

Pi2 pulsations over a wide region observed by the cluster satellites, HF radar, and SAMNET: The event on 5 March 2004

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Pi2 pulsations, which have the period of 40-150 seconds, are observed over a wide latitudinal range on the nightside. Teramoto et. al., (2008) have found Pi2 pulsations observed in the compressional component by the polar orbiting DE-1 satellite (perigee: 500 km and apogee: 3.6 Re) located in the polar cap. They have high coherence with those observed at low-latitude ground stations. They concluded that they originate from a plasmaspheric virtual resonance (PVR) mode type resonance excited in the plasmasphere which has an imperfect boundary. However, in previous studies Pi2 pulsations observed at high latitude on the ground were characterized as Alfvén waves (Sutcliffe and Nielson [1990, 1992], Yeoman et al, [1991]). The purpose of this research is to investigate the relationship between the Pi2 pulsations observed at mid and high latitudes and outside plasmasphere, and to obtain their excitation mechanisms.

We used the data from the polar orbiting Cluster satellites. The orbit of these satellites has a perigee 2.97 Re and an apogee 18.6 Re. At 2212UT on 5 March 2004, Cluster satellites were located on the nightside (MLT=2259UT-23:06UT) at high latitude (-50.85[deg]- -52.25[deg]) of Southern hemisphere. The energy flux of electron observed by PEACE (Plasma Electron And Current Experiments) instruments indicated that they were located in PSBL. There were Pi2 pulsations in the compressional and radial components of all satellites. The power of these variations had clear peaks at 11 mHz. Simultaneously, there were Pi2 pulsations at Hermanus (HER), SAMNET, and Syowa Station (SYO). Pi2 pulsations observed by satellites had good coherence and out-of-phase relationship with those observed in the H component at HER and mid-latitude stations of SAMNET at 11 mHz. On the other hand, the power spectrum of Pi2 pulsations at high-latitude stations of SAMNET and SYO are 8 mHz. There were Pi2 pulsations of electron velocity observed by PYK of HF radar (Super DARN), whose oscillations were similar to those observed by Cluster satellites and mid- and low-latitude stations.

We suggest that PVR mode influence geomagnetic field at very wider region, on the low- and mid-latitude ground, in the ionosphere, and the magnetosphere, on the other hand at high latitudes other mode excites Pi2 pulsation.