Study of spatial and energy characteristics of relativistic electron bursts in magnetosphere with robust methods

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Electron bursts are well-known phenomena of fast increase in particle fluxes in near-Earth space. Powerful local geophysical events like earthquakes or thunderstorms can induce precipitation of electrons with defined energy spectrum from radiation belt, which would be registered as fast increase in particle count rate on board the low orbit satellite.

The process of longitudinal drift of precipitated relativistic electrons to the geographical east gives opportunity to detect burst in any point of L-shell around the globe. Electrons with different energies drifts with different velocities. Study of energy spectrum change in time of the detected burst gives information required to determine distance between location of electron precipitation and its registration as burst on board the satellite. Mixing of background albedo electrons with burst electrons and low total statistics of registered particles leads to high complexity of this type of analysis on experimental data with traditional methods. An analytical methods based on robust regression analysis was introduces for processing of data with high level of experimental uncertainty.

Results of comparison between various data analysis methods in application to study of spatial and energy characteristics of relativistic electron bursts in the Earth magnetosphere are presented in this work. Numerical modeling of local relativistic electron precipitation with albedo electron fluxes and data from satellite experiments ARINA (on board the Resurs-DK1) and VSPLESK (on board the International Space Station) are used. Robust methods proved to be optimal for data analysis of energy spectrum evolution in time for search of zones of local radiation belt disturbances.

Presentation type

Section talk (10+5 min)

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