GC2024-STP035

Influence of wave properties on energetic charged particle precipitation during a magnetic storm of 10-16 October 2017

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We analyze low-frequency wave observations during a geomagnetic storm of 10-16 October 2017 and their relation to energetic particle precipitation. The storm had a moderate strength (SYM-H_{min} = –67 nT) but was accompanied by an intense substorm activity. Van Allen Probes had their apogee in late morning to early afternoon sectors, and ERG orbit apogee was in the evening sector. Intense chorus and plasmaspheric hiss was observed by Van Allen Probes during the substorm intervals. Chorus and hiss were also detected by ground-based Lovozero station (LOZ) at Kola Peninsula. Van Allen probes also observed some electromagnetic ion cyclotron (EMIC) waves near their apogee, but these observations were much more rare than the Pc1 pulsation observations at LOZ during the same time interval. On the other hand, Van Allen probes detected EMIC waves at frequencies at and above 2 Hz that were almost not seen at LOZ during the considered storm interval. ERG did not observe significant EMIC wave activity in the evening sector, although IPDP pulsations were observed at LOZ in the same sector. We use the spacecraft wave data to calculate pitch-angle diffusion coefficients and estimate precipitated energetic particle fluxes that can be measured at low Earth orbits. These estimates are compared with NOAA/POES and Meteor-M2 observations. A role of ducted whistler mode waves in providing dayside precipitation of subrelativistic (several hundred keV) electrons is demonstrated in this study.

This work is supported by the Russian Science Foundation (grant No. 22-62-00048).

We acknowledge the use of Van Allen Probes, ERG, and NOAA/POES spacecraft data, and PGI ground-based data (LOZ).