E109-004 **Room: 101A** **Time: May 30 9:45-10:00**

Decay and Coalescence of the Kelvin-Helmholtz vortices

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Solar wind plasma provides the velocity shear layer at the terrestrial magnetopause, where the Kelvin-Helmholtz instability (KHI) have been observed by the in-situ observations. Recently, Hasegawa et al.[2006] statistically showed the observed locations of the KH vortex and found that they lie along the magnetopause down the tail. Thus the spacial degree of freedom in the actual situation is much larger than the box size of recent numerical simulations. If one allowed a larger simulation size, not only the fastest growing mode (the fundamental mode) but also the subharmonic modes start to grow [Wu, 1986; Miura, 1999]. Eventually, the longest wave mode dominate the system and a large scale vortex appears (inverse energy cascade). This nature contrasts with our previous study in which we observed a direct energy cascade to short scale modes inside a single vortex by exciting the secondary magneto-rotational instability (MRI) [Matsumoto and Seki, 2007].

In order to understand these competitive processes, we have examined 3-D MHD simulatons of the KHI with a lager simulation domain allowing both the direct (secondary instability) and the inverse energy cascades (vortex parings). As a result, we found that both processes coexist. In the nonliear stage of the fundamental mode, the secondary MRI grows inside each vortex. While the secondary MRI grows, the first subharmonic mode apppears at a growth rate expected from the linear theory. During the coalescence of vortices, the magnetic field lines are strongly tangled in the 3-D space even under a strong magnetic field condition (beta=1.0). In this presentation, we show the detailed energy transfer among wave modes and comparison of the present result with previous 2-D studies.