<table>
<thead>
<tr>
<th>Title</th>
<th>Inter-university Upper atmosphere Global Observation NETwork (IUGONET) - Development of metadata database</th>
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<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>Issue Date</td>
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Inter-university Upper atmosphere Global Observation NETwork (IUGONET) - Development of metadata database -

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1. RISH, Kyoto Univ., 2. WDC/Kyoto, Kyoto Univ.,
3. Kwasan and Hida Observatories, Kyoto Univ.
4. SERC, Kyusyu Univ.,
5. STE Lab., Nagoya Univ., 6. NIPR,
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 institutes/universities.
- to promote effective use of the observational data and 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
Project members

• Tohoku Univ.
  T. Ono, N. Terada
  M. Kagitani

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  N. Sato, T. Nakamura,
  H. Miyaoka, M. Okada,
  Y. Tomikawa
  Y. Tanaka

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  T. Ogino, Y. Miyoshi, Y. Otsuka
  T. Hori, T. Kouno

• World Data Center, Kyoto Univ.
  T. Iyemori, M. Nosé
  Y. Koyama, D. Yoshida

• Research Institute of Sustainable Humanosphere, Kyoto Univ.
  T. Tsuda
  H. Hayashi (*), A. Shinbori

• Kwasan and Hida Observatory, Kyoto Univ.
  K. Shibata
  S. UeNo, N. Kaneda

• SERC, Kyushu Univ.
  K. Yumoto
  S. Abe

Member of core development team
(*) Lead of core development team
Observations by IUGONET institutions

Iceland
- aurora imager x2
- magnetometer x3

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

MU radar @Shigarki

SuperDARN radar
- Hokkaido HF radar
- Solar observatory
  (Kyoto Univ.)

Equatorial Atmospheric Radar (EAR)

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

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

Iitate, Onagawa
- radio telescope magnetometer

SuperDARN radar

JPGU Meeting 2010 in Makuhari (May 26, 2010)
Problem with databases

A University
- MLT radar data DB
- MLT radar data experts

B University
- Geomag. data DB
- Geomag. data experts

C University
- Solar data DB
- Solar data experts

Not impossible, but hard to reach the other disciplinary data!

JPGU Meeting 2010 in Makuhari (May 26, 2010)
Database access through metadata DB

- MLT radar data
- Geomag. data
- Solar data

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

Metadata DB

XML

MD generation

Sharing MD among all MDB

MLT radar data experts

Geomag. data experts

Solar data experts

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

JPGU Meeting 2010 in Makuhari (May 26, 2010)
Collaboration by Virtual Information Center

SERC, Kyushu Univ.
STE Lab, Nagoya Univ.
Kwasan & Hida Obs., Kyoto Univ.
PPARC, Tohoku Univ.
NIPR

Virtual Information Center for upper atmospheric sci.

Other institutes and universities in Japan, Overseas researchers

Development to other Earth Science fields

Extension to satellite, simulation data

Metdata DB

Ionospheric & magnetospheric research community

Solar physics research community

Database (+Analysis software)

Geomagnetic research community

Equatorial atmos. research community

PPARC, Tohoku Univ.
NIPR

Geomagnetic research community

Magnetospheric research community

Polar research community

WDC for Geomag, Kyoto Univ.

JPGU Meeting 2010 in Makuhari (May 26, 2010)
## Project Timeline

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</thead>
<tbody>
<tr>
<td>Virtual information center (VIC) of UA studies</td>
<td>System</td>
<td>Normal</td>
<td></td>
<td>System</td>
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<td></td>
<td>Construct the integrated research environment (TV-conference system, ..)</td>
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<tr>
<td></td>
<td>installation</td>
<td>operation</td>
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<td>update</td>
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<tr>
<td>Development of metadata DB system</td>
<td>Prototype</td>
<td>Regular</td>
<td>Open to</td>
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<td>Design and develop the metadata DB system</td>
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<tr>
<td></td>
<td>system devel.</td>
<td>system devel.</td>
<td>public</td>
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<tr>
<td>Design the Metadata format standards</td>
<td>Ver.1 format</td>
<td>Update &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Release the format ver.1 and keep updating if necessary</td>
</tr>
<tr>
<td></td>
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<td>document</td>
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</tr>
<tr>
<td>Development of data analysis software</td>
<td>Specifications and basic design</td>
<td>Programming</td>
<td>Open to public</td>
<td></td>
<td></td>
<td></td>
<td>Develop and release analysis softwares for UA data</td>
</tr>
<tr>
<td>Maintenance &amp; extension of existing DBs of</td>
<td>Maintenance of obs. DBs &amp; exam. of non-digital dataset</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Incorporate non-DB’d data into the DBs</td>
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<tr>
<td>Observation data</td>
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<td></td>
<td></td>
<td>Effort focused on old data from Y2012 on</td>
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<tr>
<td>Metadata generation</td>
<td>Collecting metadata from each obs. DB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Effort focused on old data from Y2012 on</td>
</tr>
<tr>
<td>Operation of metadata DB</td>
<td></td>
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<td></td>
<td></td>
<td>Generate metadata in the designated format and add to metadata DB</td>
</tr>
<tr>
<td>VIC extension to related fields</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Release the metadata DB for community</td>
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*JPGU Meeting 2010 in Makuhari (May 26, 2010)*
Design of metadata format

**IUGONET metadata format = SPASE + modifications**

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

**SPASE**

Space Physics Archive Search and Extract

<table>
<thead>
<tr>
<th><strong>Announcements:</strong></th>
<th><strong>Have a question?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>SPASE face-to-face meeting (July 9-11, 2007) more...</td>
<td>Ask SPASE</td>
</tr>
</tbody>
</table>

The SPASE data system is a model for scientific data systems, it is based on the latest web-based technologies and is designed to be a distributed data systems with a heterogenous mix of platforms and systems.

These pages focus on the data model for the SPASE data system. The data model includes the structure of messages passed between systems; how to enrich data for interchange and archiving; and a data dictionary defining all terms and keywords used in the system. A full description of the data model is included under Documents.

Also included are examples that implement the data model.

Tools to demonstrate the utility and capability of the SPASE metadata and framework

If you should have any questions or comments please contact us.

**Data Model Document**

- History of changes
  - Current Version (2.0.0)
  - Released: 2009-04-29
  - Current Draft (2.0.1)
  - updated: 2009-07-10
- All documents

**Services**

- SMWG Registry Search
- Naming Authority
- Groups and Mailing Lists

**Data Dictionary**

- Search
- Tree
- Explorer (New!)
- XML Schema
- XML Stylesheet
- XML Templates
- XML Models
- Ontologies

**News**

- SPASE in the literature
- Proofs

**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
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 academic repositories)
Development of analysis software

- 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 comprehensive, multi-disciplinary 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 started to be developed with TDAS IDL libraries.

The IUGONET metadata DB will surely contribute to the promotion of international interdisciplinary studies in the CAWSES-II Escience and informatics group.
More info about IUGONET

● IUGONET homepage

http://www.iugonet.org/en

● JpGU exhibition booth

JPGU Meeting 2010 in Makuhari (May 26, 2010)