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Characteristics of energetic particle precipitation determined by incoherent scatter measurements and modelling

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Recently there have been several studies concerning the effects of solar activity on tropospheric and stratospheric variability through chemical changes induced by energetic particle precipitation [Randall et al., 2005; Rozanov et al., 2005; Seppälä et al., 2009]. The key issue of this approach is the quantification of the actual precipitating particle spectrum since the particle detectors onboard the current satellites generally struggle to measure accurately the precipitation fluxes in the high energies.

Traditional ground based radio wave techniques, such as radars, riometers and VLF receivers, monitor changes in the ionospheric electron density as a consequence of various ionisation sources including the particle precipitation. This provides opportunities to invert the precipitation characteristics from existing long-term datasets in comparison with the satellite observations.

In this study, the electron density profiles measured by the EISCAT radars are investigated against the MEPED particle detector data onboard the POES satellites. Markov-Chain-Monte-Carlo (MCMC) methods together with the Sodankylä Ion Chemistry model (SIC) are used to construct a statistical model between the datasets.