

Characteristics of Pi2 Electric Pulsations at Low-Latitude Ionosphere: FM-CW Radar Observations

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At the onset of magnetospheric substorms, impulsive hydromagnetic oscillations occur with period range from 40 to 150 seconds. They are called Pi2 magnetic pulsations and occur globally in the magnetosphere. Pi2 has been studied with arrays of magnetometers on the ground and with in-situ observation by satellites. However Pi2 electric pulsation in the low-latitude ionosphere is not yet clarified sufficiently. Therefore we have focused on measuring Pi2 electric pulsations by an FM-CW radar.

In order to detect the ionospheric electric fields we have built an FM-CW (HF) radar at Sasaguri, Fukuoka, Japan (Magnetic Latitude: 23.2 degree, Magnetic Longitude: 199.6 degree). The radar provides us Doppler information of the ionosphere by high-time resolution of 10 sec. When the eastward electric field penetrates into the low-latitude ionosphere, it drifts upward owing to the frozen-in effects of the F-region. In contrast to the penetration of the eastward electric field, the ionosphere drifts downward when the westward electric field penetrates. Thus we can measure the east-west ionospheric electric fields.

From our ionospheric radar observation, Pi2 electric pulsation of about 0.2 mV/m amplitude can be identified in night side at Nov.6, 2003. We also compared the Pi2 with geomagnetic field data obtained from Circum-pacific Magnetic Network (CPMN) stations. As a result, we found a phase lag between the Pi2 electric pulsation and night side magnetic Pi2 pulsation at Kujyu (KUJ; M. Lat. 23.6 degree, M. Lon. 203.2 degree).