties in Modeling X-Ray Bursts[1] ERIC REGIS, A. MATTHEW AMTHOR, Bucknell University — Type I x-ray bursts occur when a neutron star accretes material from the surface of another star in a compact binary star system. For certain accretion rates and material compositions, much of the nuclear material is burned in short, explosive bursts. Using a one-dimensional stellar model, Kepler, and a comprehensive nuclear reaction rate library, ReacLib, we have simulated chains of type I x-ray bursts. Unfortunately, there are large remaining uncertainties in the nuclear reaction rates involved, since many of the isotopes reacting are unstable and have not yet been studied experimentally. Some individual reactions, when varied within their estimated uncertainty, alter the light curves dramatically. This limits our ability to understand the structure of the neutron star. Previous studies have looked at the effects of individual reaction rate uncertainties. We have applied a Monte Carlo method-simultaneously varying a set of reaction rates-in order to probe the expected uncertainty in x-ray burst behaviour due to the total uncertainty in all nuclear reaction rates. Furthermore, we aim to discover any nonlinear effects due to the coupling between different reaction rates. Early results show clear non-linear effects.

[1]This research was made possible by NSF-DUE Grant 1317446, BUScholars Program.

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Date submitted: 07 Aug 2017 Electronic form version 1.4