Magnetic reconnection induced by Kelvin-Helmholtz instability and the formation of the low-latitude boundary layer

Takuma Nakamura[1]; Masaki Fujimoto[2]
[1] Earth and Planetary Sci., TITech; [2] ISAS, JAXA

We have performed two-dimensional two-fluid simulations including finite electron inertial effects to investigate the role of Kelvin-Helmholtz Instability (KHI) on the plasma of Low-Latitude Boundary Layer (LLBL).

We have showed in various fundamental magnetic configurations that magnetic reconnection in the vortex flow crucially changes the structure of the KH vortex. In this study, we concentrate particularly on the cases in which in-the-plane magnetic configuration is anti-parallel across the shear layer (the anti-parallel case). In this case, KHI forces magnetic reconnection as its flow compresses the current sheet in its early phase. Reconnection can be triggered even when the Alfven Mach number of the shear (MA) is small (>2). The reconnection process allows the vortex to highly roll-up to cause large scale plasma mixing.

The results imply that the combination of anti-parallel geometry and low MA may play an important role in the plasma mixing and the formation of the LLBL. Indeed it is shown that for a realistic LLBL situation under northward IMF the combination is achieved rather commonly.