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Energetic Electron Precipitation: Drivers, properties, and impacts on atmosphere-ionosphere coupling

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Energetic electron precipitation (EEP) connects the magnetosphere to the middle and lower atmosphere through ionization, chemical reactions, and modulation of winds. It has, however, been questioned to which degree current EEP measurements and proxies are able to quantify the medium energy electron (MEE) ($\gtrsim$30 keV) precipitation and the associated daily and decadal variability [1, 2]. It is particularly challenging to predict the high energy tail ($\gtrsim$300 keV) of MEE, both in terms of the intensity as well as the timing [3]. This presentation addresses recent advances and remaining challenges in terms of understanding the drivers of EEP and the associated characteristics.

EEP flux data from MEPED onboard the POES/Metop satellites over a full solar cycle from 2004 – 2014 is explored on a daily scale. Flux observations from both the MEPED 0° and 90° detectors are combined with theory of pitch angle diffusion by wave-particle interaction to estimate the precipitating fluxes[4]. Both continuous and event-based flux behavior is examined using correlation and superposed epoch analysis, as well as probability assessments in respect to solar wind parameters and geomagnetic indices [3, 5]. In particular, the nature of $\gtrsim$300 in respect to $\gtrsim$30 keV electron fluxes are investigated to better understand the conditions responsible for acceleration and scattering of high energy electrons into the atmosphere.

Finally, to underline the importance of realistic, full-range EEP parameterization, the impact of NO, OH, and ozone are exemplified and discussed.

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