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<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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Inter-university Upper atmosphere Global Observation NETwork (IUGONET) - Development of metadata database -

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   4. SERC, Kyusyu Univ., 5. STE Lab., Nagoya Univ., 6. NIPR,
   7. PPARC, Tohoku Univ.
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
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  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

- **SYOWA base**
  - SuperDARN radar x2
  - MF radar
  - Aurora imagers
  - Magnetometer chain
  - ELF obs. (conjugate with Onagawa)

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

- **MU radar @Shigaraki**

- **SuperDARN Hokkaido HF radar**

- **MST radar**

- **MF/meteor radar**

- **MAGDAS magnetometer**

- **FM-CW radar**

- **OMTI imager**

- **WDC magnetometer**

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

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

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

Metadata DB

MLT radar data experts

Geomag. data experts

Solar data experts

XML

MD generation

Sharing MD among all MDB

A University

B University

C University

JPGU Meeting 2010 in Makuhari (May 26, 2010)
## 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>Open to public</td>
<td></td>
<td></td>
<td></td>
<td>Design and develop the metadata DB system</td>
</tr>
<tr>
<td>Design the Metadata format standards</td>
<td>Ver.1 format</td>
<td>Update &amp; document</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Release the format ver.1 and keep updating if necessary</td>
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<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>
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<td>Incorporate non-DB’d data into the DBs</td>
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<tr>
<td>Metadata generation</td>
<td>Collecting metadata from each obs. DB</td>
<td></td>
<td>Effort focused on old data from Y2012 on</td>
<td></td>
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<td></td>
<td>Generate metadata in the designated format and add to metadata DB</td>
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<tr>
<td>Operation of metadata DB</td>
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<td>VIC extension to related fields</td>
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*JPGU Meeting 2010 in Makuhari (May 26, 2010)*
IUGONET metadata format = SPASE + modifications

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

Design of metadata format

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 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 E-science 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)