Gas-Kinetic Scheme for Ideal Magnetohydrodynamics

K. Xu[1] **and H. Z. Tang**[2]

Abstract:

A gas-kinetic BGK-type flux splitting method is developed for the ideal magnetohydrodynamics (MHD) equations. The scheme is based on the direct splitting of the flux function of the MHD equations with the inclusion of "particle" collisions in the transport process. Consequently, the artificial dissipation in the BGK scheme is much reduced in comparison with the MHD Flux Vector Splitting method based on the collisionless Boltzmann equation.. The numerical results from the current scheme are favorable in comparison with that from the Roe-type MHD solver. In the current talk, the general principle of splitting the macroscopic flux function based on the gas-kinetic theory is presented. The second-order MUSCL-type BGK scheme will also be introduced. The numerical tests include the spherical explosion, the Kelvin–Helmholtz instability, and the Orszag–Tang MHD turbulence problems.

[1] Department of Mathematics
Hong Kong University of Science and Technology,
Clear Water Bay, Kowloon, Hong Kong
makxu@ust.hk

[2] Department of Scientific Computing
Beijing University, Beijing, China