E109-010 **Room: 101A** **Time: May 30 11:30-11:45**

Competition Between the Mirror-Mode Instability and the L-Mode Electromagnetic Ion Cyclotron Instability

Masafumi Shoji[1]; Yoshiharu Omura[2]; Bruce Tsurutani[3]; Olga Verkhoglyadova[4]

[1] RISH, Kyoto Univ.; [2] RISH, Kyoto Univ; [3] JPL; [4] University of California at Riverside

Spacecraft observations show that the mirror instability dominates over the L-mode electromagnetic ion cyclotron (EMIC) instability in planetary magnetosheaths, although the theoretical linear growth rate of the L-mode EMIC wave is higher than that of the mirror mode waves. This has been a long-standing puzzle. To analyze the competing processes between the L-mode instability and the mirror instability, we performed both two-D and three-D hybrid simulations, assuming anisotropic energetic ions. In the two-D model, the energy of the L-mode wave is higher at the initial stage because its linear growth rate is larger than that of the mirror mode. However, in the three-D simulation, we find that the mirror mode wave can consume more free energy than the L-mode wave at the initial state of wave growth. To understand this apparent discrepancy, we performed parametric analyses on the nonlinear evolution of the proton temperature anisotropy. The growth of the L-mode EMIC waves declines earlier in the 3D model than that in the 2D model, due to efficient proton scattering by the mirror mode waves. The L-mode EMIC waves are subject to inverse-cascading in the one-D and two-D models, while this is not the case in the three-D model. In the latter model runs, the amplitude of EMIC waves are not strong enough to cause the decay instability. The L-mode EMIC waves in the three-D model are damped by the nonlinear trapping of resonant particles instead. We also find that the nonlinear evolution of the mirror waves in the three-D model is significantly different from that in the two-D model. Although coalescence of the mirror mode structures takes place in both models, in the two-D case, the coalescence proceeds slowly, while in the three-D case coalescence is much more rapid. Because of this rapid change, electric fields are induced, and the energy of the electromagnetic fields is converted to the thermal energy of particles.