

Ring current electron precipitation into the Earth's atmosphere

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The particle flux in the near-Earth environment can increase by orders of magnitude during geomagnetically active periods, which leads to intensification of particle precipitation into Earth's atmosphere and can further affect atmospheric chemistry and temperature. In this research, we concentrate on ring current electrons and investigate precipitation mechanisms using a numerical model based on the Fokker-Planck equation.

We investigate a time period that covers 4 corotating interaction region and 2 coronal mass ejection storms. Our results are validated against observations from the POES satellite mission, low Earth orbiting meteorological satellites, and Van Allen Probes. Maps of precipitating modeled fluxes for different energies allow us to understand in which regions on Earth precipitation is the most intensive. The output of the model is further used for calculation of ionization rates at different altitudes, allowing it to estimate effects of geomagnetically active periods on chemical and physical variability near the polar areas.

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