<table>
<thead>
<tr>
<th>Title</th>
<th>Inter-university Upper atmosphere Global Observation NETwork (IUGONET) - Metadata Database for Upper Atmosphere</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author(s)</td>
<td>HAYASHI, Hiroo; HORI, Tomoaki; KOYAMA, Yukinobu; TANAKA, Yoshimasa; KAGITANI, Masato; KOUNO, Takahisa; YOSHIDA, Daiki; UENO, Satoru; KANEDA, Naoki; ABE, Shuji; MIYOSHI, Yoshizumi; OKADA, Masaki; NAKAMURA, Takuji; NOSE, Masahito; SHINBORI, Atsuki</td>
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<td>Citation</td>
<td>(2010)</td>
</tr>
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<td>Issue Date</td>
<td>2010-07-08</td>
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<tr>
<td>URL</td>
<td><a href="http://hdl.handle.net/2433/123273">http://hdl.handle.net/2433/123273</a></td>
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**Type**

Presentation

**Textversion**

Author

Kyoto University
Inter-university Upper atmosphere Global Observation NETwork (IUGONET) - Metadata Database for Upper Atmosphere -

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\textsuperscript{1}RISH, Kyoto Univ., \textsuperscript{2}WDC/Kyoto, Kyoto Univ., \textsuperscript{3}Kwasan and Hida Observatories, Kyoto Univ., \textsuperscript{4}SERC, Kyusyu Univ., \textsuperscript{5}STE Lab., Nagoya Univ., \textsuperscript{6}NIPR, \textsuperscript{7}PPARC, Tohoku Univ.
The IUGONET project - Objectives

Purposes of this 6-year (2009-2014) project are:

- to develop a metadata database (DB) of the upper atmosphere (UA) data by ground-based observation accumulated over 50 years since IGY by Japanese universities/institutes.
- to promote effective use of the observational data spread across the institutes/universities, which leads to interdisciplinary, comprehensive studies of the UA.
- to investigate mechanism of long-term variation in the UA

*This project is supported by Special Educational Research Budget (Research Promotion), MEXT, Japan

Participating universities and research institutes

- Planetary Plasma and Atmospheric Research Center, Tohoku University
- National Institute of Polar Research
- Solar Terrestrial Environment Laboratory, Nagoya University
- Research Institute for Sustainable Humanosphere, Kyoto University
- World Data Center for Geomagnetism, Kyoto University
- Kwasan and Hida Observatories, Kyoto University
- Space Environment Research Center, Kyushu University
Observations by IUGONET institutions

Iceland
- aurora imager x2
- magnetometer x3

Toromso
- IS radar (EISCAT)
- meteor radar
- MF radar

Svalbard:
- IS radar (EISCAT), meteor radar, aurora imager

SuperDARN radar @ Shigaraki

Hokkaido HF radar

Solar observatory (Kyoto Univ.)

Iitate, Onagawa
- radio telescope
- magnetometer

SYOWA base
- SuperDARN radar x2
- MF radar
- aurora imagers
- magnetometer chain
- ELF obs. (conjugate with Onagawa)

SuperDARN radar

MST radar

MF / meteor radar

MAGDAS magnetometer

OMTI imager

WDC magnetometer

AOGS2010 in India (July 08, 2010)
Altitude coverage of observations

<table>
<thead>
<tr>
<th>Heliosphere</th>
<th>Solar telescope</th>
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<tbody>
<tr>
<td>Magnetosphere</td>
<td>Solar wind</td>
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<tr>
<td>Plasmasphere</td>
<td>Solar telescope</td>
</tr>
<tr>
<td>Ionosphere</td>
<td>Solar wind</td>
</tr>
<tr>
<td>Thermosphere</td>
<td>Solar wind</td>
</tr>
<tr>
<td>Mesosphere</td>
<td>High-lat. IS &amp; SD radar</td>
</tr>
<tr>
<td>Stratosphere</td>
<td>Imager LIDAR</td>
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<tr>
<td>Troposphere</td>
<td>MF/Meteor radar</td>
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</tbody>
</table>

WDC data: magnetometer data, geomagnetic indices

Antarctica | Low-mid lat. | Equator | Low-mid lat. | Arctic

NIPR | Kyushu Univ. | Kyoto Univ. | Tohoku Univ. | Nagoya Univ.

AOGS2010 in India (July 08, 2010)
Problem with databases

Not impossible, but hard to reach the other disciplinary data!
Database access through metadata DB

- Obs. time & loc.
- Instrument type
- Location of data file
- Data format
- Contact
- … etc.

MLT radar data
DB

Geomag. data
DB

Solar data DB

XML

Metadata DB

Sharing MD among all MDBs

Easy to obtain various kinds of UA data from research institutes/universities!
Project Schematic

Collaboration by Virtual Information Center

Other institutes and universities in Japan, Overseas researchers

Development to other Earth Science fields

Extension to satellite, simulation data

STE Lab, Nagoya Univ.

Ionospheric & magnetospheric research community

Kwasan & Hida Obs., Kyoto Univ.

Solar physics research community

Database (+Analysis software)

PPARC, Tohoku Univ.

Geomagnetic research community

Polar research community

SERC, Kyushu Univ.

Magnetospheric research community

NIPR

Virtual Information Center for upper atmospheric sci.

AOGS2010 in India (July 08, 2010)
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<tbody>
<tr>
<td>Virtual information center (VIC)</td>
<td>System installation</td>
<td>Normal</td>
<td>System update</td>
<td></td>
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<td></td>
<td>Construct the integrated research environment (TV-conference system, ..)</td>
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<td>of UA studies</td>
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<td>operation</td>
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<td>Development of metadata DB</td>
<td>Prototype system</td>
<td>Regular</td>
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<td>Design and develop the metadata DB system</td>
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<td>Design the Metadata format</td>
<td>Ver.1 format</td>
<td>Update &amp;</td>
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<td>Release the format ver.1 and keep updating if necessary</td>
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<td>standards</td>
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<td>document</td>
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<td>Development of data analysis</td>
<td>Specifications</td>
<td>Programming</td>
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<td>Develop and release analysis softwares for UA data</td>
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<td>software</td>
<td>and basic design</td>
<td>Open to</td>
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<td>Maintenance &amp; extension of</td>
<td>Maintenance of obs.</td>
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<td>Incorporate non-DB’d data into the DBs</td>
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<td>existing DBs of Observation data</td>
<td>DBs &amp; exam. of non-</td>
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<td>digital dataset</td>
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<td>Metadata generation</td>
<td>Collecting</td>
<td>Effort</td>
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<td>Generate metadata in the designated format and add to metadata DB</td>
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<td>metadata from each</td>
<td>focused on</td>
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<td>old data</td>
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<td>from Y2012 on</td>
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<td>Operation of metadata DB</td>
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<td>Release the metadata DB for community</td>
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<td>VIC extension to related fields</td>
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<td>Wrap up the project and discuss further extension</td>
</tr>
</tbody>
</table>
Design of metadata format

IUGONET metadata format = SPASE + modifications

(http://www.spase-group.org)

What’s SPASE?

metadata format developed by international consortium to comprehensively describe research resources regarding heliospheric and magnetospheric satellite observations

- closely related to STP and upper atmosphere researches (easy to use as a base format)
- new metadata elements & words appendable (customizable according to our data)
- widely-used in VxOs (possible metadata exchange in the future)

IUGONET’s modifications

- additional words to represent non-digital archives
- additional words to represent heliospheric coordinates
- new metadata elements to describe observation location & range
Metadata of Numerical Data

**ResourceID:** space://IUGONET/NumericalData/EAR/RAO/EAR/trop_std_netcdf

**ResourceHeader:**
- **ResourceName:** EAR standard tropospheric observation mode
- **ReleaseDate:** 2010-04-12
- **Description:** Zonal, meridional, vertical winds, beam echo intensity, and spectral width data taken by the EAR operated in the standard …
- **Acknowledgement:** If you acquire EAR data, we ask that you acknowledge us in …

**Contact:**
- **PersonID:** space://IUGONET/Person/EAR.Management.Group
- **Role:** General Contact

**AccessInformation:**
- **RepositoryID:** space://IUGONET/Repository/RISH/RISHDB
- **Availability:** Online
- **AccessRights:** Open
- **AccessURL:**
  - **URL:** http://www.rish.kyoto-u.ac.jp/ear/data/index.html
- **Format:** NetCDF

- Metadata of instrument, observatory, person, repository also created
- Each metadata file written in XML
Prototype of MDB system is being developed by an existing repository software (DSpace).

- able to register, search, collect, and provide metadata
- able to handle arbitrary metadata formats
- free, and widely used (e.g. digital university repositories)
Development of analysis and quick-look software for our observation data has just started, in collaboration with the ERG Science Center.

The software will be produced with the THEMIS science Data Analysis (TDAS) IDL libraries and be functioned on the free IDL Virtual Machine.
The “IUGONET” project will develop a metadata DB to facilitate efficient use of the upper atmospheric data, and thereby to promote interdisciplinary, comprehensive studies.

Current development status:
- Metadata DB system is being developed on the basis of DSpace.
- Metadata format has been determined - SPASE with some modifications.
- Analysis software will be developed with TDAS IDL libraries.

The IUGONET metadata DB will surely contribute to promotion of many research projects (e.g. CAWSES-II Escience and informatics, Asia-oceanian MLT radar network, etc.)
Regional CAWSES-II MLT Radar Workshop
~ Singapore, 8 & 9 March 2010 ~
More info about IUGONET

- **IUGONET homepage**
  http://www.iugonet.org/en

The Inter-university Upper atmosphere Global Observation NETwork (IUGONET) is a six-year research project of the National Institute of Polar Research (NIPR), Tohoku University, Nagoya University, Kyoto University, and Kyushu University to build a metadata database (MDB) of ground-based observations of the upper atmosphere. We have various kinds of observational data acquired so far by a global network of radars, magnetometers, optical sensors, heliophotographs, etc., but these data are archived in individual databases at each site. By developing the MDB, which will give the location and other information about the observational data, we intend to provide researchers with a seamless data environment linking databases spread across the member institutions. This MDB will be of great help in conducting comprehensive analyses with various observational data to clarify the mechanisms of the long-term variations in the upper atmosphere.