Automatic Identification of Pi 2 Pulsations using MAGDAS/CPMN Network -Toward Construction of a new Pi 2 Index-

Mina Sakai[1]; Terumasa Tokunaga[2]; Teiji Uozumi[3]; Shuji Abe[4]; Akihiro Ikeda[1]; Akimasa Yoshikawa[5]; Hideaki Kawano[5]; Kiyohumi Yumoto[6]; Yumoto Kiyohumi MAGDAS/CPMN Group[7]

[1] Earth and Planetary Sci.,Kyushu Univ.; [2] none; [3] SERC; [4] Space Environ. Res. Center, Kyushu Univ.; [5] Earth and Planetary Sci., Kyushu Univ.; [6] Space Environ. Res. Center, Kyushu Univ.; [7] -

At the onset of magnetospheric substorms, impulsive hydromagnetic oscillations with periods of 40-150 sec, so called Pi 2 magnetic pulsations, are excited globally in the magnetosphere [*Saito*, 1969; *Yumoto and the CPMN Group*, 2001]. They reported that when a single low-latitude station was located in the sectors of 00-24 hr local time (LT) (with no restriction in LT), 20-03 hr LT, and 23-01 hr LT, respectively, 62%, 79%, and 100% of auroral breakups identified by the Polar satellite had associated Pi 2s. Recently, equatorial Pi 2s in daytime are found to show the same frequency component with that of high-latitude Pi 2s in nighttime [*Tokunaga et al.*, 2007].

Real-time Pi 2 identification is conducive to nowcast substoms. In order to identify the substorms in real time, we are constructing a new Pi 2 index using 10 pairs of the equatorial and low-latitude stations of the MAGDAS/CPMN (MAGnetic Data Acquisition System in the Circum-pan Pacific Magnetometer Network) [*Yumoto and the MAGDAS Group*, 2006]. One major advantage of our Pi 2 index is its local time coverage along the magnetic dip-equator. Our Pi 2 index could provide more information on the magnetospheric situation at the moment Pi 2 occurs.

The following items should be clarified when constructing Pi 2 index. (1) How to identify Pi 2 automatically in real time from the MAGDAS network data. (2) How to determine onset time of the identified Pi 2. (3) How to classify magnitude of the identified Pi 2 quantitatively as of the index. For the first step in constructing the Pi 2 index, we will report here the development of the automatic identification procedure of Pi 2 pulsations. In order to identify Pi 2 automatically, it is required to distinguish Pi 2 oscillations from artificial and sc/si perturbations. It is better if we can identify as many Pc 4 time Pi 2s as possible. In addition, an identification method should be applicable for highly irregular Pi 2 waveform (Pi 2 does not always exhibit simple dumped-sinusoidal waveform). We have developed two methods of the Pi 2 automatic identification, which satisfy all the above requirements. The one is the segmentation of amplitude-time series by local AR modeling, and the other is the multi-station wave packet method. We evaluated those two Pi 2 identification methods, and confirmed that the both results were equivalent if Pi 2s were observed at the station pair in the nighttime sector (18-06LT).

In conclusion, it is possible to identify Pi 2 events successfully compare to visual inspection if we apply above methods to the MAGDAS/CPMN data obtained from the night-side (18h-06h LT) low-latitude and equatorial stations.