

Cross-Correlating Radiation Belt Electron Flux and Substorm Activity

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Magnetic reconnection in the tail of the Earth's magnetosphere causes geomagnetic 'substorms,' which are known to enhance particle content in the radiation belts. The twin Van Allen Probes pass through the radiation belts multiple times per day and collect particle flux data with the Relativistic Electron Proton Telescope (REPT) instruments on each spacecraft. The outer radiation belt is made of electrons and varies significantly with respect to time, so this project uses spin-averaged electron flux (FESA) from REPT averaged through a portion of the outer belt. The lower Auroral Electrojet (AL) index, which comes from ground magnetometer stations, is used to characterize substorm activity. The goal of the project was to cross-correlate electron flux and a modified version of the AL index, which we created by cumulatively integrating AL index over time steps varying in size according to predefined conditions. A strong correlation can be found between the two datasets, which gives insight into the physical relation between magnetic reconnection and radiation belt content. In the future, the results of this project can be built upon by doing a statistical study to see how well the modified AL index correlates with electron flux for a large number of substorm intervals and to determine the average lag time between high substorm activity and the corresponding rise in electron flux.