

Properties of whistler turbulence: particle-in-cell simulations

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Two dimensional electromagnetic particle-in-cell simulations in a magnetized, homogeneous, collisionless electron-proton plasma demonstrate the forward cascade of whistler turbulence. The decaying whistler turbulence displays magnetic energy spectra that are relatively steep function of wavenumber and are anisotropic with more energy in directions relatively perpendicular to the background magnetic field than parallel. In the weak turbulence regime, the primary new results of the simulations are 1) Magnetic spectra of the cascading fluctuations become more anisotropic with increasing fluctuation energy; 2) the wavevector dependence of the three magnetic energy components show good agreement with linear dispersion theory for whistler fluctuations; 3) the turbulence heats electrons in directions both parallel and perpendicular to the background magnetic field, with stronger heating in the parallel direction.