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<th>Inter-university Upper atmosphere Global Observation NETwork (IUGONET)</th>
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<tr>
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</tr>
<tr>
<td>Citation</td>
<td>(2012)</td>
</tr>
<tr>
<td>Issue Date</td>
<td>2012-12-04</td>
</tr>
<tr>
<td>URL</td>
<td><a href="http://hdl.handle.net/2433/165563">http://hdl.handle.net/2433/165563</a></td>
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<tr>
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<td>Type</td>
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Kyoto University
The Inter-university Upper atmosphere Global Observation Network (IUGONET) is an inter-university project for 6 years (Aug. 2009 - Mar. 2015) by the National Institute of Polar Research (NIPR), Tohoku University, Nagoya University, Kyoto University, and Kyushu University to build a database of metadata for ground-based observations of the upper atmosphere. The IUGONET institutes/universities are collecting various types of data by radars, magnetometers, photometers, radio telescopes, helicopters, etc. at various locations all over the world and at various altitude layers from the Earth's surface to the Sun. The database will be of great help to researchers in efficiently finding and obtaining these observational data spread over the world and the universe. The project is also developing a software to help researchers download, visualize, and analyze the data provided from the IUGONET institutes/universities.

**Target of the IUGONET**

The upper atmosphere is considered a compound system consisting of the mesosphere, thermosphere, ionosphere, and magnetosphere. Although different atmospheric layers are often referred to as independent regions, they are closely coupled by exchange of materials, momenta, and energies through complicated physical processes, for example:

- Energy input from the sun (e.g., ultraviolet radiation and the solar wind), drive convection of both neutral and charged particles,
- Moments and energy from the stratosphere and troposphere injected by atmospheric waves,
- Many internal phenomena (e.g., electromagnetic energy transport, plasma convection, chemical reaction).

Therefore, we need to create integrated and organic links between a variety of ground-based observations made at various locations from the equator to the poles.

The IUGONET project aims at building a metadata database of the upper atmospheric data acquired by ground-based observations so that people can obtain information of various data from the metadata database. This will promote effective use of the observational data spread across international geoscience research communities, and then lead to new interdisciplinary, comprehensive studies regarding the upper atmosphere.

We are incorporating the metadata of the data obtained by the cooperative institutes such as NAOG, NICT and Kakioka Magnetic Observatory of JMA. In addition, we are incorporating the metadata of the tropospheric observations taken by various radars in the Equatorial Ionospheric Observatory Radar (EAR) site and that in Shigaraki MU observatory (mid-latitude). Further, the metadata of solar full diskchromospheric imaging data have been registered. With these updated metadata, research basis of the whole solar-terrestrial system is being established.

**Available UDAS load procedures**

- Mean velocity of mesospheric wind
- Mean zonal and meridional winds in the mesosphere averaged for 1986-2012, which are taken by the MU radar. There can be clearly seen seasonal variation in both the wind components.
- Two-dimensional (2-D) plot of Doppler velocity of the ionospheric plasma observed with SENSU SuperDARN Syowa East radar around the day/night terminator on Oct. 4. It was averaged over 14 years from 1997 to 2010.

**Acknowledgement**

This project is supported by the Special Educational Research Budget (Research Promotion) FY2009 and the Special Budget (Project) FY2010 and later years) from the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan.

We acknowledge the cooperation and generosity of the THEMIS Science Support Team in allowing us to use TDAS for our data analysis software (UDAS).

The UDAS has been developed in collaboration with the Energelization and Radiation in Geospace (ERG) Science Center.

**Analysis examples**

- Users can easily visualize and analyze a long-term dataset by using TDAS and UDAS.
- Routines for loading and plotting 2-D data such as solar images, auroral images, and ionospheric absorption, will be added into UDAS in near future.

**Scope of the IUGONET project**

The IUGONET metadata database has been released since March, 2012. It is available at http://search.iugonet.org/iugonet/.

The official version of UDAS (current version 2.00.1) has been released since Feb, 2012. It can be downloaded from http://www.iugonet.org/en/software.html.

The UDAS is distributed as a research basis of the whole upper atmospheric data acquired by ground-based observations of the upper atmosphere. The IUGONET metadata database will lead to new interdisciplinary, comprehensive studies regarding the upper atmosphere.