

Warm energy-banded ions are observed with the FAST satellite during every large geomagnetic storm.

Energy-banded waves are observed on FAST and DEMETER, concurrent with the ion bands. The waves are observed for several hours, in both hemispheres, in both electric and magnetic fields, with E-field both parallel and perpendicular to the ambient magnetic field. Theoretical mechanisms investigated for the generation of these waves involve free energy in the particle distribution due to the ion bands, and wave growth at harmonics of the proton cyclotron frequency. Simulations using the WHAMP code show wave growth in bands near fcp with single and double ion ring input particle distributions. Additional simulations including oxygen and helium ion rings will investigate growth at other frequencies. Future observations of these waves during large storms are needed to further explore their nature.