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Mass ejection in failed supernovae: equation of state and neutrino loss dependence[1] MARIO IVANOV, RODRIGO FERNANDEZ, Univ of Alberta — A failed core-collapse supernova from a non-rotating progenitor can eject mass due to a weakening of gravity associated to neutrino emission by the protoneutron star. This mass ejection mechanism yields observable transients and sets an upper limit to the mass of the remnant black hole (BH). Here we report on global hydrodynamic simulations of this mechanism that evolve the inner supernova core with a spherically-symmetric, general-relativistic neutrino radiation-hydrodynamic code until BH formation, and the outer stellar layers with a Newtonian code that captures the response of the star to the change in gravity. We find that the dense-matter equation of state (EOS) can introduce a factor of about 2 variation in gravitational mass lost to neutrinos, with a stiff EOS matching previous parametric results, and a soft EOS yielding lower ejecta masses and energies by a factor of several. With a soft EOS, our red and yellow supergiant progenitors fail to unbind mass if hydrogen recombination energy is not included. Our results imply quantitative but not qualitative modifications to previous predictions for shock breakout, plateau emission, and final BH masses from these events.

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