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Sensitivity of stellar physics to the equation of state[1] DAMIAN SWIFT, TOM LOCKARD, Lawrence Livermore Natl Lab, MANDY BETHKENHAGEN, U. of Rostock, ANDREA KRITCHER, SEBASTIEN HAMEL, DAVID DEARBORN, Lawrence Livermore Natl Lab — The formation and evolution of stars depends on various physical aspects of stellar matter, including the equation of state (EOS) and transport properties. Although often dismissed as 'ideal gas-like' and therefore simple, states occurring in stellar matter are dense plasmas, and the EOS has not been established precisely. EOS constructed using multi-physics approaches found necessary for laboratory studies of warm dense matter give significant variations in stellar regimes, and vary from the EOS commonly used in simulations of the formation and evolution of stars. We have investigated the sensitivity of such simulations to variations in the EOS, for sun-like and low-mass stars. We find a high sensitivity of the lifetime of the Sun and of the lower luminosity limit for red dwarfs, and a significant sensitivity in the lower mass limit for red dwarfs. Simulations of this type are also used for other purposes in astrophysics, including the interpretation of absolute magnitude as mass, the conversion of inferred mass distribution to the initial mass function using predicted lifetimes, simulations of star formation from nebulae, simulations of galactic evolution, and the baryon census used to bound the exotic contribution to dark matter.

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