<table>
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<tr>
<td>Author(s)</td>
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Kyoto University
Inter-university Upper atmosphere Global Observation NETwork (IUGONET) - Development of metadata database -

H. Hayashi¹, T. Hori⁵, Y. Koyama², Y. Tanaka⁶, M. Kagitani⁷, T. Kouno⁵, D. Yoshida², S. Ueno³, N. Kaneda³, S. Abe⁴, Y. Miyoshi⁵, M. Okada⁶, T. Nakamura⁶, M. Nosé², and A. Shinbori¹

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.
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- National Institute of Polar Research
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- World Data Center, Kyoto Univ.
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  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 @Shigarakì

SuperDARN 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

SuperDARN radar

Iitate, Onagawa
- radio telescope magnetometer

MST radar
- MF / meteor radar
- MAGDAS magnetometer
- FM-CW radar
- OMTI imager
- WDC magnetometer

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!
Database access through metadata DB

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

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

Virtual Information Center for upper atmospheric sci.

STE Lab, Nagoya Univ.

PPARC, Tohoku Univ.

SERC, Kyushu Univ.

PPARC, Tohoku Univ.

Geomagnetic research community

Magnetospheric research community

Polar research community

Geomagnetic research community

Equatorial atmos. research community

Database (+Analysis software)

Solar physics research community

Ionospheric & magnetospheric research community

Development to other Earth Science fields

Extension to satellite, simulation data

NIPR

Metadata DB

WDC for Geomag, Kyoto Univ.

RISH, Kyoto Univ.

Other institutes and universities in Japan, Overseas researchers

Virtual Information Center

Geomatics research community

Equatorial atmos. research community

Ionospheric research community

Polar research community

Geomagnetic research community

Magnetospheric research community

STE Lab, Nagoya Univ.

PPARC, Tohoku Univ.

SERC, Kyushu Univ.

NIPR
## Project Timeline

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<tbody>
<tr>
<td>Virtual information center (VIC) of UA studies</td>
<td>System installation</td>
<td>Normal operation</td>
<td>System update</td>
<td></td>
<td></td>
<td></td>
<td>Construct the integrated research environment (TV-conference system, ..)</td>
</tr>
<tr>
<td>Development of metadata DB system</td>
<td>Prototype system devel.</td>
<td>Regular system devel.</td>
<td></td>
<td></td>
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<td></td>
<td>Design and develop the metadata DB system</td>
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<tr>
<td>Design the Metadata format standards</td>
<td>Ver.1 format</td>
<td>Update &amp; document</td>
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<td></td>
<td></td>
<td></td>
<td>Release the format ver.1 and keep updating if necessary</td>
</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 Observation data</td>
<td>Maintenance of obs. DBs &amp; exam. of non-digital dataset</td>
<td></td>
<td></td>
<td>Effort focused on old data from Y2012 on</td>
<td></td>
<td>Incorpoated non-DB’d data into the DBs</td>
<td></td>
</tr>
<tr>
<td>Metadata generation</td>
<td>Collecting metadata from each obs. DB</td>
<td></td>
<td></td>
<td>Effort focused on old data from Y2012 on</td>
<td></td>
<td>Generate metadata in the designated format and add to metadata DB</td>
<td></td>
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<tr>
<td>Operation of metadata DB</td>
<td></td>
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<td></td>
<td>Release the metadata DB for community</td>
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<tr>
<td>VIC extension to related fields</td>
<td></td>
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<td></td>
<td></td>
<td>Wrap up the project and discuss further extension</td>
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*JPGU Meeting 2010 in Makuhari (May 26, 2010)*
IUGONET metadata format = SPASE + modifications

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

IUGONET’s modifications

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

Design of metadata format

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)
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)