

The VLF and ULF related particle precipitation as a tool for diagnostics of the equatorial cold plasma structures in the evening sector

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Cyclotron wave-particle interactions in the ring current produce the precipitation of energetic charged particles into the ionosphere. Recently, specific isolated patterns of energetic ion (EI) and electron (EE) precipitation related, respectively, to ULF and VLF waves were selected using low-altitude satellite observations in the evening sector. It was suggested that the wave-particle interactions producing these evening-side precipitation patterns take place in regions where the energetic particles drifting around the Earth contact the cold plasma structures forming so called "plamaspheric tail". To check if the above suggestion is correct we used the cold plasma measurements onboard the geosynchronous LANL spacecraft and energetic particle measurements onboard the low-altitude NOAA-12 satellite. From the two-year data set, we select those NOAA orbits at which both EI and EE precipitation events were observed. From this subset, those events are selected for which one of the LANL spacecraft is in the vicinity of the EI/EE precipitation MLT sector. For most of such events the Magnetospheric Plasma Analyser (MPA) instrument onboard LANL spacecraft detects localised (few MLT hours) cold plasma enhancements. These enhancements are the clear evidence of the presence of the detached plasmaspheric plasma forming the tail. The MPA measurements show that the plamaspheric tail consists of smaller scale plasma structures. We compare locations of these cold plasma structures with those of the EI/EE precipitation patterns mapped onto the equatorial plane and find rather good consistency. Thus, observations confirm that cyclotron wave-particle interaction producing the isolated IE and EE precipitation occurs in the plasmaspheric tail region. The EI/EE precipitation pattern can be used as diagnostic tool for monitoring the detached cold plasma in the equatorial plane of magnetosphere.

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