Long-Term Comparisons of F10.7 solar radiation flux and MAGDAS magnetic field

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The ultimate goal of this study is to understand the connectivity of, and independencies in, the Solar wind-Magnetosphere-Ionosphere-Atmosphere (S-M-I-A) system. Toward this goal, in this paper we analyze ground magnetometer data at the DAV station (located at 7.0N, 125.3E), belonging to MAGDAS/CPMN (MAGnetic Data Acquisition System/Circum-pan Pacific Magnetometer Network); MAGDAS/CPMN has been installed by Kyushu University, and widely covers the world. DAV is located at the intersection point of the 210 degree magnetic meridian and the magnetic equator. We have spectral analyzed the DAV data (1 hour averaged) in the interval from Dec. 1, 2006 to Jun. 30, 2007, in which analysis we have focused on long-term variations having the period of 2˜40 days. In addition, we have spectral analyzed the F10.7 solar radiation flux (1 day data) measured at the Dominion Radio Astrophysical observatory, Canada [ftp://ftp.ngdc.noaa.gov/]. If a spectral peak is found at the same frequency in the both datasets, that peak on the ground is thought to have been generated by the solar radiation.

We have also constructed 'H-Dst' by subtracting Dst (1 hour data provided by the World Data Center for Geomagnetism, Kyoto [http://swdcwww.kugi.kyoto-u.ac.jp/index-j.html]) from the H-component in magnetic field data of MAGDAS; variations caused by the atmosphere should be clearly identifiable in H-Dst because the influence of the ring current (represented by Dst) has been removed.

Results of the spectral analyses are summarized as follows:

(1) DAV H: Strong peaks are found at 1, 9, 14, 18, and 27 days.

(2) Dst: Strong peaks are found at 9, 14, 18, and 27 days.

(3) H-Dst: Strong peaks are found at 1, 9, 14, 22, and 35 days.

(4) F10.7: Strong peaks are found at 14, 18, 22, 27, and 35 days.

(5) Spectral powers of H-Dst at the 22 and 35 days are about 1/3 of those of DAV H at 18 and 27 days.

The results suggest that the magnetic field at DAV oscillated with the periods of 22 and 35 days because the ionospheric conductivity changed in response to the solar radio emission, where the magnitude of the influence of the solar radio emission is about 1/3 of that of the Dst variations of the period of 18 and 27 day.