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<td>HAYASHI, Hiroo; KOYAMA, Yukinobu; HORI, Tomoaki; TANAKA, Yoshimasa; KAGITANI, Masato; SHINBORI, Atsuki; ABE, Shuji; KOUNO, Takahisa; YOSHIDA, Daiki; UENO, Satoru; KANEDA, Naoki; IUGONET project team</td>
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<td>Citation</td>
<td>(2011)</td>
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<td>Issue Date</td>
<td>2011-03-29</td>
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<td>URL</td>
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<td>Textversion</td>
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Introduction to a metadata database developed by the Inter–university Upper atmosphere Global Observation NETwork (IUGONET) project

• H. Hayashi, Y. Koyama, T. Hori, Y. Tanaka, M. Kagitani, A. Shinbori, S. Abe, H. Kouno, D. Yoshida, S. UeNo, N. Kaneda, and IUGONET project team
The IUGONET project aims at building “e-infrastructure” for researchers to effectively find, get, and analyze various kinds of upper atmospheric data spread over universities and institutes.

- Distributes ground-based observational data accumulated over 50 years since IGY (both digital and analogue data)
- Promotes analyses of multi-disciplinary data, which will lead to comprehensive studies of mechanisms of long-term variations in the upper atmosphere

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

Various observation parameters (temperature, wind, geomagnetism, aurora, etc.) taken by various observation techniques at various locations and altitudes

Such observational data not necessarily well used in scientific researches so far → What’s the problem?
Problem with databases

Hard to even reach to the other disciplinary data due to lack of information!
Database access through metadata DB

- Observation time
  ex) 2011-03-29 07:30:00
- Observation location
  ex) 34.85N, 135.10E
- Instrument type
  ex) VHF radar
- Location of data file
  ex) www.rish.kyoto-u...
- Contact
  ex) hhayashi@rish...
- ... etc.

Easy to access various kinds of data from other disciplines **by using metadata**!
### Project Timeline

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**Today**

*To be beta-released on April 1st!!*
Design of metadata format

- Many metadata formats available in the Earth and planetary sciences!
  - Dublin Core
  - ISO 19115 / 19139
  - GCMD DIF
  - FGDC CSDGM
  - IPY Metadata Profile
  - ISTP Standards
  - SPASE
  - ...

- IUGONET adopted SPASE with some modifications

  - closely related to STP and upper atmospheric researches (➔ easy to use as a base format)
  - new metadata elements & words appendable (➔ customizable according to our data)
  - widely-used in existing Virtual Observatories (➔ possible metadata exchanges)
Creation of metadata

EXAMPLE: 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 format
Tohoku Univ.

- Geomagnetic data: PC3 index, Onagawa fluxgate and search coil magnetometers
- HF-band radio wave data: Jupiter radio wave, Sun/Jupiter wide band radio wave
- VHF-band: Jupiter radio spectral data, Solar radio spectral data
- LF-band: Standard radio wave phase-amplitude variation data

National Institute of Polar Research

- Syowa Station (Antarctica): Aurora camera, magnetometers, Upper Atmos. Physics Monitoring Obs., Imaging Riometer, 1-100Hz ULF/ELF Electromagnetic wave, Fabry-Perot Imager, SuperDARN HF radar, MF radar, Unmanned magnetometer network, Sodium Lidar
- Upper Atmosphere Physics Obs. at Zhongshan Station, All-skyimager at South Pole station
- Conjugate Obs. at Icelând: fluxgate/induction magnetometer, Imaging riometer, EISCAT radar, NIPR/Norway Svalbard meteor radar, Tromso meteor radar, Auroral and Airflow obs. at Svalbard and Tromso

Solar-Terrestrial Environment Lab., Nagoya Univ.

- NO, NO2, NOx, O3 density, Aerosol chemical composition, Aerosol extinction coefficient, Database of variation of atmospheric constituents derived by ground spectroscopy obs.
- Ground magnetometers, Airglow and aurora image by All-sky camera, Thermospheric wind speed scintillation, GPS-TEC, GPS scintillation, VHF radar, EISCAT radar, Optical/MF radar/Meteor radar data at Norway
- Spatial profile of solar wind velocity by interplanetary Scintillation (IPS)
- SuperDARN Hokkaido HF radar data

Kwasan and Hida Observatories, Kyoto Univ.

- FMT: Event-list, Movies of outstanding events, Real-time images, Digital raw data
- SMART: Hα full-disk solar images, Hα partial images, Hα real-time images, event catalog, movies, full-disk magnetogram
- DST: Hα partial solar QL images, Hα partial images, Spectrograph QL images, Spectrograph data

WDC/Kyoto, Kyoto Univ.

- Geomagnetic indices (final, provisional, quick look) ↔ AE, SYM/ASY, Geomagnetic field digital data (WDC final, WDC prompt), Geomagnetic field analog data
- Geomagnetic field digital data and Barometer data (Original obs. by WDC for Geomag, Kyoto)
- Geomagnetic field model (IGRF), Ionospheric conductivity model (IRI2007)
- Catalogue for archived geomagnetic field data

Research Institute for Sustainable Humanosphere, Kyoto Univ.

- Shigaraki MU Observatory: MU radar (standard tropospheric obs. Mode, standard mesospheric obs. Mode, standard ionospheric obs. Mode, special obs.: Meteor/RASS/FAI), Ionosonde, Radiosonde, Boundary layer radar, L-band lower Tropospheric radar, Lower Thermosphere profiler radar, Ceilometer, AWS
- Equatorial Atmosphere Observatory: EAR (standard tropospheric/ionospheric obs.), Boundary layer radar, X-band weather radar, Ceilometer, Radiosonde
- Other sites: Pontianak MF radar, Pameungpeuk MF radar, Jakarta meteor radar, Kototabang meteor radar, Jakarta boundary layer radar, Darwin radiosonde (DAW, GDP, KHC) (campaign obs.), Serpong boundary layer/Meteor radar

Space Environment Research Center, Kyushu Univ.

- Ground magnetometers (MAGDAS, CPMN)
- FM-CW radar
- Geomagnetic Pc5 Index, EE Index
IUGONET has been building a metadata DB based on DSpace, a free, repository software widely used by digital repositories in many universities over the world.

IUGONET metadata DB:

http://search.iugonet.org/iugonet/

User ID = iugonet
Password = iugonet
Metadata DB system – search form

- **Keyword search**
- **Time range search**
- **Spatial coverage search**
**Metadata DB system – search result**

<table>
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<tr>
<th>Relative Stop Date: 14 days ago (-P14D)</th>
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<tr>
<td><a href="http://gemisssc.stelab.nagoya-u.ac.jp/erg/">http://gemisssc.stelab.nagoya-u.ac.jp/erg/</a></td>
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**The common time filter CDF data of SuperDARN King Salmon HF radar distributed by ERG-SC**

**NumericalData**

Common mode data obtained by SuperDARN King Salmon HF radar. Data files are distributed in the CDF format through the ERG-SC repository.

**Start Date**: 2006-12-02T00:00:00  
**Relative Stop Date**: 180 days ago (-P180D)  
[http://gemisssc.stelab.nagoya-u.ac.jp/erg/](http://gemisssc.stelab.nagoya-u.ac.jp/erg/)


**Standard observation data of the troposphere and lower stratosphere taken by the MU radar (NetCDF format)**

**NumericalData**

The 10-minute average observation data in the NetCDF (Network Common Data Form) format taken by the MU radar at Shigaraki in the Shiga prefecture, Japan (34.85N, 136.10E, 385m MSL), which has been operated in the standard observation mode of the troposphere and stratosphere. The observation data are stored in the NetCDF files of each day. The file name is (year)(month)(day).nc. The NetCDF data include range, height, time, three components of wind velocity, radial Doppler velocity, echo power, spectral width and noise level for each beam number and so on. The azimuth and zenith angles of beam 1, 2, 3, 4 and 5 are (0, 0), (90, 10), (180, 10) and (270, 10), respectively, in unit of degree. The value of 1.0e+10 means missing data.

**Start Date**: 1986-03-16T15:05:00  
**Relative Stop Date**: 14 days ago (-P14D)  


**Field-aligned irregularity (FAI) observation data of the ionosphere taken by the EAR (NetCDF format)**

**NumericalData**

The field-aligned irregularity (FAI) observation data in the NetCDF (Network Common Data Form) format taken by the equatorial atmosphere radar (EAR) at Kototabang, Indonesia (0.20S, 100.32E, 865m MSL). This FAI observation mode covers a wide altitude range from 80 to 600 km in the ionosphere (D-region (below 90 km), E-region (90-150 km), and F-region (above 150 km)). The observation data are stored in the NetCDF files of each day and observation parameter. The file name is (year)(month)(day).(observation parameter).nc. The NetCDF data include range, height, time, radial Doppler velocity, echo power, spectral width and noise level for each beam number and so on. Details of the observation parameter are described in the EAR-FAI homepage ([http://www.rish.kyoto-u.ac.jp/ear/data-fai/index.html](http://www.rish.kyoto-u.ac.jp/ear/data-fai/index.html)). The value of 1.0e+10 means missing data.
### Resource Name:
Standard observation data of the troposphere and lower stratosphere (NetCDF format)

### Description:
The 10-minute average observation data in the NetCDF (Network Common Data Form) format taken by the MU radar at Shigaraki in the Shiga prefecture, Japan (34.85N, 136.10E, 385m MSL), which has been operated in the standard observation mode of the troposphere and stratosphere. The observation data are stored in the NetCDF files of each day. The file name is (year)(month)(day).nc. The NetCDF data include range, height, time, three components of wind velocity, radial Doppler velocity, echo power, spectral width and noise level for each beam number and so on. The azimuth and zenith angles of beam 1, 2, 3, 4 and 5 are (0, 0), (0, 10), (90, 10), (180, 10) and (270, 10), respectively, in unit of degree. The value of 1.0e+10 means missing data.

### Acknowledgement:
If you acquire MU radar data, we ask that you acknowledge us in your use of the data. This may be done by including text such as MU radar data provided by Research Institute for Sustainable Humanosphere of Kyoto University. We would also appreciate receiving a copy of the relevant publications.

### Release Date:
2011-03-06T00:00:00

### Contact Person ID:
0: spase://IUGONET/Person/Hirohiko.Hashiguchi
1: spase://IUGONET/Person/MU.Radar.Management.Group
2: spase://IUGONET/Person/Noriko.Hashiguchi
3: spase://IUGONET/Person/Atsuki.Shinbori

### Contact Role:
0: PrincipalInvestigator
1: GeneralContact
2: DataProducer
3: MetadataContact

### Access Information Repository ID:
spase://IUGONET/Repository/RISH/RISHDB

### Access Information Access URL:
http://www.rish.kyoto-u.ac.jp/radar-group/mu/data/

### Access Information Availability:
Online

### Access Information Access Rights:
Open

**AcessURL points the location of dataset you are interested in.**
## Project Timeline

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**Dr. Shinbori will talk about the IUGONET analysis software**

**To be beta-released on April 1st!!**

**To be beta-released in early May!!**
Planning to use metadata DB from analysis software to get some info (e.g. URL)

(1) Query

(2) Metadata

Get URL of data

(3a) Load procedure

(3b) Wget (internal call)

(4) Obs. data

(5) Plot

User

IUGONET metadata DB

OpenSearch / SRU / SRW

Observational DB

(Data Analysis Software)
Regional CAWSES-II MLT Radar Workshop
~ Singapore, 8 & 9 March 2010 ~
Asia-oceanian MLT radar network

- **Open symbol**: suspended or terminated
- **Blue colored**: planned

**Sites**:
- **Koto Tabang**, **Pontianak**, **Kotowaringin**, **Kunming**, **Wuhan**, **Sanya**
- **Jakarta/Serpong**, **Pameungpeuk**, **Katherine**, **Buckland Park (Adelaide)**
- **Rikubetsu**
- **Shigaraki**
- **Wakkanai**
- **Mohe**
- **Yamagawa**
- **Gyeryong**
- **Langfang**
- **Kunming**
- **Wuhan**
- **Beijing**
- **Singapore (Int’l WS)**
- **Geraldton**
- **Alice Springs**
- **Darwin**
- **Buckland Park (Adelaide)**
- **Kauai**
- **Rarotonga Is.**
- **Kolhapur**
- **Kodapa**
- **Trivandrum**
- **Kollam**
- **Shigaraki**

**Types of Radars**:
- **MF radar**
- **Meteor radar**
- **VHF radar**
- **Others**
- **(VHF MST radar / Lidar)**
- **(VHF BLT radar)**
- **(VHF Ionospheric radar)**
- **(MST radar)**
- **(Lidar)**
- **(MU radar / Lidar)**
- **(SuperDARN / Lidar)**
- **(SuperDARN HF radar)**
The IUGONET project builds e-infrastructure (metadata database and analysis software) to promote effective use of upper atmospheric data taken by ground-based observations.

The IUGONET metadata database is scheduled to be beta-released on April 1st, 2011.

The IUGONET metadata database should be used to facilitate data exchange among the Asia-oceanian MLT radar network.