



Workshop at NARL, Gadanki, India / 27-29 March 2011

- Recent Advances in Observational Studies of the Tropical Atmosphere and Ionosphere -

Introduction to a metadata database developed by the Inter-university Upper atmosphere Global Observation NETwork (IUGONET) project

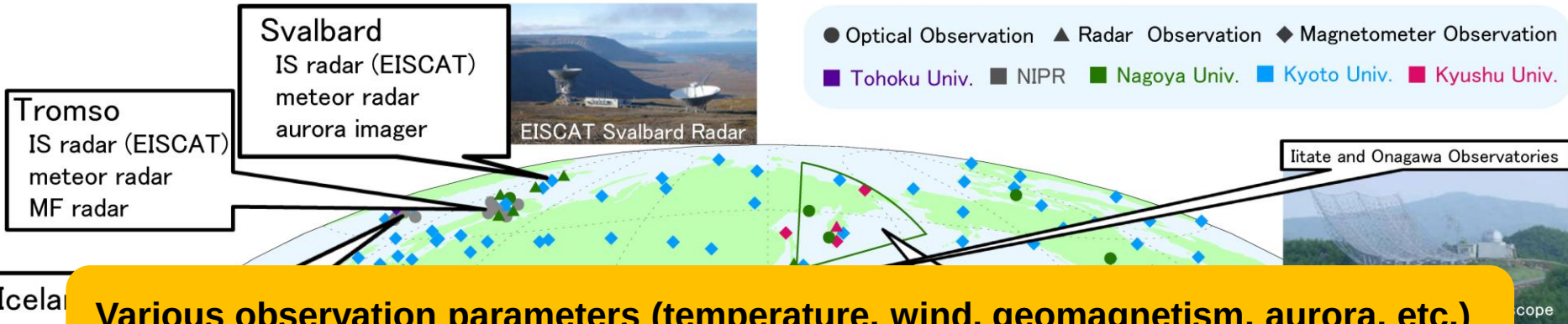
- **H. Hayashi, Y. Koyama, T. Hori, Y. Tanaka, M. Kagitani,
A. Shinbori, S. Abe, H. Kouno, D. Yoshida, S. UeNo,
N. Kaneda, and IUGONET project team**

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](#)



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?

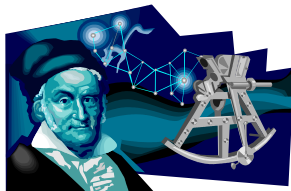
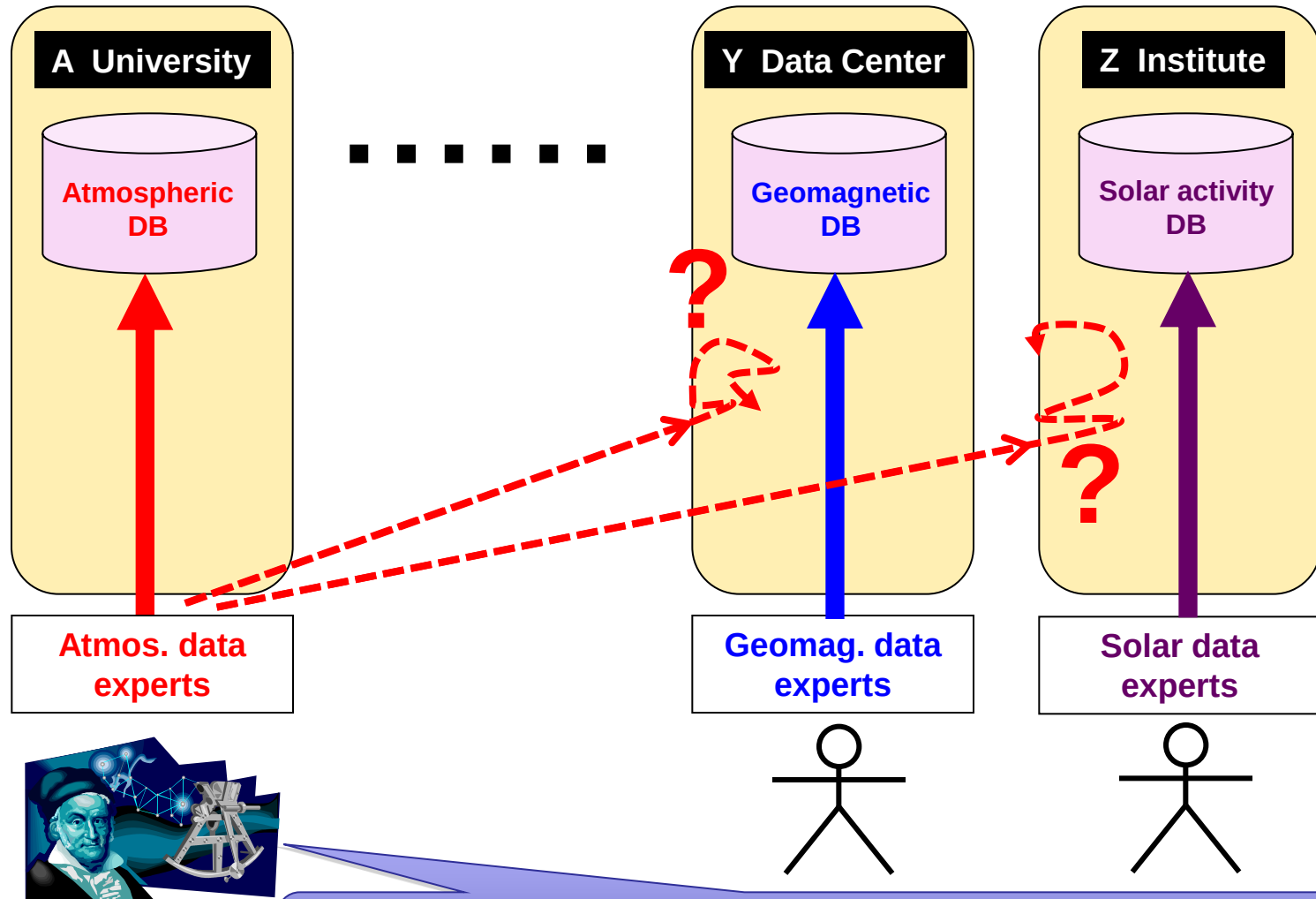
SuperDARN Radar

Syowa Station
 SuperDARN radar x2
 MF radar
 aurora imagers
 magnetometer
 ELF/VLF receiver
 riometer

Peru Ica University

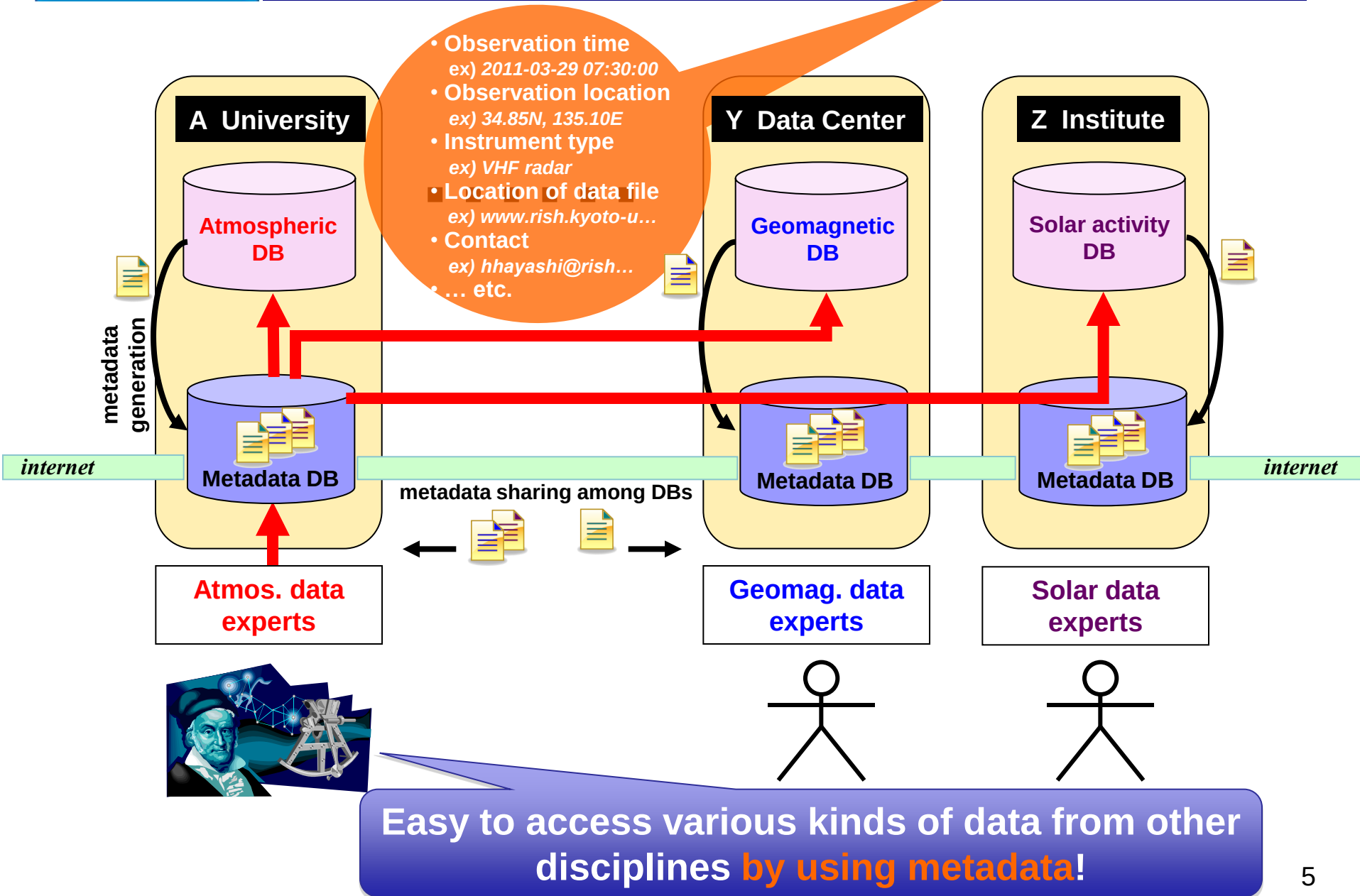


▲ MST radar
 MF/meteor radar
 ◆ MAGDAS magnetometer
 ▲ FM - CW radar
 ● OMTI imager
 ◆ WDC magnetometer
 — Magnetic Equator (IGRF2005, Height 100km)



Hard to even reach to the other disciplinary data due to lack of information!

Database access through metadata DB



Project Timeline

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	Extension							Wrap up the project and discuss further extension of the system to other discipline
Metadata DB system	Development	Make prototype	Develop regular system	Open metadata DB to public				Design and build the IUGONET metadata DB system on the basis of DSpace
	Operation				Update computers			Conduct regular operation of the metadata DB and customize it as needed
Metadata	Design of metadata format	Release ver.1 format	Prepare documents	Update format as needed				Formulate the IUGONET common metadata format and keep updating it if necessary
	Creation of metadata				Target relatively old, undatabased items			Create metadata in the designated format and register them in the metadata DB system
Analysis Software	Survey & Specification of analysis software	Specification	Prepare documents					Design an integrated analysis software to download, visualize, and analyze data provided from the IUGONET institutions
	Programming			Open software to public	Target relatively old, undatabased items			Develop the IUGONET analysis software by using TDAS (a set of IDL subroutines)
Others	Rearrangement of observational DBs		Rearrange DBs corresponding to metadata & software development		Arrange relatively old, undatabased items and digitize analogue data			Rearrange existing observational DBs and newly compile DBs of undatabased items
	Management of project website	Build project homepage						Provide project information to the public through the website

Today

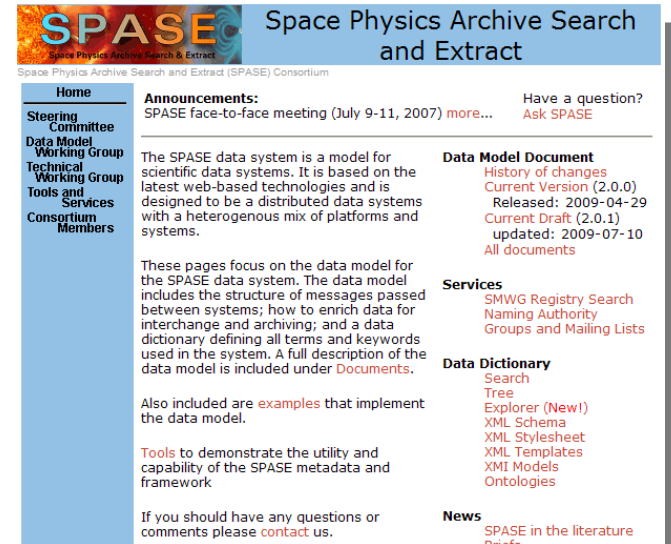
● Many metadata formats available in the Earth and planetary sciences !

- Dublin Core
- ISO 19115 / 19139
- GCMD DIF
- FGDC CSDGM
- IPY Metadata Profile
- ISTEP Standards
- SPASE
- ...

● IUGONET adopted **SPASE** with some modifications

originally developed to describe research resources regarding heliospheric and magnetospheric satellite observations

- 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)



The screenshot shows the SPASE Consortium website. The header includes the SPASE logo and the text "Space Physics Archive Search and Extract". Below the header, there is a navigation menu on the left with links: Home, Steering Committee, Data Model, Working Group, Technical, Tools and Services, Consortium, and Members. The main content area is divided into several sections: "Announcements" (SPASE face-to-face meeting), "Data Model Document" (History of changes, Current Version 2.0.0, Current Draft 2.0.1), "Services" (SMWG Registry Search, Naming Authority, Groups and Mailing Lists), "Data Dictionary" (Search, Tree, Explorer, XML Schema, XML Stylesheet, XML Templates, XMI Models, Ontologies), and "News" (SPASE in the literature). A sidebar on the right contains links for "Have a question? Ask SPASE" and "All documents".

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

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: spase://IUGONET/Person/EAR.Management.Group

Role: General Contact

AccessInformation:

RepositoryID: spase://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-sky imager at South Pole station
- Conjugate Obs. at Iceland: fluxgate/induction magnetometer, Imaging riometer, EISCAT radar, NIPR/Norway Svalbard meteor radar, Tromsø meteor radar, Auroral and Airglow obs. at Svalbard and Tromsø

• Solar-Terrestrial Environment Lab., Nagoya Univ.

- NO, NO₂, NO_x, 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: H α full-disk solar images, H α partial images, H α real-time images, event catalog, movies, full-disk magnetogram
- DST: H α partial solar QL images, H α partial images, Spectrograph QL images, Spectrograph data

• WDC/Kyoto, Kyoto Univ.

- Geomagnetic indices (final, provisional, quick look) $\leftarrow$ 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 :

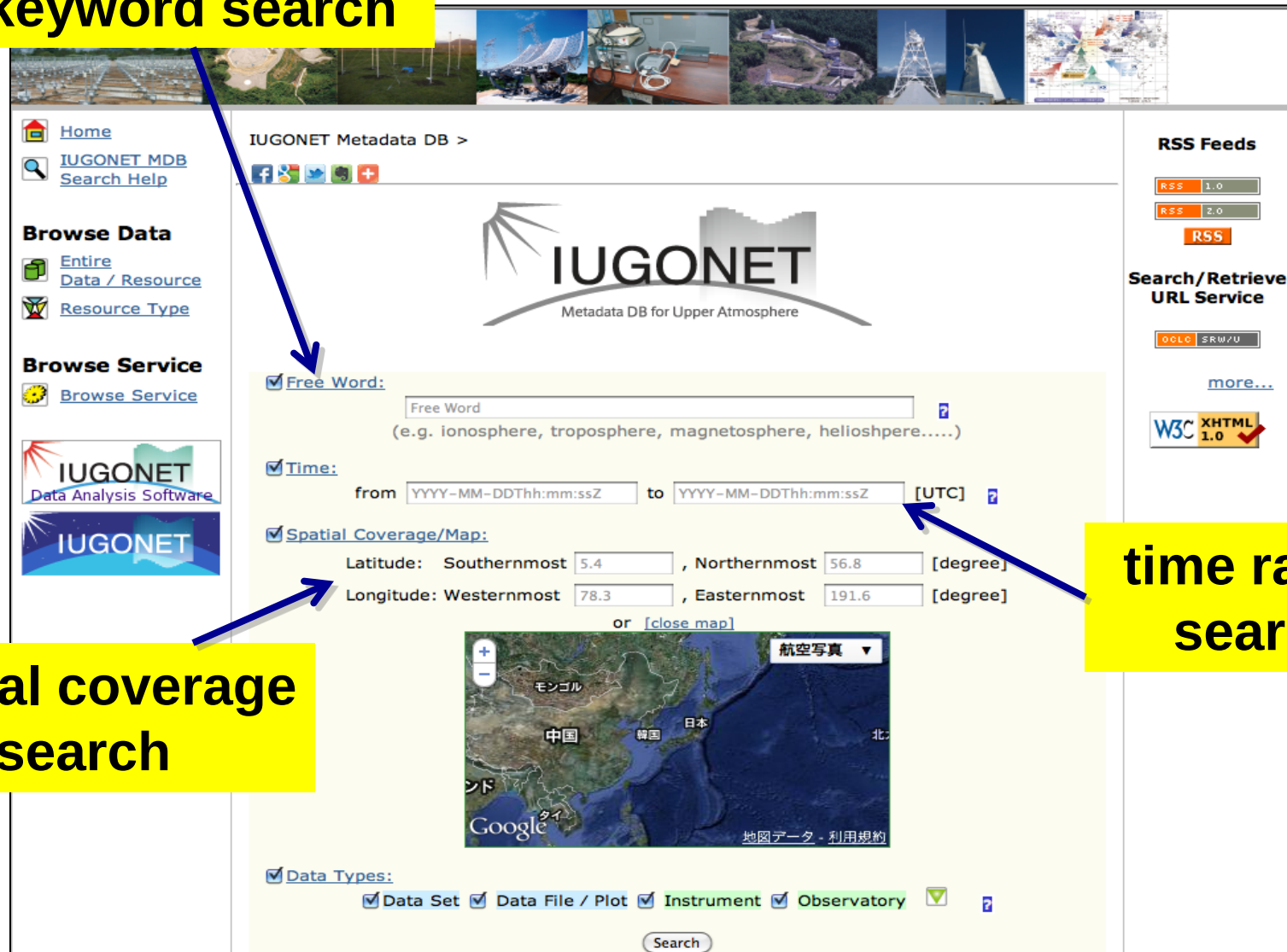
<http://search.iugonet.org/iugonet/>

User ID = iugonet
Password = iugonet



The screenshot shows the IUGONET Metadata DB search interface. The header includes the IUGONET logo and the tagline "Metadata DB for Upper Atmosphere". The left sidebar contains navigation links: Home, IUGONET MDB, Search Help, Browse Data (Entire Data / Resource, Resource Type), and Browse Service (Browse Service). The main search area includes a "Free Word" search box, a "Time" range selector (from YYYY-MM-DDThh:mm:ssZ to YYYY-MM-DDThh:mm:ssZ [UTC]), and a "Spatial Coverage/Map" section with latitude and longitude input fields. Below the map is a "Data Types" section with checkboxes for Data Set, Data File / Plot, Instrument, and Observatory. The right sidebar features "RSS Feeds" and a "Search/Retrieve URL Service" section. The bottom of the page has a "Search" button.

keyword search



The screenshot shows the IUGONET Metadata DB search interface. A blue arrow points from the 'keyword search' label to the 'Free Word' search box. Another blue arrow points from the 'time range search' label to the 'Time' search fields. A third blue arrow points from the 'spatial coverage search' label to the 'Spatial Coverage/Map' section, which includes a map of East Asia.

IUGONET Metadata DB >

Home
[IUGONET MDB](#)
[Search Help](#)

Browse Data
[Entire Data / Resource](#)
[Resource Type](#)

Browse Service
[Browse Service](#)

IUGONET Data Analysis Software
IUGONET

Free Word:

 (e.g. ionosphere, troposphere, magnetosphere, heliosphere.....)

Time:
 from to [UTC]

Spatial Coverage/Map:
 Latitude: Southernmost , Northernmost [degree]
 Longitude: Westernmost , Easternmost [degree]
 or [\[close map\]](#)

Data Types:
☒ Data Set ☒ Data File / Plot ☒ Instrument ☒ Observatory

Search

RSS Feeds
[RSS 1.0](#)
[RSS 2.0](#)
[RSS](#)

Search/Retrieve URL Service
[OCLC](#) [SRW/U](#)
[more...](#)

W3C XHTML 1.0

time range search

spatial coverage search

Relative Stop Date: 14 days ago (-P14D)
<http://gemsissc.stelab.nagoya-u.ac.jp/erg/>

Repository: <spase://IUGONET/Repository/STEL/ERG-SC>
 Instrument: <spase://IUGONET/Instrument/STEL/SuperDARN/HOK/HFradar>

The common time fitacf 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://gemsissc.stelab.nagoya-u.ac.jp/erg/>

Repository: <spase://IUGONET/Repository/STEL/ERG-SC>
 Instrument: <spase://IUGONET/Instrument/STEL/SuperDARN/KSR/HFradar>

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), (0, 10), (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)

<http://www.rish.kyoto-u.ac.jp/radar-group/mu/data/>

Repository: <spase://IUGONET/Repository/RISH/RISHDB>
 Instrument: <spase://IUGONET/Instrument/RISH/misc/SGK/MUradar>

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>). The value of 1.0e+10 means missing data.

details of metadata

ResourceName:

Standard observation data of the troposphere and lower stratosphere ta
format)

Description:

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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.

ReleaseDate:

2011-03-06T00:00:00

Contact PersonID:

0: [spase://IUGONET/Person/Hiroyuki.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

AccessInformation RepositoryID:

[spase://IUGONET/Repository/RISH/RISHDB](#)

AccessInformation AccessURL URL:

<http://www.rish.kyoto-u.ac.jp/radar-group/mu/data/>

AccessInformation Availability:

Online

AccessInformation AccessRights:

**AccessURL points the location of
dataset you are interested in.**

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	Management of project website	Build project homepage						Provide project information to the public through the website

To be beta-released on April 1st !!

To be beta-released in early May !!

Dr. Shinbori will talk about the IUGONET analysis software

Today

(5) Plot

(3a) Load procedure

(4) Obs. data

(3b) Wget (internal call)

Observational DB

User

Get URL of data

(2) Metadata

(1) Query

IUGONET metadata DB

OpenSearch / SRU / SRW

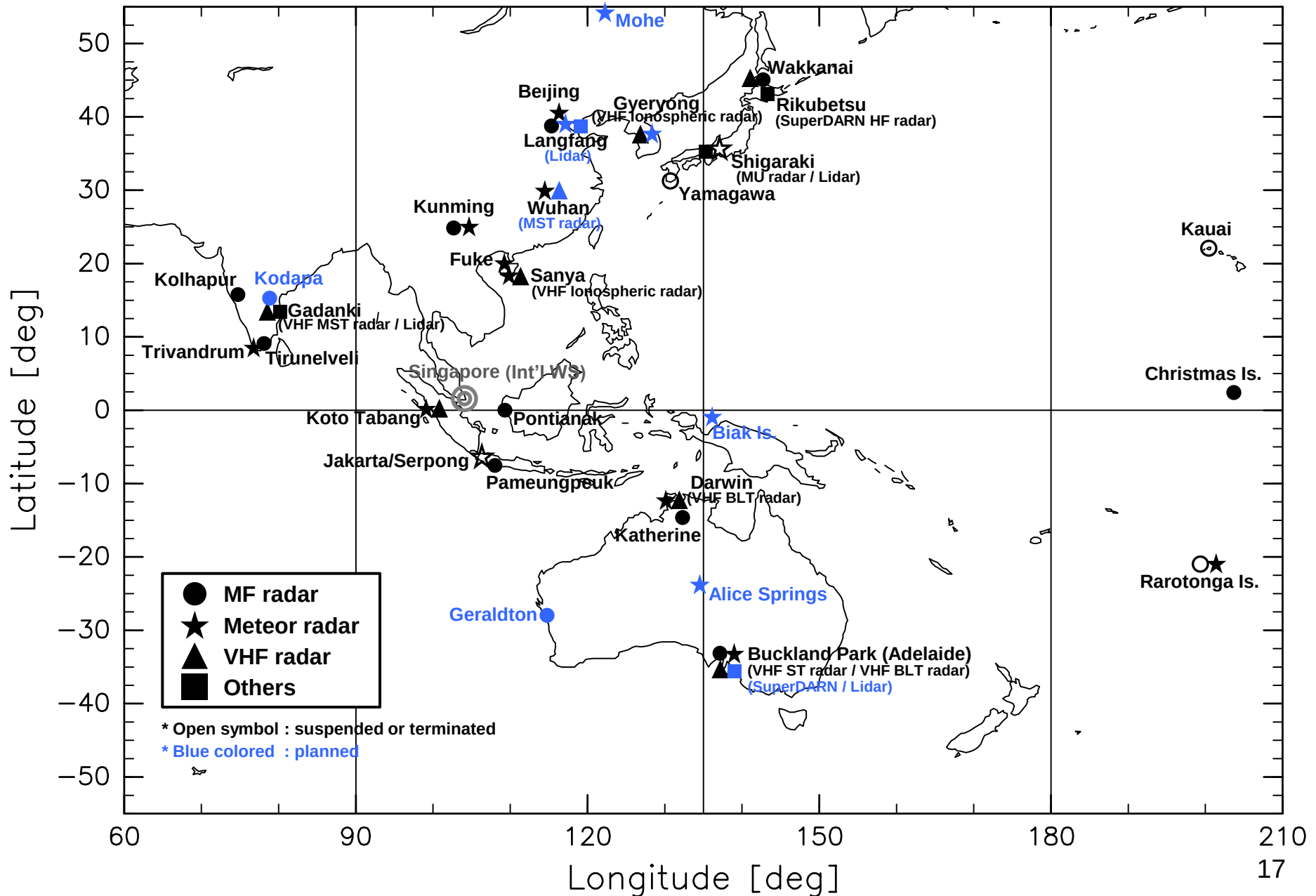


Regional CAWSES-II MLT Radar Workshop

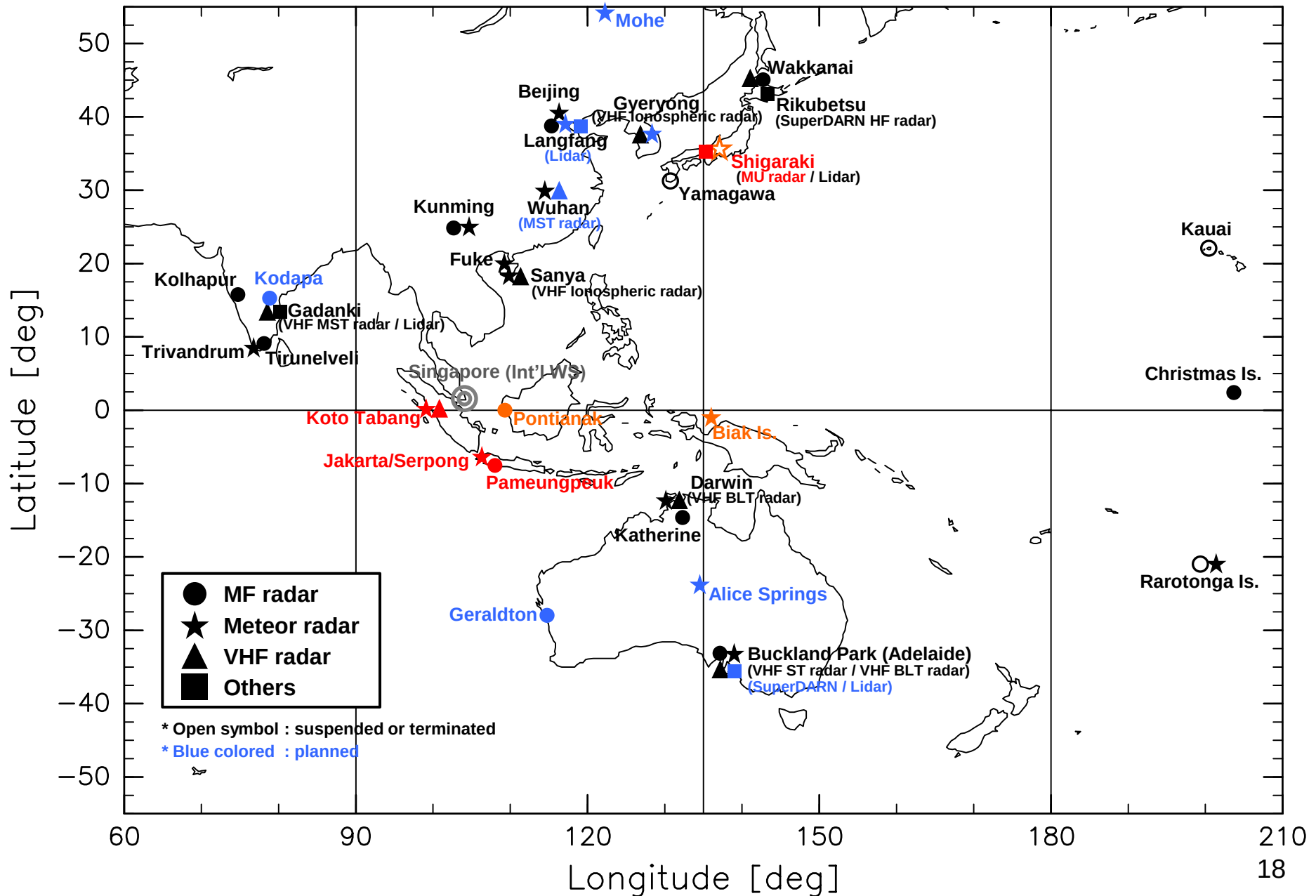
~ Singapore, 8 & 9 March 2010 ~



Asia-oceanian MLT radar network



Asia-oceanian MLT radar network



- **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.**