

Characteristics of long-term oscillations of Equatorial ElectroJet observed by CPMN

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The ultimate goal of this study is to understand the couplings of, and independencies in, the Solar wind-Magnetosphere-Ionosphere-Atmosphere (S-M-I-A) system. The ionosphere is a part of S-M-I-A system. For this goal, we studied long-term equatorial electrojet oscillations in the ionosphere.

In the magnetic equatorial region, the current towards the east is enhanced by the cowling effect. We call this current Equatorial ElectroJet (EEJ). The EEJ develops a magnetic field toward the north on the ground.

We can analyze the intensity of the EEJ by examining the H-component magnetic field data of near the dip-equator. It has been demonstrated that the EEJ oscillates over days to months (T. Uozumi, et al. 2008.). We call it the long-term EEJ oscillations. However, the generating mechanisms of the long-term EEJ oscillations are not yet clarified.

In the present study, we analyzed MAGDAS/CPMN ground magnetometer data from the Davao, Ancon, Muntinlupa and Biak stations. Davao at [GM lat.-1.37, GM lon.196.53]. Ancon at [GM lat.3.05, GM lon.354.40]. Muntinlupa at [GM lat.6.26, GM lon.192.22]. Biak at [GM lat.-9.73, GM lon.207.39]. The MAGDAS/CPMN network has been constructed by SERC, Kyushu University, and widely covers the world. We examined the relationships among the EEJ amplitude, the F10.7 solar radiation flux, the solar wind parameter, Ap-index and the ionospheric conductivity.

The following were clarified.

- (1) On the global scale, the EEJ and Sq current oscillate with two different periods; (a) 14.5 days and (b) semi-annual.
- (2) In the F10.7 solar radiation flux and the solar wind parameter, we could not find the (a) and (b) oscillations.
- (3) The 14.5-day EEJ oscillation is amplified on winter.
- (4) The peaks of the semi-annual EEJ oscillation is found on spring and autumn.
- (5) The semi-annual EEJ oscillation is similar to Ap-index oscillation.
- (6) The EEJ oscillations do not depend on the geographic latitude but the ionospheric conductivity depends on that.
- (7) The intensity of the EEJ depends on the 11-years solar activity.

The results suggest that (1) The 14.5-day EEJ oscillation is caused by waves inside the atmosphere. (2) The semi-annual EEJ oscillation is caused by changes in the ionosphere dynamo and not by changes in the ionospheric conductivity.