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The K-H instaility having a three-dimensionalstructure

Chika Hashimoto[1], Ryoji Tandokoro[2], Masaki Fujimoto[3]

[1] Earth and Planetary Sci., TITech, [2] Dept.Earth and Planetary Sci.,TIT, [3] DEPS, TITECH

We have performed three-dimensional MHD simulations of the Kelvin-Helmholtz instability. The sheared flow is set perpendicular to the uniform magnetic field. Also we set the density variation along the field lines. It makes a layer unstable to the K-H instability which is located between two stable regions and thus makes a three-dimensional situation. By varying the thickness of the unstable layer H and the plasma beta for the fixed magnetosonic Mach number, we have searched for the parameter space where the vigorous growth of the K-H instability is available. We find the larger normalized growth rate when the thickness H is larger or the plasma beta is larger. Still more, as the thickness H is increased, while the growth of the instability becomes as vigorous as a two-dimensional situation, the flow pattern on the z=0 plane is by far more complicated. As H is increased further, the pattern eventually approaches the two-dimensional result. For the most complicated case, there are several vortices emerging in the velocity shear layer. This is one of the most prominent effects of the three-dimensional structure. We can apply this to the case in the magnetotail flank shear layer. The growth of K-H instability depends on the thickness of the current layer, and for the plasma beta of 0.5, H larger than 10D is required for the vigorous instability and the most complicated flow pattern appears at H=15D, where D is the half-thickness of the sheared velocity layer. Implications of the present results to the magnetotail flank situation will be discussed.