MAGDAS Projects at SERC for Litho-Space Weather

Kiyohumi Yumoto[1]; Yumoto Kiyohumi MAGDAS/CPMN Group[2]
[1] Space Environ. Res. Center, Kyushu Univ.; [2] -

http://www.serc.kyushu-u.ac.jp/

The Space Environment Research Center (SERC), Kyushu University is executing MAGDAS (MAGnetic Data Acqusition System) projects.

During the IHY (International Heliophysical Year; 2007-2009) period, 50 state-of-art magnetometers are deployed at 50 stations in the Circum-pan Pacific Magnetometer Network (CPMN) region, and several FM-CW radars along the 210-degree magnetic meridian. This MAGDAS I project has the potential to contribute greatly to IHY by supporting ground-based magnetometer array for worldwide studies, and by demonstrating the beauty, importance, and relevance of space science to the world. The MAGDAS II project is being carried out to construct a 10-magnetometer chain along the 110-degree magnetic meridian from South Africa to Hungary during 2008-2009. By using these data from the 210-degree and the 110-degree MM stations, it will be possible to examine the local time asymmetry of Solar-Terrestrial phenomena. The goal of MAGDAS I & II is to become the most comprehensive ground-based monitoring system of the earth's magnetic field. The projects intend to get the MAGDAS network fully operational and provide data for studies on space weather. By analyzing these MAGDAS I & II data, we can perform a real-time monitoring and modeling of the global 3-dimensional current system and the ambient plasma mass density for understanding the electromagnetic and plasma environment changes in geo-space during helio-magnetospheric storms.

On the other hand, there are electromagnetic couplings of ULF waves in the Litho-Space (i.e. including plasmasphere-ionosphere-atmosphere-lithosphere). The electric field of external ULF waves in the plasmasphere gives rise to an ionospheric current, which produces magnetic field on the ground. This incident magnetic field generates the induced current in the ground. The induced current also produces additional magnetic field on the ground. The total magnetic field variation on the ground includes the space and lithosphere components. It is also noteworthy that the skin depth of the ULF waves is comparable to the depth at which seismic activities take place. Therefore, the ground ULF observations are concluded to be the most promising means for monitoring environment changes in the lithosphere (see Yumoto et al., 2008).

In order to minimize the human and economic damages from earthquake and volcanic activities in Asia, SERC are also planning to construct MAGDAS III and IV networks in collaborations with Indonesian and Philippines Institutes, and to monitor lithospheric changes associated with earthquake and volcanic activities by using sixty magnetometers in Indonesia and twenty five ones in Philippines, respectively. The MAGDAS III and IV data will be sent to each central server in the International Research Center for Litho-Space Weather in real time. In order to identify ULF anomalies associated with the lithospheric activities, these data will be analyzed to separate electromagnetic variations, those caused by lithospheric changes and those produced by the iono-magnetospheric phenomena. Finally, the ULF anomalies will be monitored on the plasma display.