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A study of the influence of geomagnetic field asymmetry on relativistic electron fluxes at low Earth orbit altitudes

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We report on a statistical study of the characteristics of trapped and precipitating relativistic electrons (with energies > 800 keV) by using a dataset of relativistic electron precipitation (REP) events observed by NOAA/POES spacecraft. The dataset includes REP events observed in 2017 during the NOAA/POES flybys near the Lovozero observatory (68°N, 35°E) and in the geomagnetically conjugate region in the Southern Hemisphere. Classifying events into four groups based on the works [1] and [2] allowed us to associate these precipitations to different processes in the magnetosphere. The first group include the events due to the scattering of particles in the regions of strong magnetic field line curvature in the night magnetosphere. The second group is characterized by simultaneous observations of relativistic and energetic (> 30 keV) electron precipitations, both having a distinct latitudinal maximum in the fluxes of precipitating particles and not accompanied by energetic proton precipitation, along with geomagnetic PiB/PiC pulsations detected by the ground-based Lovozero station. The third group is related to simultaneous observation of energetic proton precipitation and is thus attributed to the interaction of relativistic electrons with electromagnetic ion-cyclotron (EMIC) waves (observed on the ground as Pc1 pulsations). The fourth group includes precipitation events not falling into any of the first three groups. The properties of trapped and precipitating electrons for each group were analyzed separately for the northern and southern hemispheres to investigate the influence of geomagnetic field asymmetry on these fluxes. The most closely conjugate (in time and space) satellite passes were identified and the characteristics of REP were described based on geomagnetic activity.

[1] A.G. Yahnin, T.A. Yahnina, N.V. Semenova, A.B. Pashin, Relativistic electron precipitation as seen by NOAA POES, J. Geophys. Res. Space Physics 121 (2016) 8286.

[2] A.G. Yahnin, T.A. Yahnina, T. Raita, J. Manninen, Ground pulsation magnetometer observations conjugated with relativistic electron precipitation, J. Geophys. Res. Space Physics 122 (2017) 9169.

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