



Variations in cutoff latitude during the January 2012 solar proton event and implication for the distribution of particle energy deposition

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The access of solar protons into the Earth's magnetosphere is mainly controlled by the magnetospheric magnetic field and limited by the particle cutoff energy. In particular, protons with energies less than 20 MeV are known to have a complicated dynamics with e.g. strong day-night asymmetries. These protons will deposit most of their energies in the middle atmosphere (60-100 km), and knowledge of their latitudinal distribution is crucial for determining their potential effect on the chemistry and dynamics in the atmosphere.

During the January 2012 solar proton event (SPE), NOAA/POES 15, 16, 17, 18, and 19, and METOP02 satellites were orbiting the Earth in polar, sun-synchronous orbits at 850 km altitude with a period of approximately 100 minutes. Combining measurements from the Medium Energy Proton and Electron Detector (MEPED) and the OMNI detectors we cover the proton energy range: 30 keV-70 MeV. We investigate the cutoff dependence on the Dst-index, solar wind pressure and IMF orientation for the SPE in January 2012. We show how the geomagnetic cutoff energy varies with latitude in different local time sectors. We also present how the cutoff variation affects the energetic particle precipitation (EPP) and the energy deposition in the middle atmosphere and discuss the implication it will have for studies concerned with EPP effects on the middle atmosphere chemistry and dynamics.