Abstract Submitted
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Equations of State for Supernova Simulations[1] JAMES LATTIMER, Stony Brook University, TERASCALE SUPERNOVA INITIATIVE COLLABORATION[2] — New formulations of dense matter equations of state suitable for use in supernova and neutron star simulations are described. These equations of state are based on the compressible liquid droplet model of Lattimer et al. (Nucl. Phys. A432, 646 [1985]) and contain several modifications and improvements to the models of Lattimer & Swesty (Nucl. Phys. A535, 331 [1991]). Changes include consideration of the nuclear neutron skin, convergence even for arbitrarily low temperatures, electron fractions and densities, and the incorporation of relativistic field-theoretical nucleon interactions in addition to non-relativistic potential nuclear forces. For each nuclear interaction, surface energy parameters are evaluated from Thomas-Fermi semi-infinite calculations, so that surface properties remain consistent with bulk matter properties. Comparisons are made between models with significantly different nucleon-nucleon interaction parametrizations, and with results obtained from conventional "nuclear statistical equilibrium" calculations at lower densities. The properties of cold neutron star matter in the crust of neutron stars and implications for the astrophysical r-process are also discussed.

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