EPP inversion from the EISCAT radar data in support of the ERG satellite mission

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The ERG satellite mission aims to study the acceleration and loss mechanisms of relativistic electrons during geospace storms by observing both "the cause", i.e., magnetospheric waves responsible for the acceleration/loss, and "the effect", i.e., the corresponding energetic electron flux populations seen by the particle detectors onboard. Ground-based verification of the precipitating electron fluxes serves as a crucial complement for this approach.

EISCAT incoherent scatter radar measures the height-dependent density of free electrons, and its time-dependent response to variable ionising radiation from space, yielding information on both the ionisation source processes (solar electro-magnetic radiation, energetic particle precipitation, cosmic rays) and their consequences on the atmosphere (changes in chemistry, energetics and dynamics).

We introduce a novel inversion technique for determiming the EPP characteristics, i.e., precipitation flux density spectrum and ionisation rate profile. In addition, potential chemical consequences of the energetic particle precipitation are assessed. In our approach, a detailed ion chemistry model (SIC) is used as a time-dependent forward model in the MCMC based inversion.