Improvement of localtime dependence of Pc5 index by using multi-point magnetometer observations

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In order to estimate the solar wind velocity from the low-latitude Pc5 index for space weather study and application,we investigated the relationship between low-latitude ground Pc5 amplitudes in the H component and the solar wind velocity.

We also investigated the relationship of Pc5 H-component amplitudes at two ground stations: We used the geomagnetic CPMN data (Yumoto et al.,2001) obtained at SMA (Geomag.Lat. = -19.27) and KAG (Geomag.Lat. = 24.37), and the solar wind velocity (Vsw) observed by the ACE satellite (http://www.srl.caltech.edu/ACE). The local time difference between the two ground stations is about 12 hours.

From our analysis, we found the following:

(1) There was good correlation between the Pc5 amplitudes at the two stations when one station was located in the noonside while the other station was located in the midnightside. On the other hand, the correlation was weak when one station was located in the dawnside while the other station was located in the duskside.

(2) The correlation between the ground Pc5 amplitude and the solar wind velocity was highest when the geomagnetic station in question was located in the noonside.

(3) The standard deviation of the Vsw vs. the Pc5 ampliatude is the smallest when we use the Pc5 amplitude data from noonside stations.

These results indicate that low-latitude Pc5 amplitude in the noonside are more useful than any other side for estimating the solar wind velocity.

It is concluded that 24 hour monitoring of the solar wind velocity can be done by using the Pc5 index obtained from four low-latitude ground stations (e.g , SMA in South America , KUJ in Japan , EWA in Honolulu , and HER in South Africa).