Abstract Submitted
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Electron Capture in Core Collapse Supernovae[1] THOMAS GRUBB, Michigan State University, CHRIS SULLIVAN, REMCO ZEGERS, Michigan State University, National Superconducting Cyclotron Laboratory, Joint Institute for Nuclear Astrophysics, EVAN O'CONNOR, University of Toronto, Canadian Institute for Theoretical Astrophysics, NSCL CHARGE EXCHANGE GROUP TEAM — In stars with mass $M \geq\approx 8M_\odot$, core collapse supernovae occur when the mass of the core reaches the Chandrasekhar Limit. This collapse is followed by a "bounce," after which the star explodes and completes the type II supernova process. Just before bounce, electron degeneracy pressure in the star's core is removed through electron capture. Low entropy levels in the star cause electron capture on heavy nuclei to affect the supernova much more strongly than capture on free protons, which makes understanding the weak reaction rates of stellar nuclei essential to characterizing the core collapse process (Langanke et al, "Electron capture rates on nuclei and implications for stellar core collapse"). We combine two programs, NuLib and GR1D, which respectively provide a library of neutrino interaction rates and a hydrodynamic simulation of stellar collapse, to study the consequences that varying weak reaction rates have on the supernova process. In doing so, we find groups of nuclei that contribute most strongly to the core collapse process, and better understand the level of certainty needed for accurate astrophysical modeling. This work allows us to advise for and against experimental efforts on nuclei in order to use resources as efficiently as possible.

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