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Features of energetic electron precipitation of different mechanisms from the outer radiation belt during geomagnetic disturbances

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The mechanisms of energetic electron precipitation from the Earth's outer radiation belt are one of the important problems of modern cosmophysics. Using data from the Meteor-M2 low-orbit polar satellite, several periods of intense geomagnetic and auroral activity, which contributes to effective pitch-angle scattering and particle loss in the atmosphere, have been investigated for precipitation. Different magnetic storms (periods of geomagnetic activity) were taken in order to see the general dynamics of precipitation intensity. It was obtained that the precipitation intensity in all considered cases correlates with the auroral activity (the maximum intensity corresponds to the maximum of auroral activity), but not with the phases of the magnetic storm.

MLT-L circular diagrams of the distribution of 0.1 MeV electron precipitation for different time intervals during the magnetic storm were obtained for the event 5-23.11.2015. The same diagrams were obtained for L*, which were calculated by the paraboloid model A2000. POES satellites data were also used for this task.

For the event 9-16.10.2017, the particle losses in the atmosphere caused by different mechanisms were considered in detail separately. Most of the electron precipitation events that occurred during this period could be classified and correlated with a certain cause of occurrence. For this purpose, multi-satellite observations, wave activity data, and a priori knowledge of the distinctive features of precipitation mechanisms were used. A comparative analysis of precipitation of different mechanisms was carried out - the intensity dynamics and the energy spectrum. The results of this comparison showed that the particle losses produced by different causes have specific spectral features determined by the nature of the precipitation mechanism. Precipitation events of the same nature have their own characteristic shape of the spectrum. Geomagnetic activity changes only the intensity of these precipitation events.

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