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A new code for the numerical simulation of relativistic flows on supercomputers by means of a low-dissipation scheme

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A new code to simulate special relativistic hydrodynamic flows on supercomputer architectures with distributed memory is described. The code is based on a combination of Godunov's method and a piecewise parabolic method with a local stencil. This approach has good conservation properties, correctly reproduces shock waves, and ensures high accuracy on smooth solutions and low dissipation on discontinuities. Only a local computation stencil is needed for the piecewise parabolic reconstruction of the solution. The code scalability is 94% on a cluster, Intel Xeon X5670 NKS-30T, with 768 cores. The results of code verification using a relativistic jet problem and computational experiments on the evolution of a galactic jet are presented.

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