[P06-7] Effects of Heavy Ions on ULF Waves in the Planetary Magnetosphere

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We present a simulation study of the propagation of ULF waves in the magnetosphere when multi-ions such as helium and oxygen ions are present. Since the inclusion of multi-ions affects the wave propagation near the cyclotron frequency of each ion and the ion-ion hybrid resonance, we adopt a three dimensional multi-fluid model, which can fully include the effects of multi-ions and electron. In inhomogeneous plasma, we examine how mode conversion arises over a wide range of frequency. Wave spectra for linearly-polarized components and elliptically-polarized eigenmode are presented. In addition, the role of plasma composition in the wave coupling problem is investigated in detail. We discuss and compare our results with the previous theoretical and numerical studies.

[P06-8] Effects of Geomagnetic Field-Aligned Inhomogeneity on Plasma Wave Coupling: Application of Invariant Imbedding Method

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In an inhomogeneous plasma, the plasma waves become complicated owing to the existence of local cutoff, coupling, and resonances. Since the plasma wave equations become coupled, it is often difficult to obtain the analytical solution. Approximations such as WKB and Bremmer series also become invalid near the local cutoff and discontinuities, and the singularities often give rise to complexity in interpreting the time-dependent solutions. We introduce a powerful technique of the invariant imbedding method (IIM), which is very useful in these kinds of coupled differential equations. With the aid of IIM, we can have an exact solution of plasma waves under certain conditions. In this work, we attempt to the wave coupling problem when parallel inhomogeneity is assumed in a magnetized plasma. We obtain the exact reflection and transmission as well as absorption coefficients when the wave propagates across such nonuniform region. It is discussed in detail how R and L waves are affected by the field-aligned nonuniform density by considering the mode conversion and reflection/transmission in the inhomogeneous region.