

Abstract Submitted
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Temporally Iterative Spatial Refinement: How to Predict the Unpredictable¹ WILLIAM BLACK, DAVID NEILSEN, HYUN LIM, ERIC HIRSCHMANN, Brigham Young University — In nonlinear fluid dynamics, sharp small-scale features can spontaneously develop from smooth fluid flows, which poses a challenge for computational simulations. Adaptive Wavelet Multiresolution Representation (AWMR) techniques use wavelets to adapt the computational grid to the features of a solution, thereby decreasing computational time. We use AWMR to solve the relativistic fluid equations. However, the formation of especially strong shocks can lead to solutions with unacceptable levels of noise. Temporally Iterative Spatial Refinement (TISR) iterates the fluid update in time, adding resolution when these features appear, thereby anticipating the resolution required for the emerging shock. The TISR method thus provides a robust method for accurately computing developing shocks, and can be used in a wide variety of adaptive numerical methods.

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