昼間側 Pi 2 地磁気脈動の電離圏等価電流分布

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Distribution of equivalent ionospheric currents associated with dayside Pi 2 pulsations

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Pi 2 pulsations are defined as transient dumping oscillations of geomagnetic fields with period between 40 and 150 sec. The source (or energy source) of Pi 2s is believed to be located in the magnetotail because they mainly occur accompanied with onset of nightside auroral intensifications. Pi 2 pulsations are even observed on the day side ground, which means they can propagate to the dayside region from the nightside region. The latitudinal profiles of amplitude and phase difference of dayside H-component Pi 2s supported that electric fields from high-latitude region penetrate equatorward, and then drives the zonal ionospheric current enhanced at the dayside equator due to the Cowling effect. However, it is unclear how the dayside zonal ionospheric current are connected with the source electric field to ensure current continuity. In this study, we investigated the distribution of equivalent ionospheric currents associated with Pi 2 fluctuations on the day side using magnetic data from globally distributed ground-based stations. The equivalent current vectors were determined by rotating the filtered horizontal magnetic field vector by an angle of 90 degrees clockwise. Oscillating equivalent currents flowed equatorward (poleward) in the prenoon sector and poleward (equatorward) in the postnoon sector. Around the noon, the equivalent current flows in the zonal direction. The meridional component of equivalent currents in the prenoon sector is larger than in the postnoon sector and configuration of currents appears to be asymmetric. We also numerically estimated the distribution of ionospheric currents produced by the SCW-like pair of FACs around the midnight. The distribution of the simulated ionospheric current is consistent with that of equivalent currents derived from observed magnetic fields. We conclude that the oscillating ionospheric current system driven by nightside FAC oscillations is the dominant source of dayside Pi 2 pulsations.