Multi-satellite study of phenomena in the evening magnetosphere during the Pc1 event

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At around 11 UT of August 3, 1996 a cluster of three spacecraft occurred in the evening sector of the near-Earth equatorial magnetosphere. The Polar satellite was at dusk (MLT=16.5), moving toward the plasmasphere from the northern auroral region, at the altitude from 6 to 4.5 RE. Two LANL geosynchronous spacecraft were situated at 16 and 18 MLT. When crossing the evening sector the LANL spacecraft detected localised enhancements of cold plasma at MLT=15-18. All three satellites detected a series of energy-dispersed injections of hot (>30 keV) ions related to substorm occurred in the night sector. A specific pattern of energetic proton precipitation, which is known as the particle counterpart of the Pc1 pulsations (EMIC waves), was registered at low altitude by the NOAA-12 satellite in the region conjugated with the cluster of the near-equatorial spacecraft. In agreement with these low-altitude particle observations the low-frequency waves with period of ~6 s were detected onboard the Polar satellite both in electric and magnetic components. Emissions in the Pc1 frequency range were observed also on the ground. These observations provide a clear experimental evidence of the concept, which suggests that the ion-cyclotron instability develops in the region where energetic protons drifting westward from the substorm region are in contact with the cold plasma. The instability leads to the scattering of energetic ions into the lose cone and generation of the ion-cyclotron waves observed both in space and on the ground.
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