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Determining latitudinal extent of energetic electron precipitation using MEPED on-board NOAA POES

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Energetic Electron Precipitation (EEP) from the plasma sheet and the radiation belts ionize the polar lower thermosphere and mesosphere. EEP increase the production of NOx and HOx, which will catalytically destroy stratospheric ozone, an important element of atmospheric dynamics. Therefore, measurement of the latitudinal extent of the precipitation boundaries is important in quantifying atmospheric effects of Sun-Earth interaction.

This study uses measurements by Medium Energy Proton Electron Detector (MEPED) of six NOAA/POES and EUMETSAT/METOP satellites from 2004 to 2014 to determine the latitudinal boundaries of EEP and its variability with geomagnetic activity and solar wind drivers. Variation of the boundaries with respect to different particle energies and magnetic local time is studied. Regression analyses are applied to determine the best predictor variable based on solar wind parameters and geomagnetic indices. The highest correlation was found for pressure-corrected Dst index through linear regression. Although, the model has an error estimate of ±2.2° cgmlat and exhibits a solar cycle bias, it performs well in predicting the precipitation boundaries. The result will be a key element for constructing a model of EEP variability to be applied in atmosphere climate models.