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thornado-Hydro: A Discontinuous Galerkin Method for General Relativistic Hydrodynamics with an Eye towards Simulating Core-Collapse Supernovae[1] SAMUEL DUNHAM, Vanderbilt University, NICK ROBERTS, ZACHARY M. ELLEDGE, University of Tennessee, EIRIK ENDEVE, University of Tennessee, Oak Ridge National Lab, ANTHONY MEZZACAPPA, University of Tennessee, KELLY HOLLEY-BOCKELMANN, Vanderbilt University, Fisk University, DAVID POCHIK, The Ohio State University, BRANDON BARKER, Michigan State University, JESSE BUFFALOE, University of Tennessee — We present results from thornado [1], a neutrino-hydrodynamics code being developed for simulations of core-collapse supernovae that uses high-order-accurate discontinuous Galerkin (DG) methods [2]. Here, our primary focus is on the module that solves the hydrodynamics equations under the conformally-flat approximation (CFA) to general relativity (GR) [3], and its coupling to Poseidon [4], a CFA gravity solver. GR is needed to capture properly, among other things, the compactness of the proto-neutron star and, in turn, the neutrino luminosities emanating from it (e.g., see [5]). We discuss details of the numerical method and show results from the self-similar collapse of a polytropic star, as well as the adiabatic collapse of a 15 solar mass progenitor. The latter requires a tabulated, nuclear equation of state to capture the dynamics up to bounce. The results from each of these test problems are compared with their Newtonian counterparts [6]. We also discuss progress on our work to develop a DG neutrino transport solver under the CFA. [1] Dunham et al. 2020 J. Phys.: Conf. Ser. 1623 012012 [2] Cockburn & Shu 2001 JSC 16 173 [3] Wilson et al. 1996 PRD 54 1317 [4] Roberts et al. 2021 (in prep.) [5] Bruenn et al. 2001 ApJ 560 326 [6] Pochik et al. 2020 arXiv: 2011.04680

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