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Building CCSN Explosion Simulation with Spectral Two-Moment Neutrino Transport Using FLASH RAN CHU, University of Tennessee, Knoxville, AUSTIN HARRIS, EIRIK ENDEVE, Oak Ridge National Laboratory, ANTHONY MEZZACAPPA, University of Tennessee, Knoxville — We are developing the toolkit for high-order neutrino-radiation hydrodynamics (thornado) to simulate in an efficient and robust manner core-collapse supernova (CCSN) explosions. thornado implements spectral two-moment neutrino transport with a high-order discontinuous Galerkin method and implicit-explicit time stepping. More details of our numerical methods are presented in previous publications[1][2]. WeakLib[3] is a microphysics library that provides input microphysics (equations of state (EoS) and neutrino opacities) by table interpolation. thornado and WeakLib have been coupled with FLASH[4] as external libraries. With this enhanced FLASH code, we hope to simulate CCSN explosions in multiple dimensions with self gravity, hydrodynamics, spectral two-moment neutrino transport, the Steiner, Hempel and Fischer (SFHo)[5] EoS, and "Bruenn 85"[6] neutrino opacities. Here we present select physically motivated test problems and preliminary results from gravitational collapse.

[1]Endeve et al. 2015, JCP, 287, 151-183
[2]Chu et al. 2019, JCP, 389,62-93
[3]WeakLib: https://github.com/starkiller-astro/weaklib
[4]Fryxell et al. 2000, AJSS, 131.1, 273
[5]Steiner et al. 2010, Astro. J., 722(1), p.33
[6]Bruenn, S. W. 1985, AJSS, 58, 771-841

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