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Poster
The Earth’s outer belt is populated by energetic particles, including relativistic (>700 keV) electrons. When geomagnetic activity is induced by solar wind (SW) fluctuations, plasma waves are excited and often scatter the outer belt electrons into the atmosphere. Relativistic electron precipitation (REP) affects the atmospheric chemical composition and ionization, possibly contributing in disrupting communications and altering the radiative balance through ozone depletion.
We collected precipitation events from the ELFIN CubeSats and found that REP is primarily observed on the duskside, most efficient at high-energies (>~MeV), but also observed at ~200 keV. We also quantified the average atmospheric ionization due to REP and found that relativistic electrons can affect the atmosphere over a broad range of altitudes, peaking in the mesosphere – a region where energy deposition is often overlooked.
To advance our knowledge on the distribution and flux intensity of REP, we are currently extending the dataset of events using the POES/MetOp constellation and analyzing the precipitation depending on SW conditions, with the ultimate goal of predicting REP occurrence (location and intensity) from the L1 monitors. Our preliminary work shows that REP from 14 to 4 MLT occurs during dayside reconnection, while REP from 4 to 14 MLT might be associated with a closed and compressed magnetosphere.
This research is crucial for improving our understanding of the SW-REP relationship, the dynamics of the Earth’s radiation environment, and the energy input into the atmosphere.

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