How Does The Outer Radiation Belt Change Under Recurrent Solar Wind Structures?

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The key question on the Earth's radiation belts trapped particles lies on the understanding of how solar wind drives the magnetospheric physical mechanisms changing the trapped particle populations. In particular, in this study we are interested in describing the electron flux changes under interplanetary medium conditions determined by recurrent interplanetary structures. We identified 46 Corotating Interaction Regions (CIRs) throughout the descending phase of the solar cycle 24. Losses of relativistic electrons are observed in 61% of the events. To evaluate the physical mechanisms involved with these dropouts, we choose a CIR event that recurred through at least seven solar rotations. The first passage started on 30 October 2017 and the seventh on 05 May 2018. Since the interplanetary conditions slightly change in each solar wind rotation, the outer radiation belt dynamics also changes. We identify recurrent characteristics, e.g. the increase of ultra-low frequency (ULF) waves activity during each CIR's passage, the time-step required for the outer radiation belt recovery of about two days after the CIR's arrival, and the increase of low energy particle flux prior to this recovery. The outer radiation belt flux decreases in four of the seven passages studied, dayside magnetosphere is eventually compressed, and ULF waves are observed in a broad range of frequencies from Pc3 to Pc5, which is likely to persist for days. The results obtained give a description of the physical mechanisms occurring in the recurrent CIR-magnetosphere coupling, which can provide subsidies to improve outer radiation belt electron flux modeling and forecasting accuracy.

Publication:
American Geophysical Union, Fall Meeting 2019, abstract #SM41C-3250

Pub Date:
December 2019

Bibcode:

2019AGUFMSM41C3250A

Keywords:
2720 Energetic particles: trapped; MAGNETOSPHERIC PHYSICS;
2722 Forecasting; MAGNETOSPHERIC PHYSICS;
2774 Radiation belts; MAGNETOSPHERIC PHYSICS;
7984 Space radiation environment; SPACE WEATHER