Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Contributions of sub-grid-scales to energy transfer in Hall MHD turbulence[1] HIDEAKI MIURA, National Institute for Fusion Science, KEISUKE ARAKI, Okayama University of Science — Effects of the Hall term on energy transfer in MHD turbulence is studied numerically with a view point of modeling small-scales numerically. While MHD simulation is a convenient tool to study various plasma dynamics such as fusion plasma, solar winds and so on, the (single-fluid) MHD equations do not give an appropriate description for small-scale dynamics, because some small-scale effects such as the ion skin depth (Hall term) and the finite Larmor effects are discarded. The incorrectness of small-scale dynamics can be essential when the small scales are coupled with large-scales through the nonlinearity of the discarded effects. In order to study influences of the ion skin depth to larger scales, we carry out direct numerical simulations of homogeneous Hall MHD turbulence as well as homogeneous MHD turbulence. A direct comparison of the energy transfers between the two kinds of turbulence reveals that Hall term can bring about a tight coupling between large and small scales. We also show that the roles of the Hall term cannot be replaced by a simple diffusive numerical model but should be replaced as a combination of diffusive and non-diffusive parts.

[1]This work is partially supported by the NIFS Collaborative Research Program (NIFS10KTAS001, NIFS09KNXN154, NIFS10KTBS003, NIFS11KNS0016) and Grant-in-Aid for Scientific Research, KAKENHI (22540509, 23340182, 23540583).

Hideaki Miura
National Institute for Fusion Science

Date submitted: 12 Jul 2012 Electronic form version 1.4