

Long-term variation of upper atmosphere using the IUGONET metadata database and data analysis software (UDAS)

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Various kinds of atmospheric and ionospheric disturbances and long-term variation of the Earth's upper atmosphere as seen in several observation parameters (electric and magnetic fields, temperature, wind, density etc.) are caused by energy input from solar radiation, solar wind, momenta and energies from the lower atmosphere via atmospheric waves, and chemical reaction. Such disturbance phenomena and long-term variation observed by various kinds of ground-based and satellite instruments are the result of such complicated physical processes. Then, in order to investigate the mechanisms of the atmospheric disturbances and long-term variation of the upper atmosphere, 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 aims at the establishment of 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 metadata database (MDB) 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 study on coupling process in the Sun-Earth system. The MDB provides researchers in a wide range of disciplines with a seamless data environment to link databases spread across the IUGONET universities/institutes. In particular, UDAS will 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. Then, the IUGONET products will greatly contribute to a study on coupling process in the Sun-Earth system on the basis of integrated analysis of various kinds of long-term observation data covering a wide region from both the pole to the equator. 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: Solar activity, Upper atmosphere, IUGONET, Metadata database, Data analysis software