

Relation Between Variations of Sq Focus, Interhemispheric Field-Aligned Current, and Equatorial Electrojet Obtained From CPMN Data

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In order to clarify the relevance between Sq current system, equatorial electrojet (EEJ), and interhemispheric field-aligned current (IHFAC), we analyzed the detailed relationship between day-to-day and seasonal Sq focus variations and EEJ using ground geomagnetic data obtained from Circum-pan Pacific Magnetometer Network (CPMN).

It has been shown that IHFAC can be generated by asymmetric negative charge accumulation in the vicinity of Sq focus points in both hemispheres (Fukushima, 1979). In addition, it has been observed that anomalous heating of thermal electrons near the focus of Sq current by rocket observations (Oyama, 1979). In deed, Yamashita et al. (2002) revealed a evidence of the existence of IHFACs and their local time distribution using the θ sted satellite and ground-based geomagnetic data, and they indicated the delay cycle in IHFACs. On the other hand, by means of a dense network of magnetic observatories in Australia and a few observation points near Japan, Stening (2005) indicated the possibility that semidiurnal tides are affecting Sq current system in both hemispheres and the intensity of EEJ.

However, the systematic relationship between day-to-day and seasonal Sq focus variations, EEJ, and IHFAC is not clear, because above studies had limitations of data periods and latitudinal distribution of observation points. By visualizing equivalent current system for global magnetic variation using CPMN data, we found out that Sq twin vortices in both hemispheres and EEJ have significant daily variations. In this presentation, by using orthogonal basis function, which is obtained by applying the Principal Component Analysis to CPMN datasets of geomagnetically quiet days of the past 13 years, we discuss the relation of Sq-EEJ-IHFAC.