

Contribution of IUGONET to the VarSITI program

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The Variability of the Sun and Its Terrestrial Impact (VarSITI) program aims at understanding the current extremely low solar activity and its influence on the Earth for various time scales and locations. In order to achieve these goals, it is necessary to conduct an interdisciplinary study that uses various types of data from multiple regions, such as solar interior, solar surface, heliosphere, magnetosphere, ionosphere, and atmosphere. The Inter-university Upper atmosphere Global Observation NETWORK (IUGONET) project has developed the research infrastructure to promote such an interdisciplinary study. The IUGONET is an inter-university project by five Japanese institutes and universities (Tohoku University, Nagoya University, Kyoto University, Kyushu University, and the National Institute of Polar Research) that have been developing a worldwide ground-based observation network of the upper atmosphere, Sun and planets. The main tools developed by the IUGONET are metadata database and data analysis software.

The IUGONET metadata database (IUGONET-MDB) enables cross-searching of data distributed across the member institutes/universities of IUGONET. The metadata of various ground-based observational data have already been registered not only by the members of IUGONET but also by the other Japanese institutes, for example, the National Institute of Information and Communications Technology (NICT), the Solar Observatory of National Astronomical Observatory of Japan (NAOJ), and the Kakioka magnetometer observatory, Japan Meteorological Agency. We also consider including data from the satellites and the numerical simulation in the future. The iUgonet Data Analysis Software (UDAS) is a plug-in software of Space Physics Environment Data Analysis System (SPEDAS), which is an integrated analysis platform for visualizing and analyzing the ground-based and satellite observation data. The UDAS has provided many routines to load the ground-based observational data from various types of instruments, including solar telescope, solar radio telescope, ionosphere and atmosphere radars, imagers, magnetometers, and so on. The SPEDAS also includes a plug-in tool from a Japanese satellite mission, Energization and Radiation in Geospace (ERG), which will explore the dynamics of the radiation belts in the Earth's inner magnetosphere. Thus, they will be powerful tools for four projects of the VarSITI, in particular, Specification and Prediction of the Coupled Inner-Magnetospheric Environments (SPeCIMEN) and Role Of the Sun and Middle atmosphere thermosphere/ionosphere in Climate (ROSMIC). In the presentation we will show some examples of scientific researches that the IUGONET has done using the upper atmospheric data and discuss our possible contribution to the VarSITI program.

Keywords: IUGONET, upper atmosphere, ground-based observation, metadata database, data analysis software, interdisciplinary study