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Sensitivity of Carbon Synthesis in Accreting Neutron Stars to Reaction Rate and Network Parameter Variations JEREMY STEVENS, NSCL, JINA, HENDRIK SCHATZ, NSCL, JINA, Michigan State University, RICHARD CYBURT, NSCL, JINA, ED BROWN, NSCL, JINA, Michigan State University, ANDREW CUMMING, McGill University — Superbursts from accreting neutron stars represent an opportunity for probing nuclear processes at densities ($\rho \approx 10^9$ gr cm^{-3}) and temperatures ($T > 10^9$K) only available in a few other astrophysical locations. These 10^{42} erg bursts are most likely triggered by unstable ignition of carbon in an otherwise inert sea of heavy nuclei made during the rp-process of regular type I bursts (where the accumulated hydrogen and helium are burned). An open question is the origin of sufficient amounts of carbon, which is largely destroyed during the rp-process in X-ray bursts. We explore carbon production in steady state burning via the rp-process, which might occur together with unstable burning in systems showing super bursts. We determine carbon production for a range of accretion rates and helium mass fractions. We then examine the sensitivity of this production of carbon to steady state model parameters as well as reaction rate variations and identify critical nuclear reaction rates.

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