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MAGDAS observations for space weather

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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; (1) couplings of the complex and composite systems and (2) macro-and-micro-scale couplings in the Sun-Earth system. The goals for the attainment of the purpose are to construct Network Stations for observations and Modeling Stations for simulation/empirical modeling during the international CAWSES (Climate and Weather of Sun-Earth System), ILWS (International Living with Star) and IHY (International Heliophysical Year) period (2004-2008).

For space weather study on the complexity in the Sun-Earth system, the Space Environment Research Center (SERC), Kyushu University started from 2004 to construct a new ground-based magnetometer network, in cooperation with about 30 organizations in the world. 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 magnetic meridian, in order to study dynamics of plasmaspheric changes during spasce storms and substorms, electromagnetic responses of magnetosphere-ionosphere-thermosphere to various solar wind changes, and penetration mechanisms of DP2-ULF range disturbances from the solar wind into the equatorial ionosphere.

On the other hand, electromagnetic phenomena, e.g., ULF, ELF and VLF waves are recognized as useful diagnostic probes of the solar wind-magnetosphere-ionosphere- atmosphere coupled systems for space weather studies. These waves convey information about the dynamics and morphology of the coupled systems.

In the present paper, at the first we will introduce our real-time data acquisition and analysis of MAGDAS/CPMN system, and preliminary results of this system; (1) monitoring of the global 3-dimensional current system to know the electromagnetic coupling of high-latitude and Sq current systems, and (2) monitoring of the plasma density to understand plasma environment change during space storms. In the second, we will present the FM-CW radar system at L=1.26 to deduce electric field from the ionospheric plasma drift velocity. From 24hr monitoring of the ionospheric drift velocity with 10-sec sampling by the FM-CW radar observation, (3) we can understand how the polar electric field penetrates into the equatorial ionosphere.