

IUGONET data analysis system for a study of coupling processes in the solar-terrestrial system

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Various kinds of disturbance phenomenon and long-term variation in the upper atmosphere above 100 km are caused by energy input from solar radiation, solar wind, momenta and energies from the lower atmosphere via atmospheric waves, and chemical reaction. Such a disturbance phenomenon and long-term variation observed by various kinds of ground-based and satellite instruments are the result of such complicated processes. Therefore, in order to understand the mechanisms of these phenomena detected in this region, researchers need to conduct comprehensive analyses with various kinds of long-term observation data that have been continued by means of a global network of radars, magnetometers, optical sensors, helioscopes, etc. The IUGONET (Inter-university Upper atmosphere Global Observation NETwork) project initiated in 2009 is proposed to establish a cross-reference system for various kinds of ground-based observation data obtained from different techniques. The IUGONET participants consist of five universities/institutes: the National Institute of Polar Research (NIPR), Tohoku University, Nagoya University, Kyoto University, and Kyushu University. We have developed a metadata database (MDDB) and IUGONET data analysis software (UDAS) of ground-based observation data managed by these IUGONET universities/institutes with an international collaboration in order to promote a comprehensive study on coupling processes in the Sun-Earth system. MDDB provides researchers in a wide range of disciplines with a seamless data environment to link observation databases spread across the IUGONET universities/institutes. Researchers can find basic information of observation data (for example, observation period, data format, data use policy, instrument, observed region, observation site etc.) from the metadata for each observation data they are interested in. Recently, the metadata for several satellite observation data (for example, Akebono, GPS) have been registered to MDDB, and researcher can easily find the satellite database. UDAS will also be of great help in conducting integrated analyses and visualization of various kinds of solar-terrestrial observation data to investigate the long-term variation in the upper atmosphere throughout the Sun-Earth system. UDAS deals with 29 kinds of ground-based observation data provided by the IUGONET universities/institutes. Moreover, the executable file of SPEDAS/UDAS working on Interactive Data Language (IDL)-VM without IDL license has been released on the SPEDAS website. Owing to the executable file, anybody can use UDAS and conduct a comprehensive analysis of various kinds of solar and Earth's atmospheric observation data. Moreover, in the IUGONET project, in order to enhance an international use of these IUGONET products, we held a mini-training workshop of how to use the IUGONET MDDB and UDAS at several developing countries (India, Indonesia, Nigeria, Peru etc). Now, the IUGONET products became an essential tool to study a mechanism of the solar-terrestrial environmental change. In this talk, we introduce a brief overview of the IUGONET project, and an application of the IUGONET products to typical examples of upper atmospheric researches.

Keywords: Inter-university Upper atmosphere Global Observation NETwork, Upper atmosphere, Metadata database, IUGONET data analysis software (UDAS), Long-term variation, Ground-based observation

