Analysis of Pi2 pulsations observed by multiple ground stations and satellites

Mariko Teramoto[1]; Masahito Nose[2]; Peter R. Sutcliffe[3]

[1] Earth and Planetary Sci., Kyoto Univ; [2] DACGSM, Kyoto Univ.; [3] Hermanus Magnetic Observatory

We have been statistically analyzing Pi2 pulsations, using the 6-second magnetic field data acquired by the polar orbiting DE-1 satellite (an apogee: about 3.6 Re altitude, a perigee: about 500 km altitude). The data period used was from January 1983 to December 1991. After we determined substorm onsets with the AL index, we calculated the coherence between the magnetic field data in each component (compressional, radial, or azimuthal) and the geomagnetic field data in the H component from Kakioka or Hermanus located on the nightside. We statistically examined the spatial distributions of the occurrence probability of the 85 events, which had high coherence (greater than 0.6) at the frequency having peak in the power spectra of both the magnetic field and the geomagnetic field. In our study, the compressional component at low latitudeon the nightside had the more events than other components, as well as in the previous studies using the data acquired by the satellite orbiting near the equatorial plane. In addition, there were some high-coherence events in the compressional component at mid and high latitude on the nightside.

We examined the L dependence of the power in the compressional component normalized by power in the H component from ground stations, and phase difference, when the DE-1 was located at 16-00-08 MLT. We found that the power ratio had a peak around L˜5 and the phase difference shifted from 0 degrees to 180 degrees around L˜5. We suggested these events were excited by the plasmaspheric virtual resonance, in which the ambient magnetic fields out of plasmasphere oscillated with the cavity mode resonance because the plasmapause was imperfect boundary.

In previous studies using the data observed on the mid- and high-latitude ground stations, the Pi2 pulsations at high latitude on the nightside belived to be excited by the Alfven wave, which is different excitation mechanizm from at low latitude. We need to compare the Pi2 pulsations acquired on the mid- and high-latitude ground stations with those on the low-latitude ground stations and by DE-1 satellite.

We use also the mid- and high-latitude ground stations, Crozet (GMLAT=-51.35 degrees, GMLON=113.27 degrees, L=2.56), Port Aux Francais (GMLAT=-56.93 degrees, GMLON=132.75 degrees, L=3.36), and Syowa Station (GMLAT=-70.37 degrees, GMLON=83.55 degrees, L=8.86), as well as low-latitude ground stations, Kakioka and Hermanus. In addition, we also use GOES-5,-6, and -7, which is geostationary orbiting satellite (an apogee: 5.6Re altitude) and AMPTE/CCE orbiting near the equatorial plane (period:1984.8-1989.1, an apogee: 8.8 Re altitude, a perigee:1100 km altitude). We will analyze Pi2 pulsations which were simultaneously observed by multiple ground stations and satellites at substorm onset.