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Introducing Flow-er: a Hydrodynamics Code for Relativistic and Newtonian Flows[1] PATRICK MOTL, IGNACIO OLABARRIETA, JOEL TOHLINE, Louisiana State University — We present a new numerical code (Flow-er) for calculating astrophysical flows in 1, 2 or 3 dimensions. We have implemented equations appropriate for the treatment of Newtonian gravity as well as the general relativistic formalism to treat flows with either a static or dynamic metric. The heart of the code is the recent non-oscillatory central difference scheme by Kurganov and Tadmor (2000). With this technique, we do not require a characteristic decomposition or the solution of Riemann problems that are required by most other high resolution, shock capturing techniques. Furthermore, the KT scheme naturally incorporates the Method of Lines, allowing considerable flexibility in the choice of time integrators. We have implemented several interpolation kernels that allow us to choose the spatial accuracy of an evolution. Flow-er has been tested against an independent implementation of the KT scheme to solve the relativistic equations in 1d - which we also describe. Flow-er can serve as the driver for the hydrodynamical portion of a simulation utilizing adaptive mesh refinement or on a unigrid. In addition to describing Flow-er, we present results from several test problems.

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