MAGnetic Data Acquisition System (MAGDAS)for Space Weather Study

Kiyohumi Yumoto[1]; Yumoto Kiyohumi MAGDAS/CPMN Group[2]

[1] Space Environ. Res. Center, Kyushu Univ.; [2] -

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

One purpose of the Solar Terrestrial Physics (STP) research in the twenty-first century is to support human activities from an aspect of fundamental study. The scientific new aim for the STP society is a creation of new physics, i.e., multi-scale couplings of the complex and composite Sun-Earth system. The goals for the attainment of the purpose are to construct Network Stations for global observations and Modeling Stations for integrated simulation/ empirical modeling. In order to understand the complex Sun-Earth system and its effects to human lives, the Space Environment Research Center (SERC), Kyushu University started to deploy a new ground-based magnetometer network, in cooperation with about 30 organizations in the world during the period of International Heliophysical Year (IHY).

The SERC will conduct the MAGDAS (MAGnetic Data Acqusition System) observations at 50 stations in the CPMN (Circum-pan Pacific Magnetometer Network) region, and the FM-CW radar observations along the 210 degrees magnetic meridian. Nearly 20 MAGDAS units were installed across the Asia Pacific region in 2005. Nearly 10 MAGDAS units were also installed along the magnetic equator in Africa, Western Pacific region and South America in 2006. In the year 2007, 20 MAGDAS units will be deployed in places such as South Africa, India, Italy, Mexico, Alaska, Siberia, and Antarctica. The goal of MAGDAS is to become the most comprehensive ground-based monitoring system of the earth's magnetic field. It does not compete with space-based observation. Rather, this ground-based network complements observation from space. To properly study solar-terrestrial events, data from both is required.

MAGDAS/CPMN are roughly divided into two portions: (1) magnetometer and data logging/transferring system installed at the CPMN stations: MAGDAS-A system, (2) data acquisition and monitoring system installed in SERC: MAGDAS-B system. The new magnetometer system consists of 3-axial ring-core sensors, clinometer and thermometer in sensor unit, fluxgate-type magnetometer, data logging/transferring unit, and power unit. The total weight of the MAGDAS magnetometer system is less than 15 kg. The data transferring unit transfer the obtained data from the overseas stations to the SERC, Japan, by using three possible ways: Internet, Telephone line or Satellite phone line.

In order to establish the space weather studies and applications, we have to clarify global dynamics of geospace plasma environment during magnetic storms and auroral substorms, the electromagnetic response of iono-magnetosphere to various solar wind changes, and the penetration and propagation mechanisms of DP2-ULF range disturbances from the solar wind region into the equatorial ionosphere. The ordinary data from the MAGDAS/CPMN stations can be used for studies of long-term variations, e.g. magnetic storm, auroral substorms, Sq, etc., while the differential- and bandpass-filter-type data will be useful for studies of ULF waves, transient and impulsive phenomena. By analyzing these new MAGDAS data, we can perform a real-time monitoring and modeling of (1) the global 3-dimensional current system and (2) the ambient plasma mass density for understanding the electromagnetic and plasma environment changes in the geospace during helio-magnetospheric storms.