IUGONET

Inter-university Upper atmosphere Global Observation NETwork

Metadata Database
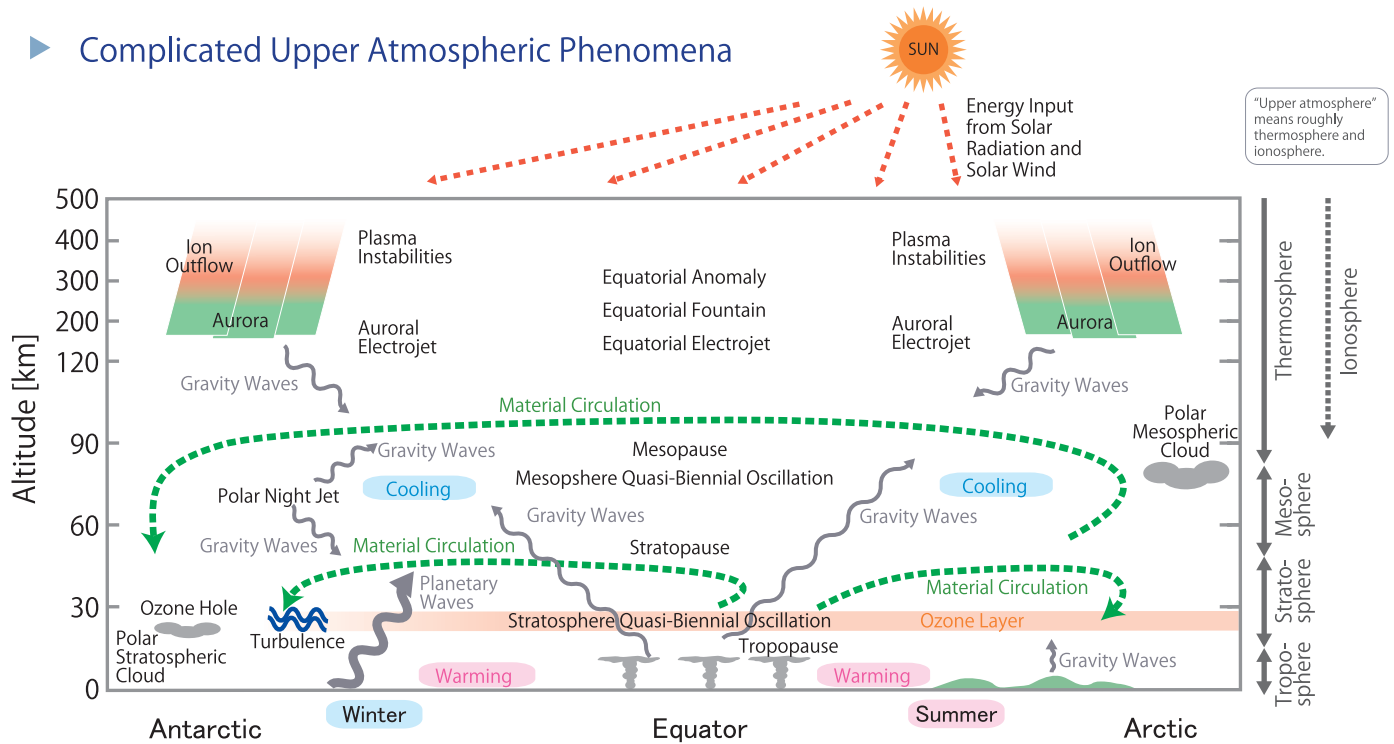& Data Analysis Software

http://www.iugonet.org/en/

Cross-Database Search and Integrated Analysis System for a Wide Variety of Data from Long-Term Ground-Based Observations to Promote Upper Atmosphere Physics Science and Interdisciplinary Research

WHAT DOES IUGONET DO?
Cross-Database Search and Integrated Analysis System for Long-Te
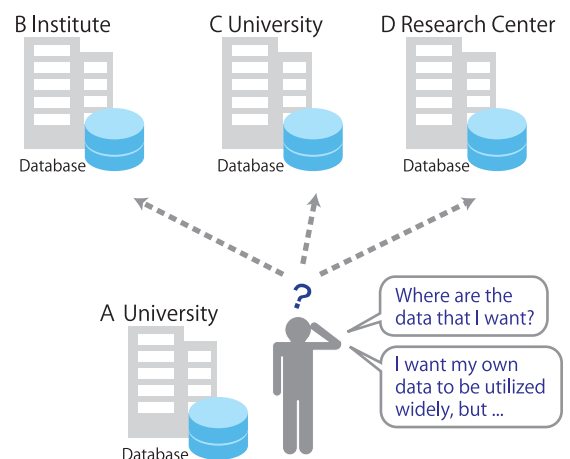
BACKGROUND OF IUGONET

▶ **Complicated Upper Atmospheric Phenomena**

SUN

Energy Input from Solar Radiation and Solar Wind

"Upper atmosphere" means roughly thermosphere and ionosphere.

Altitude [km]

500
400
300
200
120
90
60
30
0

Ion Outflow
Plasma Instabilities
Equatorial Anomaly
Equatorial Fountain
Equatorial Electrojet
Plasma Instabilities
Ion Outflow

Aurora
Auroral Electrojet
Auroral Electrojet
Aurora

Gravity Waves
Gravity Waves
Polar Mesospheric Cloud

Material Circulation

Gravity Waves
Mesopause
Mesosphere Quasi-Biennial Oscillation
Cooling
Cooling

Polar Night Jet
Gravity Waves
Gravity Waves

Gravity Waves
Material Circulation
Stratopause

Ozone Hole
Planetary Waves
Stratosphere Quasi-Biennial Oscillation
Ozone Layer
Material Circulation

Polar Stratospheric Cloud
Turbulence
Warming
Tropopause
Warming
Gravity Waves

Winter
Summer

Antarctic
Equator
Arctic

Thermosphere
Ionosphere
Meso-sphere
Strato-sphere
Tropo-sphere

The energy source of various phenomena in the Earth's atmosphere and geospace, such as geomagnetic disturbances, auroral phenomena, meteorological phenomena, etc., originates primarily from solar radiation and solar wind. Energy transported from the Sun changes in form and causes various physical phenomena as it propagates through the space surrounding the Earth's upper atmosphere. Since the Earth is a globally complex system, the coupling of various atmospheric regions is also important. Therefore, understanding the mechanisms of long-term variations in the upper atmosphere associated with changes in solar activity and global warming requires an interdisciplinary integrated analysis of various long-term observational data, such as neutral/ionized densities, temperature and composition, auroral/geomagnetic phenomena, solar wind, and solar UV radiation, from global ground-based networks.

▶ **Difficulty in Promoting Interdisciplinary Research**

Each research group has its own observation database.

Most observation data are used only in a particular institute or domain, and some data remain undisclosed.

Extra time and troublesome procedures are required for external researchers to access databases of observation data.

Interdisciplinary research requiring various observation data is inhibited.

B Institute
Database

C University
Database

D Research Center
Database

A University
Database

?
Where are the data that I want?

I want my own data to be utilized widely, but ...

OUR MISSION

The Inter-university Upper atmosphere Global Observation NETwork (IUGONET) provides a new research platform that enables metadata extracted from ground-based observation data to be shared, which IUGONET institution members have been collecting since the International Geophysical Year (1957-1958). In addition, IUGONET developed analysis software to access and analyze data in an integrated fashion. The efforts of IUGONET not only lead to the establishment of a research platform to better understand global upper atmospheric phenomena, but also help to facilitate interdisciplinary researches.

OUR APPROACH

IUGONET is a six-year inter-university project implemented by seven research groups of the following five Japanese institutes/universities: National Institute of Polar Research, Tohoku University, Nagoya University, Kyoto University, and Kyushu University. This joint research project was initiated in 2009, and was centered on the development of the following two products:

▶ IUGONET Metadata Database (DB) 🛢 →pgs. 5-6
▶ iUgonet Data Analysis Software (UDAS) →pgs. 7-8

These products were released at the end of the 2011 fiscal year and are available on the project's website. IUGONET's current objectives are to enhance the functions of the above-mentioned products and increase the number of metadata registered by the IUGONET members and collaborative metadata providers.
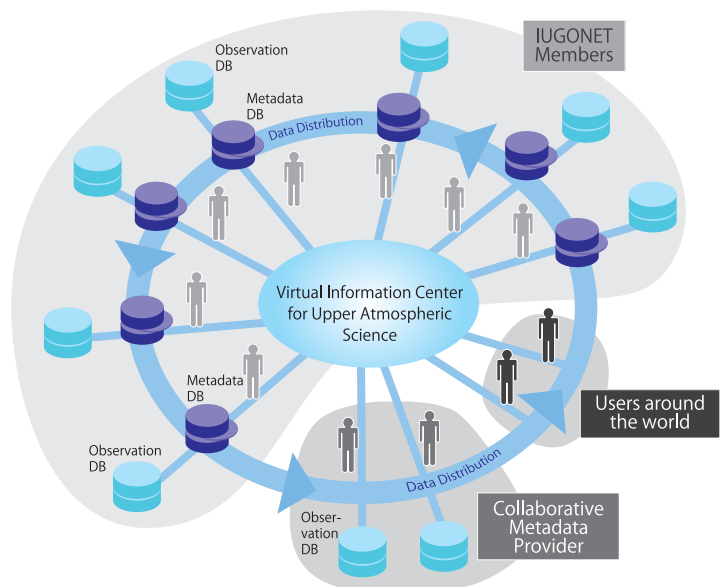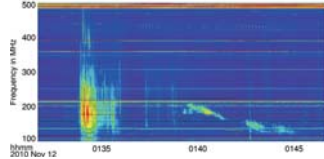

▶ IUGONET Timeline
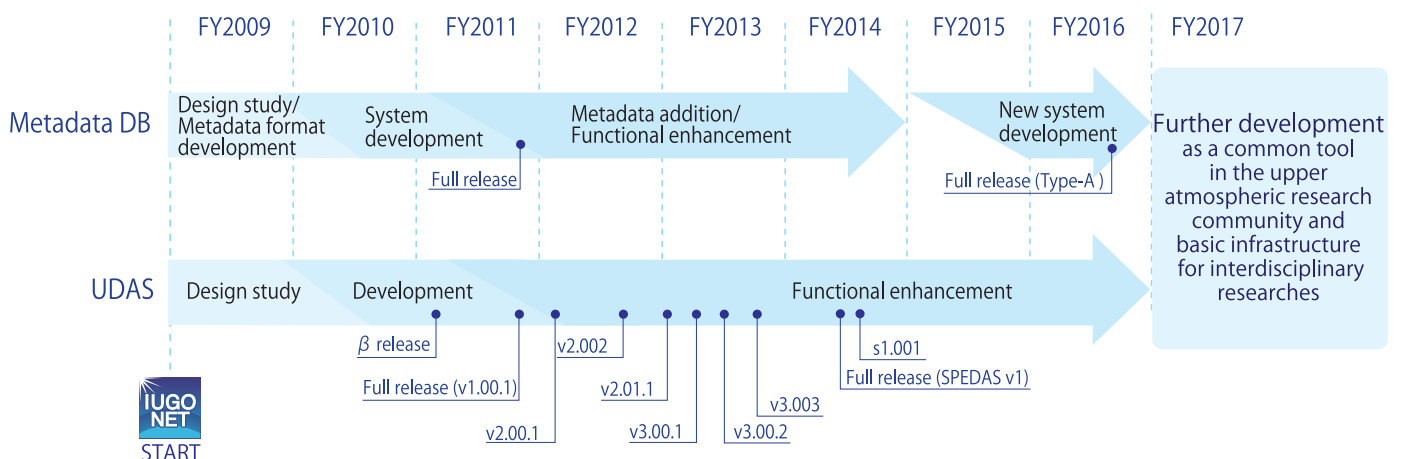
Tohoku University
Planetary Plasma and Atmospheric Research Center (PPARC)/
Planetary Plasma Physics Laboratory/ Planetary Atmosphere Physics Laboratory

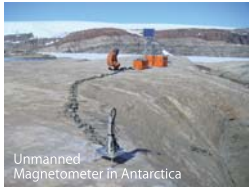Iitate Planetary Radio Telescope (IPRT)

Solar radio burst observed by IPRT

At the Iitate Observatory, which is part of Tohoku University, the Iitate Planetary Optical Telescope, Iitate Planetary Radio Telescope (IPRT), and the Jupiter/galaxy decameter radio receiver are currently in operation to help clarify certain aspects of planetary phenomena and environment via radio and optical observations. Magnetospheric and ionospheric dynamics are also studied by using auroral optical instruments, magnetometers, and conducting low frequency (LF) radio observations of the world.
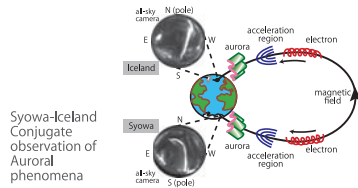
http://c.gp.tohoku.ac.jp/index_e.html

National Institute of Polar Research
Space and Upper Atmospheric Sciences Group

Unmanned Magnetometer in Antarctica

Syowa-Iceland Conjugate observation of Auroral phenomena

all-sky camera N (pole)
Iceland
Syowa
all-sky camera S (pole)
acceleration region electron
aurora
magnetic field
aurora
acceleration region electron

This group has been conducting various ground-based observations at Syowa Station and other stations in Antarctica, Iceland and Northern Europe using cameras, radars, lidars, magnetometers, etc. The observed data have been used for topics of intense scientific interest, such as magnetosphere-ionosphere coupling, auroral phenomena, and coupling and variability of the polar upper atmosphere.

http://spuas.nipr.ac.jp/english/

Nagoya University
Institute for Space-Earth Environment Research

SuperDARN Hokkaido HF radar

The radiotelescope at Fuji to observe the interplanetary scintillation.

ISEE has been conducting observations of the vast region between the Sun and Earth's atmosphere by using atmospheric and ionospheric radars, radiotelescopes, cosmic ray telescopes, optical imagers, and ground magnetometers. By combining observational data with theories and simulations, we investigate the various transport/conversion processes of energies and materials between the Sun and the Earth.

http://www.isee.nagoya-u.ac.jp/en/

Kyoto University
Data Analysis Center for Geomagnetism and Space Magnetism
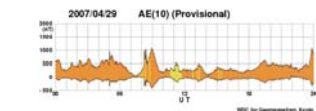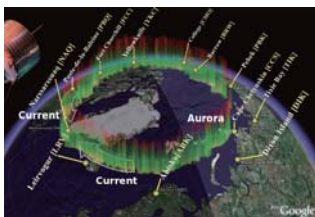
Geomagnetic Auroral Electrojet (AE) index:
An example of geomagnetic indices which this center collects, calculates and provides

Observatories for cadlulating the AE indices.

As one of the World Data Centers (WDCs), this center is currently collecting/pre-serving data from approximately 150 of the world's geomagnetic observatories. We calculate three types of geomagnetic indices: AE, ASY/SYM, and Dst, and provide them free to the global scientific community.

http://wdc.kugi.kyoto-u.ac.jp/

North Europe
Auroral Imager
Magnetomete
ELF/VLF Reveiver
Riometer
Meteor Radar

EISCAT Svalbard Radar
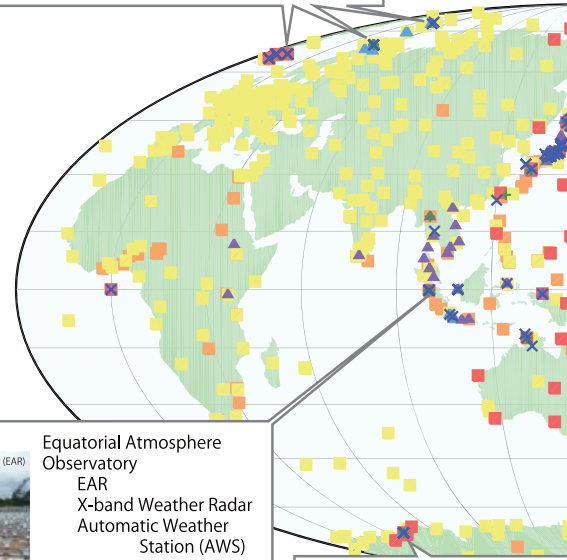
Equatorial Atmosphere Radar (EAR)

Equatorial Atmosphere Observatory
EAR
X-band Weather Radar
Automatic Weather Station (AWS)
Ceilometer   etc.

IUGONET Glob
Ground-Based

Sun
Interplanetary Space
Magnetosphere
Plasmasphere
Ionosphere
Thermosphere
Mesosphere
Stratosphere
Troposphere

Ionized

Neutral

Solar telescope

SD radar
Magnetometer

Radio obs.
Optical obs.

MF/Meteor radar
Lidar

Magnetometer
Optical obs.

WDC data, Magnetomete

Antarctic   Mid./low. Lat.

Toh
NIP

Legend
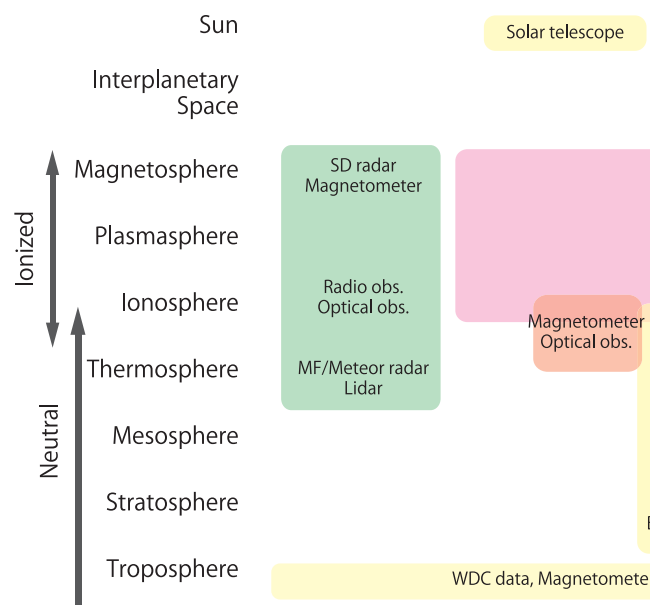
- ■ WDC magnetometer
- ■ MAGDAS/CPMN/EMN magnetometer
- ■ other magnetometer
- ▲ GNU radio beacon receiver
- ▲ various radars
- ＋ OMTI imager
- ✚ solar observations
- ✕ other observations

Athabasca
Magnetometer
LF Receiver
Imager

LF receiver

Syowa Station, Anterctica
Auroral Imager
Magnetometer
SuperDARN Radar
ELF/VLF Receiver
Riometer
Sodium Lidar   etc.

FMT at Ica
University,
Peru

bal Network of
l Observations
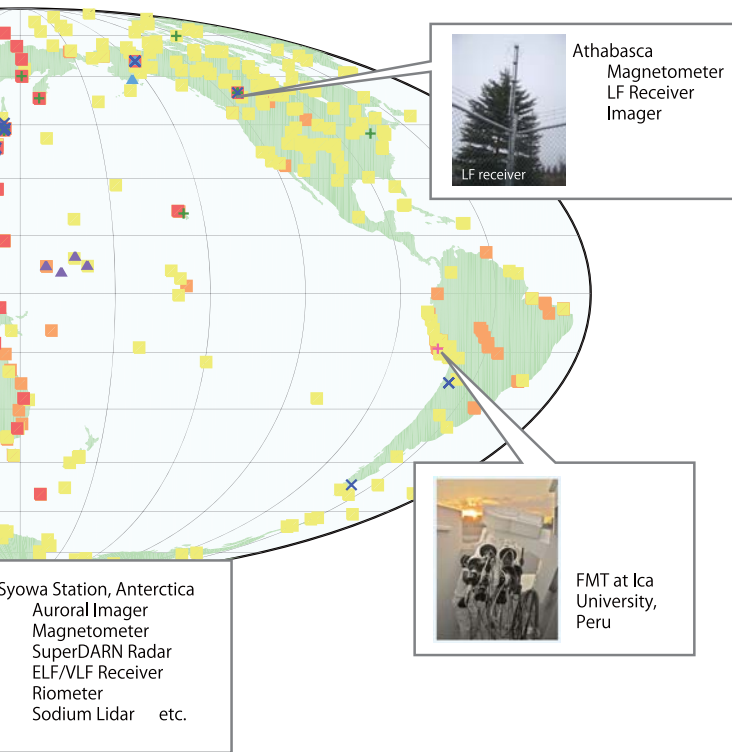
The members of IUGONET conduct ground-based observations of a wide region from the ground surface to the Sun through interplanetary space all over the world from the equator to both polar regions. While using the IUGONET metadata database, you can easily search for various observational data collected and provided by IUGONET members.

Kyoto University
Research Institute for Sustainable Humanosphere (RISH)

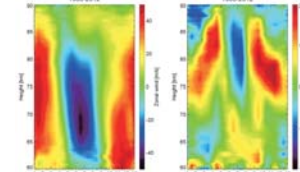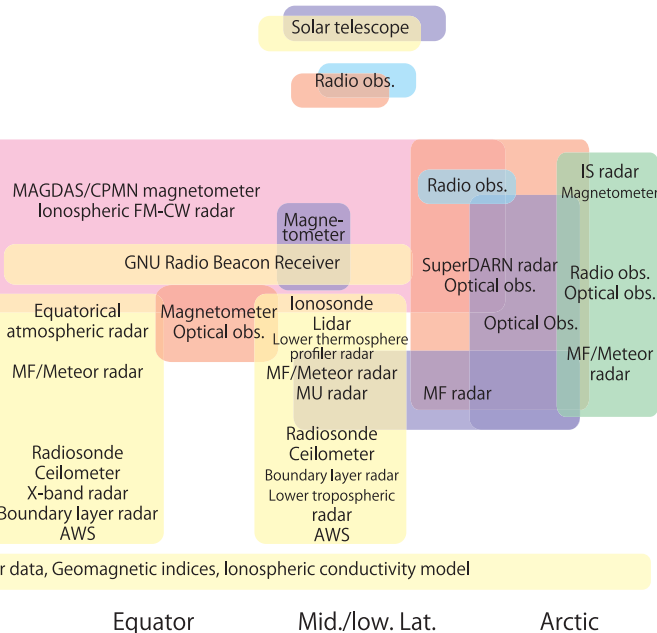Shigaraki MU radar

Time-height plots of averaged zonal (left panel) and meridional (right panel) winds in the mesosphere taken by the MU radar for 1986-2012.

The Shigaraki Middle and Upper atmosphere (MU) radar and Equatorial Atmosphere Radar (EAR) have been observing winds and turbulence phenomena from the troposphere to the lower thermosphere and ionosphere for many years. On the basis of such observation data of various altitude ranges, we investigate a coupling process between different atmospheric layers via atmospheric waves.
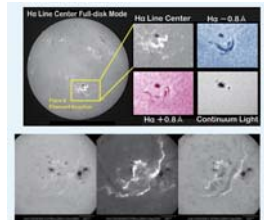
http://www.rish.kyoto-u.ac.jp/?lang=en

Kyoto University
Kwasan and Hida Observatories

Full-duisk solar chromo-spheric images

Partial-disk solar chromo-spheric images

DST at Hida Observatory   SMART at Hida Observatory

These observatories have operated three ground-based solar optical telescopes: the Solar Magnetic Activity Research Telescope (SMART), Domeless Solar Telescope (DST) at the Hida Observatory in Japan, and the Flare Monitoring Telescope (FMT) at Ica University in Peru. Our goal is to promote research on space weather and the solar-terrestrial environment by providing metadata of solar imaging data, solar spectroscopic data, event lists, and videos of solar active phenomena from such databases.

http://www.kwasan.kyoto-u.ac.jp/index_en.html

Instrument diagram

Solar telescope

Radio obs.

Equator | Mid./low. Lat. | Arctic

MAGDAS/CPMN magnetometer
Ionospheric FM-CW radar
GNU Radio Beacon Receiver
Equatorical atmospheric radar
MF/Meteor radar
Radiosonde
Ceilometer
X-band radar
Boundary layer radar
AWS

Magne-tometer
Magnetometer
Optical obs.
Ionosonde
Lidar
Lower thermosphere profiler radar
MF/Meteor radar
MU radar
Radiosonde
Ceilometer
Boundary layer radar
Lower tropospheric radar
AWS

Radio obs.
SuperDARN radar
Optical obs.
Optical Obs.
MF radar

IS radar
Magnetometer
Radio obs.
Optical obs.
MF/Meteor radar

r data, Geomagnetic indices, Ionospheric conductivity model

Equator	Mid./low. Lat.	Arctic
hoku Univ.	Kyoto Univ.	Kyushu Univ.
PR	Nagoya Univ.	Collaborative Members

Kyushu University
International Center for Space Weather Science and Education (ICSWSE)

MAGDAS is a world-wide ground magnetometer network. It consists mainly three magnetometer chains: 210MM Chain, Magnetic Equator, and 96 MM Chain.

FM-CW radar: for understanding the global disturbance of electric and magnetic field.

ICSWSE operates the Magnetic Data Acquisition System (MAGDAS), which is a global array of 70 magnetometers and several radars, to monitor the Earth's magnetic and electric field for the purpose of studying space weather. In addition, many geomagnetic indices and empirical models are calculated based on MAGDAS data.
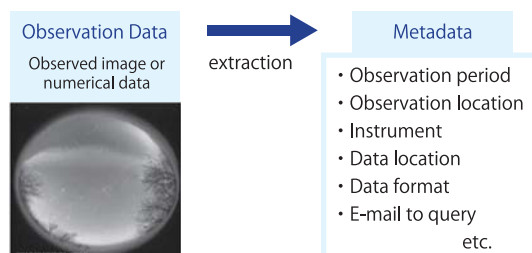
http://www.icswse.kyushu-u.ac.jp/

IUGONET Metadata Databese (DB)

IUGONET builds and maintains an online database of metadata extracted from ground-based observation data to facilitate cross-database search.

WHAT IS THE IUGONET METADATA DB?

▶ **What Is Metadata?**

Metadata are defined as data that describe certain aspects of information of other data, such as observation location and period, instrument(s) used, and data location for ground-based observation data of the upper atmosphere.

Observation Data
Observed image or numerical data

extraction

Metadata
・Observation period
・Observation location
・Instrument
・Data location
・Data format
・E-mail to query
　　　　　etc.

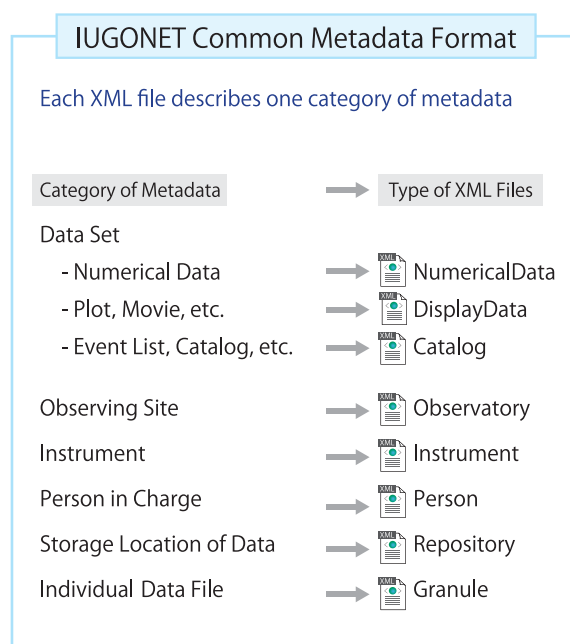▶ **Basic Objectives of the IUGONET Metadata DB**

The IUGONET metadata DB is a system that shares metadata extracted from the databases of ground-based observation data which have been individually managed by each IUGONET institution member. This cross-search system allows you to simultaneously search the dispersion-managed databases, which are owned by multiple institutes, with a single query. Such a system also facilitates the accessibility of observation data, whose location is shown in the provided metadata.

The first version of the metadata DB is a modified system based on DSpace, an open-source software that creates open digital repositories. In November 2016, we released the new metadata DB, IUGONET Type-A, which is more user-frendly than the old version and has the capability to plot and analyze data with UDAS (see pages 7 and 8).

▶ **IUGONET Common Metadata Format**

A common metadata format is needed to create a metadata database for disparate types of observation data. IUGONET's common metadata format was created on the basis of the metadata model developed by the Space Physics Archive Search and Extract (SPASE) Consortium, which is composed of representatives of the international heliophysics data community. IUGONET added modifications to the SPASE metadata model to suit data from ground-based upper atmospheric and solar observations. The use of the existing dominant metadata format makes it possible to exchange or share metadata with other communities around the world.

In accordance with IUGONET's common metadata format, each category of metadata, such as data set, instrument, observing site, person, and storage location of data, is described in a single XML file, and the XML files are cross-linked in the metadata database. In addition, XML files that refer to an individual observation data file (Granule) are also archived, which allows individual data files to be searched.

IUGONET Common Metadata Format

Each XML file describes one category of metadata

Category of Metadata		Type of XML Files
Data Set		
- Numerical Data	→	NumericalData
- Plot, Movie, etc.	→	DisplayData
- Event List, Catalog, etc.	→	Catalog
Observing Site	→	Observatory
Instrument	→	Instrument
Person in Charge	→	Person
Storage Location of Data	→	Repository
Individual Data File	→	Granule

HOW TO APPLY THE IUGONET METADATA DB TO YOUR RESEARCH

▶ **Search the IUGONET Metadata DB to Find Observation Data You Need**

How to Perform a Search

| Access the database search page (without user registration) http://search.iugonet.org/iugonet/ | Input search conditions such as observation period, metadata type, latitude/longitude, and a keyword | Access the data location (e.g., via a URL) shown in the search results to obtain the observation data |
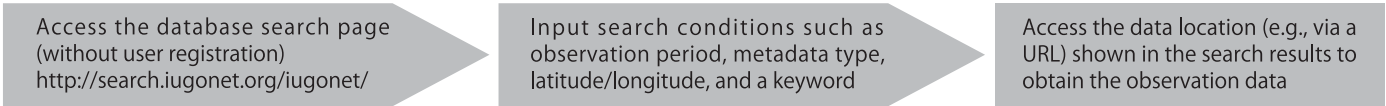
Merit

◆ The IGUONET metadata DB provides an easy-to-use interface for cross-searching metadata of observation data from ground-based instruments owned by IUGONET members and the collaborative metadata providers

Search by selecting the word(s) from the instrument/ project list.

Type the word(s) you wish to search. You can use the Boolean operators, "AND" and "OR". The operator "-" narrows the search by excluding unwanted words (Example: ISEE -magnetometer).

Specify the observation period.

You can choose a text list or thumbnail of QL plots for the display of the search results.

The world map interface is availabe to search data from the observatories.

Open the UDAS web window, in which you can plot and analyze the selected data by using SPEDAS/UDAS.
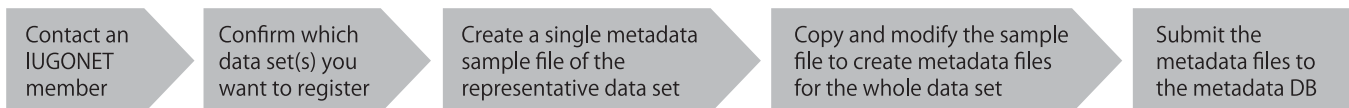
The search results are shown here as a text list or thumbnail of QL plots.

The detailed information of the data can be seen by clicking one of the search results.

http://search.iugonet.org/

▶ **Register the Metadata of Your Observation Data to Facilitate Their Distribution**

How to Register Metadata for Your Data

| Contact an IUGONET member | Confirm which data set(s) you want to register | Create a single metadata sample file of the representative data set | Copy and modify the sample file to create metadata files for the whole data set | Submit the metadata files to the metadata DB |

Merit

◆ The metadata DB leads those who are unfamiliar with your data or outside your domain to the necessary information regarding your data.

◆ The metadata DB provides information on analog record- ed data as well as digital data.

**For Who Interested in Registering Your Data**

IUGONET members will support you! Please send an e-mail to: iugonet2009@gmail.com

UDAS - iUgonet Data Analysis Software

IUGONET developed an integrated analysis system known as "UDAS," which provides time-series plots and an analysis of various ground-based observation data. UDAS has been released and can be downloaded from our website.

WHAT IS UDAS?

The iUgonet Data Analysis Software (UDAS) is a plug-in software for the Space Physics Environment Data Analysis Software (SPEDAS, former TDAS), which is written in Interactive Data Language (IDL). UDAS provides dedicated routine programs to load various ground-based observation data provided by IUGONET and enables users to plot and analyze the data using SPEDAS. SPEDAS/UDAS consists of CUI and GUI tools. The GUI tool (shown right) provides an intuitive operation for IDL beginners.
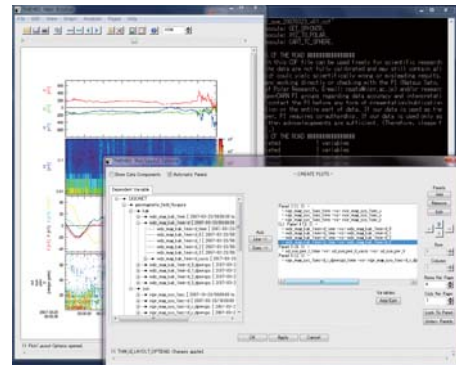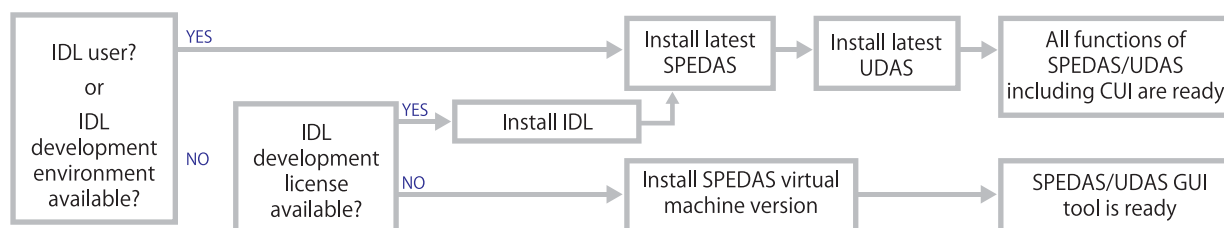
▲ An example of screenshot of the SPEDAS/UDAS-GUI tool

FEATURES OF UDAS

- Automatic data download without specifying the data's location
- Data analysis without regard to the file format of the data
- Parallel display of different types of data including SPEDAS-loading data (THEMIS, ACE, GOES, etc.)
- Utilization of various analysis functions equipped in SPEDAS (e.g., frequency analysis, filtering)
- Output into an ASCII file or image files (e.g., PNG, JPEG, GIF)
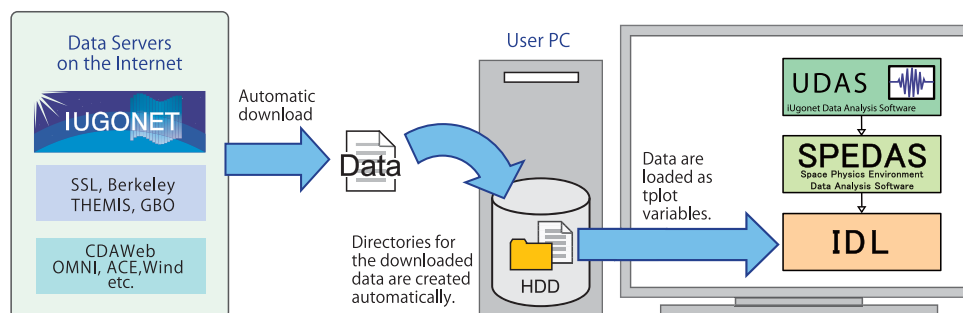
UDAS INSTALLATION FLOW CHART

IDL user?
or
IDL development environment available?

YES → Install latest SPEDAS → Install latest UDAS → All functions of SPEDAS/UDAS including CUI are ready

NO →

IDL development license available?

YES → Install IDL

NO → Install SPEDAS virtual machine version → SPEDAS/UDAS GUI tool is ready

INSTRUCTION & DOWNLOAD PAGES	▶ UDAS ▶ SPEDAS & its virtual machine version ▶ IDL	IUGONET Web THEMIS Web Exelisvis Web	http://www.iugonet.org/en/software/ http://themis.ssl.berkeley.edu/software.shtml http://www.exelisvis.com/

OUTLINE OF LOADING/PLOTTING DATA USING UDAS

Data Servers on the Internet

IUGONET

SSL, Berkeley THEMIS, GBO

CDAWeb OMNI, ACE,Wind etc.

Automatic download

Data

User PC

Directories for the downloaded data are created automatically.

HDD

Data are loaded as tplot variables.

UDAS
iUgonet Data Analysis Software

SPEDAS
Space Physics Environment Data Analysis Software

IDL

Data can be easily plotted, for example, by only three basic commands with the SPEDAS/UDAS-CUI tool. If using the GUI tool, only a few simple clicks of your mouse are required to produce the same plot.

❶ Set a time period: timespan, 'yyyy-mm-dd'
❷ Load ○○○ data: iug_load_○○○
❸ Plot the loaded data: tplot, △△△

UDAS LOAD ROUTINES

UDAS incorporated into SPEDAS enables the following ground-based observation data provided by IUGONET in addition to data from THEMIS and various satellite missions (ACE, GOES, etc.) to be loaded and analyzed.

Since SPEDAS includes UDAS by default, you can use UDAS load routines, immediately, by installing the latest SPEDAS. Newly-created UDAS load routines are released frequently from the above IUGONET web site, and extra installation of them enables you to utilize the latest UDAS load routines before the next SPEDAS update.

▼　List of load routines included in UDAS s1.00.1 (SPEDAS v1.00-compliant version)

UDAS Load Routines	Observation Data	Providers
iug_load_smart	Solar images obtained by the SMART telescope	Kwasan & Hida Obs, Kyoto Univ.
iug_load_iprt	Solar HF radio spectrum	Tohoku Univ.
iug_load_hf_tohokuu	Jupiter's/solar wide band spectral data in HF-band	Tohoku Univ.
iug_load_aws_rish	Surface meterology data taken by the Automatic Weather Station (AWS)	RISH, Kyoto Univ.
iug_load_blr_rish	Boundary layer radar data	RISH, Kyoto Univ.
iug_load_ltr_rish	L-band lower troposphere radar data	RISH, Kyoto Univ.
iug_load_ear	Equatorial Atmosphere Radar (EAR) data	RISH, Kyoto Univ.
iug_load_mu	MU radar data	RISH, Kyoto Univ.
iug_load_meteor_rish	Meteor radar data	RISH, Kyoto Univ.
iug_load_mf_rish	MF radar data	RISH, Kyoto Univ.
iug_load_wpr_rish	Wind profiler radar data	RISH, Kyoto Univ.
iug_load_ionosonde_rish	Ionogram data taken by the Ionosonde at Shigaraki	RISH, Kyoto Univ.
iug_load_radiosonde_rish	Radiosonde data	RISH, Kyoto Univ.
iug_load_sdfit	SuperDARN radar data	NIPR, Nagoya Univ., Other SuperDARN-Related Organizations
iug_load_eiscat	EISCAT radar data	NIPR, Nagoya Univ.
iug_load_eiscat_vief	EISCAT radar data (ion velocity and electric field vectors)	NIPR, Nagoya Univ.
iug_load_irio_nipr	Imaging riometer data at Syowa Station, Antarctica	NIPR
iug_load_lfrto	Low frequency radio transmitter observation data	Tohoku Univ.
iug_load_avon_vlfb	Asia VLF Observation Network (AVON/VLF-B) data	Tohoku Univ.
iug_load_camera_omti_asi	Optical Mesosphere Thermosphere Imagers (OMTI) all-sky imager data	Nagoya Univ.
iug_load_asi_nipr	All-sky imager data	NIPR
iug_load_ask_nipr	All-sky imager keogram data	NIPR
iug_load_gmag_wdc	AE, Dst, ASY/SYM indices, geomagnetic field data at the observatories	WDC, Kyoto Univ.
iug_load_gmag_nipr	Geomagnetic field data (Syowa, Iceland, and automated magnetometer network near the Syowa Station)	NIPR
iug_load_gmag_mm210	210° Magnetic Meridian magnetometer network data	Nagoya Univ., Kyushu Univ.
iug_load_gmag_magdas_1sec	MAGDAS ground magnetometer data	Kyushu Univ.
iug_load_gmag_stel_induction	Induction magnetometer data from STEL, Nagoya Univ.	Nagoya Univ.
iug_load_gmag_nipr_induction	Induction magnetometer data from NIPR	NIPR
iug_load_kyushugcm	Kyushu GCM simulation data	NIPR, Kyushu Univ.

An example of parallel ▶
display of time-series data:

EISCAT radar and
optical measurement
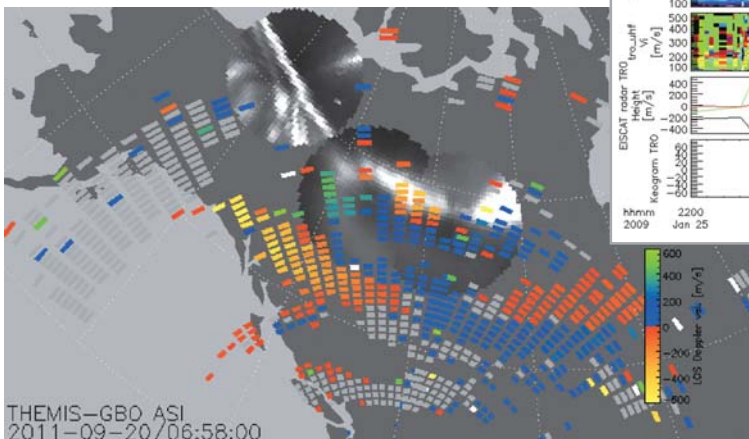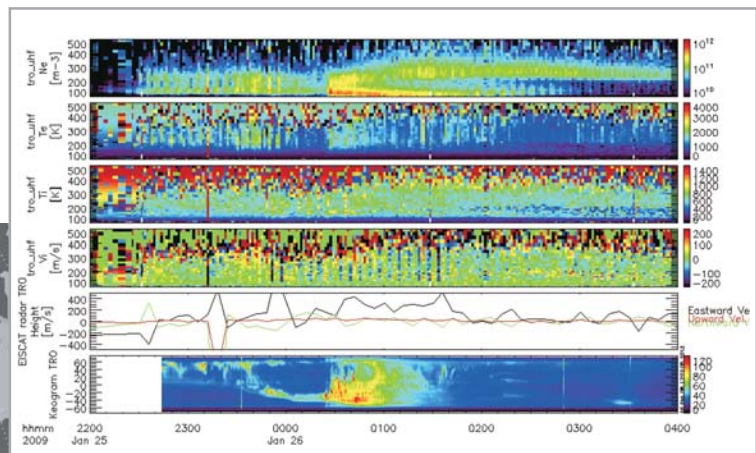
◀ An example of 2D display:

SuperDARN and
THEMIS all-sky cameras

List of Data Registered in the IUGONET Metadata DB
As of March 2014

☆: In preparation for registering its dataset metadata

● Tohoku University
Onagawa Geomagnetic Data (Search Coil)

Iitate HF-Band Jupiter-Sun Wide-Band Radio Data

Iitate UHF-Band Jupiter Narrow-Band Radio Data

Iitate VHF-Band Solar Radio Spectral Data

Zao HF-Band Jupiter Narrow-Band Radio Data

Zao HF-Band Jupiter Wide-Band Radio Data

Athabasca LF-Band Standard Radio Wave Phase-Amplitude Variation Data

Ny-Alesund LF-Band Standard Radio Wave Phase-Amplitude Variation Data

Alaska Geomagnetic Data (Search Coil)☆

Alaska Aurora Imaging Data☆

Asia VLF Observation Network (AVON)

● National Institute of Polar Research
Syowa Station:
    Auroral Observation
    Geomagnetic Observation
    Upper Atmosphere Physics Monitoring Observation
    Imaging Riometer
    1-100Hz ULF/ELF Electromagnetic Wave Observation☆
    Fabry-Perot Imager
    SuperDARN HF-Radar
    MF Radar
    Sodium Lidar
Unmanned Magnetometer Network Observation around Syowa Station
Upper Atmosphere Physics Observation at Zhongshan Station☆
All-Sky Imager at South Pole Station
Conjugate Observation at Iceland
EISCAT Radar
NIPR/Norway Svalbard Meteor Radar (NSMR)
NIPR/Norway Tromso Meteor Radar (NTMR)
Auroral and Airglow Observation (Svalbard, Tromso)

● Kyoto University; Kwasan and Hida Observatories
Flare Monitoring Telescope (FMT):
    FMT Full-Disk Solar Images
    FMT Event List
    FMT Event Movies
Solar Magnetic Activity Research Telescope (SMART):
    SMART Hα Full-Disk Solar Images
    SMART Hα Partial Solar Images
    SMART Event Catalogue
    SMART Event Movies
    SMART Solar Photospheric Magnetograms
Domeless Solar Telescope (DST) :
    DST Hα Partial Solar Images
    DST Spectrograph Quick-look Solar Images
    DST Spectrograph Data
Ca II K Full-disk Heliograms

● Kyoto University; Data Analysis Center for Geomagnetism and Space Magnetism
Geomagnetic Indices (Final)

Geomagnetic indices (Provisional)

Geomagnetic Indices (Quick Look)

Geomagnetic Field Digital Data (WDC Final)

Geomagnetic Field Digital (WDC Prompt)

Geomagnetic Field Analog Data

Geomagnetic Field Digital Data (Original Observations by WDC for Geomag., Kyoto)☆

Statoscope Data (Original Observations by WDC for Geomag., Kyoto)

Geomagnetic Field Model (IGRF)

Ionospheric Conductivity Model

Catalogue for Archived Geomagnetic Field Data☆

● Kyoto University; Research Institute for Sustainable Humanosphere
Shigaraki MU Observatory:
    MU Radar (Troposphere and Stratosphere)
    MU Radar (Mesosphere)
    MU Radar (Ionosphere)
    MU Radar (Special Obs.: Meteor/RASS/FAI)
    Radiosonde
    Boundary Layer Radar
    L-Band Lower Troposphere Radar
    Wind Profiler Radar (LQ-7)
    Ionosonde
    Meteor Radar
    Lower Thermosphere Profiler Radar☆
    Lidar☆
    Ceilometer
    AWS
    All Sky Camera
Equatorial Atmosphere Observatory:
    EAR (Troposphere and Starosphere)
    EAR (FAI)
    Boundary Layer Radar
    Kototabang Meteor Radar
    X-band Weather Radar
    Ceilometer
    Radiosonde
    AWS
    All Sky Camera
Others:
    MF Radar (Pontianak, Pameungpeuk)
    Serpong Boundary Layer Radar
    Meteor Radar (Serpong, Biak)
    Dawin Radiosonde (Campaign Observation)
    GNU Radio Beacon Receiver (GRBR)
    GPS
    Wind Profiler Radar (LQ7) (Biak, Manado, Pontianak)
    Automatic Weather Station (AWS) (Biak, Manado, Pontianak)
    Radiosonde (Bandung, Pontianak, Serpong, Uji)

● Nagoya University
Atmosphere:
    Campaign Observation of NOx and Ozone Mixing Ratio
    Aerosol Observation
    Atmospheric Molecule Observation by Infrared Spectrometer in Japan
    Atmospheric Molecule Observation by Millimeter Wave Spectrometry at Japan and South America
Ionosphere and Magnetosphere:
    210 Magnetic Meridian (210MM) Magnetometer Chain
    STEL Magnetometer
    Optical Mesosphere Thermosphere Imager (OMTI)
    Ionospheric Scintillation at Indonesia and Norway
    VHF Radar at Indonesia
    VLF/ELF Measurement in Japan and Canada
    EISCAT Radar
    MF/Meteor Radars at Norway
    Optical Observations at Norway
    SuperDARN Hokkaido HF Radar
Heliosphere:
    Multi-Directional Cosmic-Ray Muon Telescope☆
    Interplanetary Scintillation

● Kyushu University
Ground Geomagnetic Observation Data

FM-CW Radar Observation Data

Geomagnetic Pc5 Index Data

Geomagnetic EE Index Data

Geomagnetic Pi2 Index Data

Sq Equivalent Current Pattern Model from MAGDAS/CPMN Observation

Collaborative Members
● Solar Observatory, National Astronomical Observatory of Japan
White-Light/H-Alpha Full Disk Image

Full Disk Stokes Map (He-I 10830, Si-I 10827, Fe-I 15648)

● National Institute of Information and Communications Technology
Aurora Web Camera (Alaska)

MF Radar (Alaska/Wakkanai/Yamagawa)

1.3GHz Wind Profiler Radar (LQ4)

● Kakioka Magnetic Observatory, Japan Meteorological Agency
Geomagnetic Field Data (1-hour/1-min/1-sec, Kakioka/Memambetsu/Kanoya/Chichijima)

Geomagnetic Field Data (7.5-sec/0.1-sec, Kakioka/Memambetsu/Kanoya)

Geoelectric Field Data (1-hour/1-min/1-sec, 0.1-sec, Kakioka/Memambetsu/Kanoya)

Atmospheric Electric Field Data (1-hour/1-min, Kakioka/Memambetsu)

Collaborations with Other Projects/Institutions

IUGONET is continuously in discussion with the SPASE Consortium, since the IUGONET common metadata format is based on the SPASE metadata model. Thus, the metadata format makes it easy to collaborate with other international databases for upper atmospheric research. IUGONET is currently discussing the possible international collaboration with the databases of the European project "Near earth space data infrastructure for e-science (ESPAS)" and the "Virtual Observatory (VO)" of the United States. IUGONET and ESPAS completed the signature of a Memorandum of Understanding (MOU) to promote cooperation.

In Japan, in addition to the metadata provided by the IUGONET institutions/universities, metadata from the National Astronomical Observatory of Japan (NAOJ), National Institute of Information and Communications Technology (NICT), and the Kakioka Magnetic Observatory of the Japan Meteorological Agency (JMA) have been registered.

IUGONET is currently developing the UDAS analysis software in close collaboration with the TDAS team in the U.S. In Japan, the ERG science team, which consists of the researchers of Japan Aerospace Exploration Agency (JAXA), ISEE/Nagoya University, and the National Institute of Polar Research, is collaborating with IUGONET for the development of UDAS software.

SPASE — Metadata Format — IUGONET — Cross-Searching — ESPAS (Europe)

THEMIS (USA) ERG (Japan) — Analysis Software — IUGONET — Metadata Registration — NAOJ, NICT, JMA (Japan)

Support for continuous activity of IUGONET from the international scientific activities and council.

IUGONET welcomes any type of support and feedback from users!
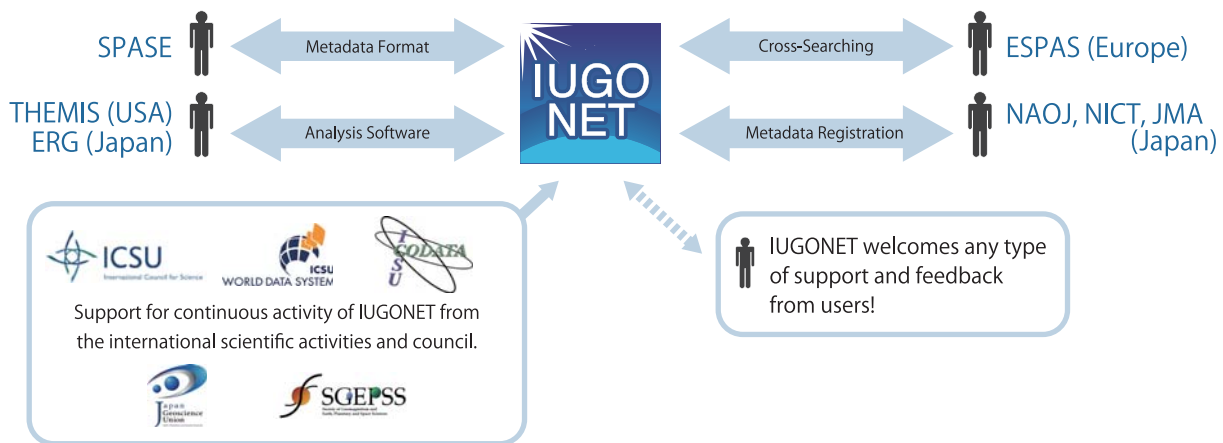
For Further Development

▶ Follow Us on Our Website, Twitter, and YouTube Channel!

IUGONET has its own website and Twitter account to transmit information and promote the two IUGONET products: the metadata DB and UDAS. You can also check out our YouTube channel which includes video tutorials that show how to use our products. We would like to welcome you to join IUGONET users mailing list, which provides you with all the latest IUGONET-related information about new releases of the IUGONET products, IUGONET workshops, and so on. You can subscribe via our website quickly and easily.

IUGONET Channel

JOIN OUR MAILING LIST!

▶ Domestic/International Analysis Workshops

IUGONET hosts domestic/international analysis workshops, where participants get a hands-on learning experience of the UDAS analysis software. IUGONET is hoping to organize smaller workshops and remote lectures in the future. IUGONET developers can provide a lecture about UDAS at your university or via the web. If you are interested in an analysis workshop/lecture, please contact us by e-mail (iugonet2009@gmail.com).

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Inter-university Upper atmosphere Global Observation NETwork (IUGONET)

- Web: http://www.iugonet.org/en/
- Metadata DB: http://search.iugonet.org/
- e-mail: iugonet2009@gmail.com
- YouTube: http://www.youtube.com/user/iugonet2009
- Twitter: https://twitter.com/iugonet

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