

Relationship between geomagnetic disturbances at high latitudes in Siberian region and ionospheric storms over Japan

Manabu Kunitake[1]; Takashi Maruyama[1]; Takashi Kikuchi[2]; Oleg Troshichev[3]; Julius Zetzer[4]; Ching Meng[5]; Toyohisa Kamei[6]; Roger W. Smith[7]

[1] CRL; [2] Communications Res. Lab.; [3] AARI; [4] IDG; [5] JHU/APL; [6] WDC-C2 Geomag., Kyoto Univ.; [7] GI, UAF

For the forecasting of negative ionospheric storms over Japan, intensive study concerning the relationship between the geomagnetic disturbances at high latitudes and ionospheric storms at middle latitudes is needed when geomagnetic disturbance at high latitudes is assumed to have some information about the source of negative ionospheric storm at mid-latitude. Geomagnetic indices, Kp and AE, were hitherto used to infer geomagnetic disturbances. These indices have information concerning geomagnetic disturbances in a global scale, but have not spatial information on geomagnetic disturbances. To overcome this problem, we use multi-point geomagnetic observations for our analysis considering about the central location in longitude, the spatial extent of geomagnetic disturbances at high latitudes, and the longitudinal difference between the source region and Japan. Further, we are paying attention to the local time when geomagnetic disturbances occur.

CRL does near-real-time monitoring of geomagnetic variations at four geomagnetic observatories at high latitudes in the east Siberian region and near-real-time monitoring of ionospheric variations at four ionosonde stations in Japan. Near-real-time data link between these four Siberian observatories and Japan was established by the summer of 2002 under a Japan/U.S.A./Russia collaborating project. The name of the project is 'The Project for Upgrading the Russian AE Stations in cooperation with Space Weather Magnetometer Experiments (PURAES/SWME)'. Four observatories are Pebek (Geographic lat. 70.1 N, long. 170.9 E), Tixie (71.6 N, 129.0 E), Cape Chelyuskin (77.7 N, 104.3 E), and Norilsk (69.2 N, 88.0 E). The ionosonde stations in Japan are Wakkanai (45.4 N, 141.7 E), Kokubunji (35.7 N, 139.5 E), Yamagawa (31.2 N, 130.6 E), and Okinawa/Ogimi (26.7 N, 128.2 E).

At first, we will show the results of the detailed analysis of (1)the negative ionospheric storm detected by Japanese stations in October 2002, (2)geomagnetic disturbances detected at the Siberian observatories of the PURAES project at that time period, and (3)the relationship between them. Then, we will show the results of some statistical analysis by using data in 2003. Dependences of the occurrence rate of negative ionospheric storms in Japan on the central position and the local time of the geomagnetic disturbances at high latitude, and the longitudinal difference between the source region and Japan are examined. Dependences of the occurrence rate on the spatial extent and the temporal duration of the geomagnetic disturbances are also examined.