ハイブリッドコードによる磁気回転不安定性の局所シミュレーション

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Local hybrid simulation of Magneto Rotational Instability

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Magneto-Rotational Instability (MRI) is a plasma instability which is considered to take place in a magnetized differentially rotating astrophysical disks. It is first proposed by Velikhov in 1959 and later by Chandrasekhar in 1960. Its importance in astrophysical rotating disk was pointed out by Balbus and Hawley in 1991.

This instability can generate MHD turbulence within a few periods of orbit and can generate a strong turbulent viscosity. Thus this instability is considered to play a major role in the context of accretion which requires a strong viscous effect to transport angular momentum in the disk. Nonlinear behavior of MRI is mainly studied by numerical simulations under MHD approximation which assumes the plasma as a single component fluid. However, results from the linear analysis of multi-component plasma shows that behavior of MRI can be modified due to the multi-component plasma effect such as charge fluctuation of dust particles, or interactions between dust acoustic wave modes.

In this study, we perform hybrid simulation of MRI which assumes ion as a positively charged particle and electron as a negatively charged massless fluid. We would like to discuss the behavior of multi-component plasma at the nonlinear stage of MRI.