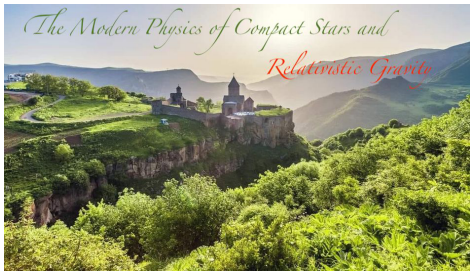

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Finite temperature equations of state

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We review the equation of state (EoS) models covering a large range of temperatures, baryon number densities and electron fractions presently available on the \textsc{CompOSE} database. These models are intended to be directly usable within numerical simulations of core-collapse supernovae, binary neutron star mergers and proto-neutron star evolution. We discuss their compliance with existing constraints from astrophysical observations and nuclear data. For a selection of purely nucleonic models in reasonable agreement with the above constraints, after discussing the properties of cold matter, we review thermal properties for thermodynamic conditions relevant for core-collapse supernovae and binary neutron star mergers. We find that the latter are strongly influenced by the density dependence of the nucleon effective mass. The selected bunch of models is used to investigate the EoS dependence of hot star properties, where entropy per baryon and electron fraction profiles are inspired from proto-neutron star evolution. The Γ-law analytical thermal EoS used in many simulations is found not to describe well these thermal properties of the EoS. However, it may offer a fair description of the structure of hot stars whenever thermal effects on the baryonic part are small, as shown here for proto-neutron stars starting from several seconds after bounce.

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