

A Relativistic Magnetohydrodynamic Code based on Upwind Scheme

Hanbyul Jang¹ and Dongsu Ryu¹

¹Department of Astronomy and Space Science, Chungnam
National University, Daejeon 305-764, Korea

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Abstract

Building a relativistic magnetohydrodynamic (RMHD) code based on upwind scheme is a challenging project, because analytic expressions for eigenvalues and eigenvectors were not yet given. In this work, we first have obtained an analytic form for eigenvalues, which is complicated but manageable. We then have found that eigenvectors, when expressed in terms of eigenvalues, can be written down in a very simple form. Here, we present a code based on the total variation diminishing (TVD) scheme using the eigenvalues and eigenvectors, and show tests performed with the code.