Weak magnetohydrodynamic turbulence in the magnetosphere of Jupiter

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Jupiter possesses the largest planetary magnetosphere of our solar system and thus exhibits very unique features. In this talk, we show that the small scale magnetic field fluctuations observed in the middle magnetosphere of Jupiter can be identified as weak magnetohydrodynamic (MHD) turbulent fluctuations. Weak MHD turbulence refers to turbulent plasma flow when the fluctuating fields are small compared to the background magnetic field. Calculating power spectra of the fluctuations, we observe for the first time a spectral index of minus two for wave vectors perpendicular to the background magnetic field as predicted by recent theoretical models for weak MHD turbulence.This turbulent description also promises to solve a number of unresolved questions for magnetospheric physics. We relate it to an electron acceleration mechanism responsible for the generation of Jupiter's main auroral oval. The dissipation of the turbulent fluctuations can also account for the high ion temperatures in the middle magnetosphere, where much smaller temperatures are expected in an adiabatically expanding magnetosphere.

Friday, October 4, 2002

11:00 a.m., 234 Ames Hall