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Tracing the evolution of energetic particle fluxes using radar inversion techniques

Joseph Mayes, Darren Wright, and Timothy Yeoman
university of Leicester, school of physics and astronomy, Leicester, United Kingdom of Great Britain – England, Scotland, Wales

Following the dynamic processes in the Earth-Sun system such as magnetic reconnection a significant amount of energy is transferred inwards from the outer magnetosphere by magnetohydrodynamic (MHD) waves. One of the ways this energy is dissipated is through energetic particle precipitation. In order to understand this energy transfer it is important that we are able to quantify the evolution of energetic particles as they precipitate. This study investigates the nature of the precipitating electron energy spectrum, whether the particles are accelerated and where the energy is absorbed in the atmosphere.

By inverting EISCAT incoherent scatter radar (ISR) data to produce a modelled incident energetic electron flux entering the upper atmosphere as detected by the radar and comparing those with the flux observed by satellites such as DMSP and Arase as they traverse flux tubes conjugate to the radar, we have been able to investigate both the magnitude of acceleration of energetic particles as well as how different energies are accelerated as they move down flux tubes. We will use these modelled fluxes to determine the level of field aligned acceleration of the energetic particles and the altitude profile of energy deposition.