

# IUGONET (Inter-university Upper atmosphere Global Observation NETwork) activities

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S. Abe, Y. Koyama, A. Shinbori, M. Yagi,  
S. UeNo, M. Nose, and IUGONET project team

- 1) NIPR (National Institute of Polar Research), 2) Nagoya University,
- 3) TRIC/ROIS, 4) Kyoto University, 5) Tohoku University

# IUGONET Members

Representative  
Developer  
As of Feb 2015

## Kyoto University

Research Institute for Sustainable Humanosphere  
Toshitaka Tsuda, Mamoru Yamamoto, Hiroyuki Hashiguchi, Jun-ichi Furumoto, Masanori Yabuki, Atsuki Shinbori, and G. Kishore Kumar

Data Analysis Center for Geomagnetism and Space Magnetism; Graduate School of Science  
Toshihiko Iyemori, Hiroaki Toh, Masahiko Tanaka, Masahito Nosé, and Yukinobu Koyama

Kwasan and Hida Observatories; Graduate School of Science  
Kazunari Shibata, Satoru UeNo, and Naoki Kaneda

## Kyushu University

International Center for Space Weather Science and Education (former Space Environment Research Center)  
Akimasa Yoshikawa, Kiyohumi Yumoto, Tohru Hada, Daisuke Ikeda, and Shuji Abe

## Tohoku University

Planetary Plasma and Atmospheric Research Center, Planetary Plasma Physics Laboratory, Planetary Atmosphere Physics Laboratory; Graduate School of Science  
Takahiro Obara, Naoki Terada, Yasumasa Kasaba, Takeshi Sakanoi, Hiroaki Misawa, Atsushi Kumamoto, Fuminori Tsuchiya, Yuto Katoh, Masato Kagitani, and Manabu Yagi

## National Institute of Polar Research

Space and Upper Atmospheric Sciences Group  
Takuji Nakamura, Akira Kadokura, Hiroshi Miyaoka, Masaki Okada, Yasunobu Ogawa, Yoshihiro Tomikawa, Natsuo Sato, and Yoshimasa Tanaka

## Nagoya University

Solar-Terrestrial Environment Laboratory; Promotion Group  
Kazuo Shiokawa, Ryoichi Fujii, Yoshizumi Miyoshi, Yuichi Otsuka, Tatsuki Ogino, and Norio Umemura

Local Steering Committee  
Tomoki Nakayama, Tomoo Nagahama, Satonori Nozawa, Yuichi Otsuka, Kenichi Fujiki, Yutaka Matsubara, Yoshizumi Miyoshi, Kanako Seki, Nozomu Nishitani, and Fumio Abe

WDS for Geomagnetism

WDS for Aurora

WDS for Cosmic Rays

**5 Universities (incl. NIPR) 7 organizations.**  
**Members 47**  
**Developers (incl. Executive director) 12**



# IUGONET Members

**New members:  
ISAS, Hokkaido Univ. Kanazawa Univ.**

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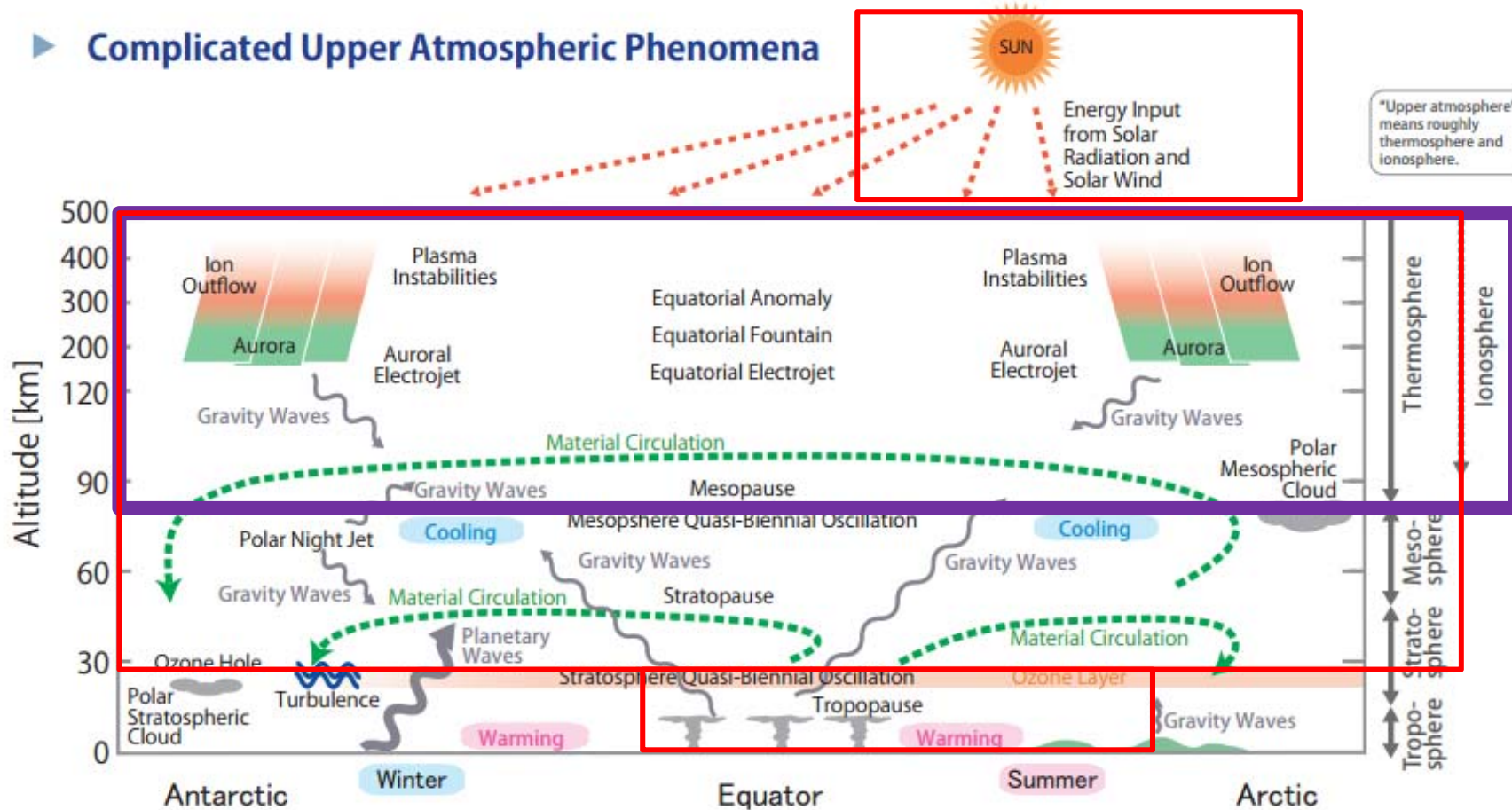
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- **To provide a new research platform for sharing metadata extracted from ground-based observation data, which have been collected by IUGONET institution members since International Geophysical Year (1957–1958).**
- **To develop analysis software 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.**

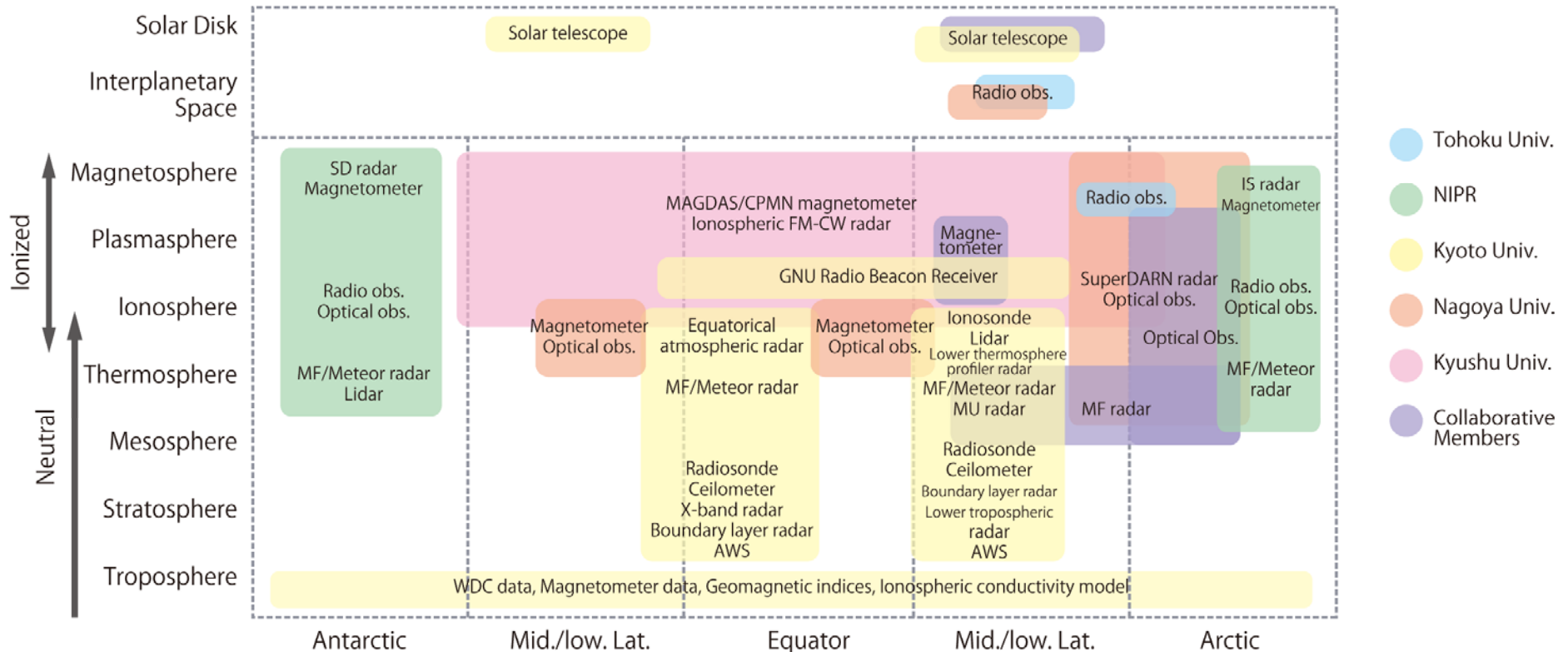
## ► Complicated Upper Atmospheric Phenomena



1. Affected by various phenomena from the earth surface to the space
2. Many physical parameters
3. Various waves including solar activity are overlapped

# Which area does IUGONET cover?

## IUGONET Global Network of Ground-Based Observations

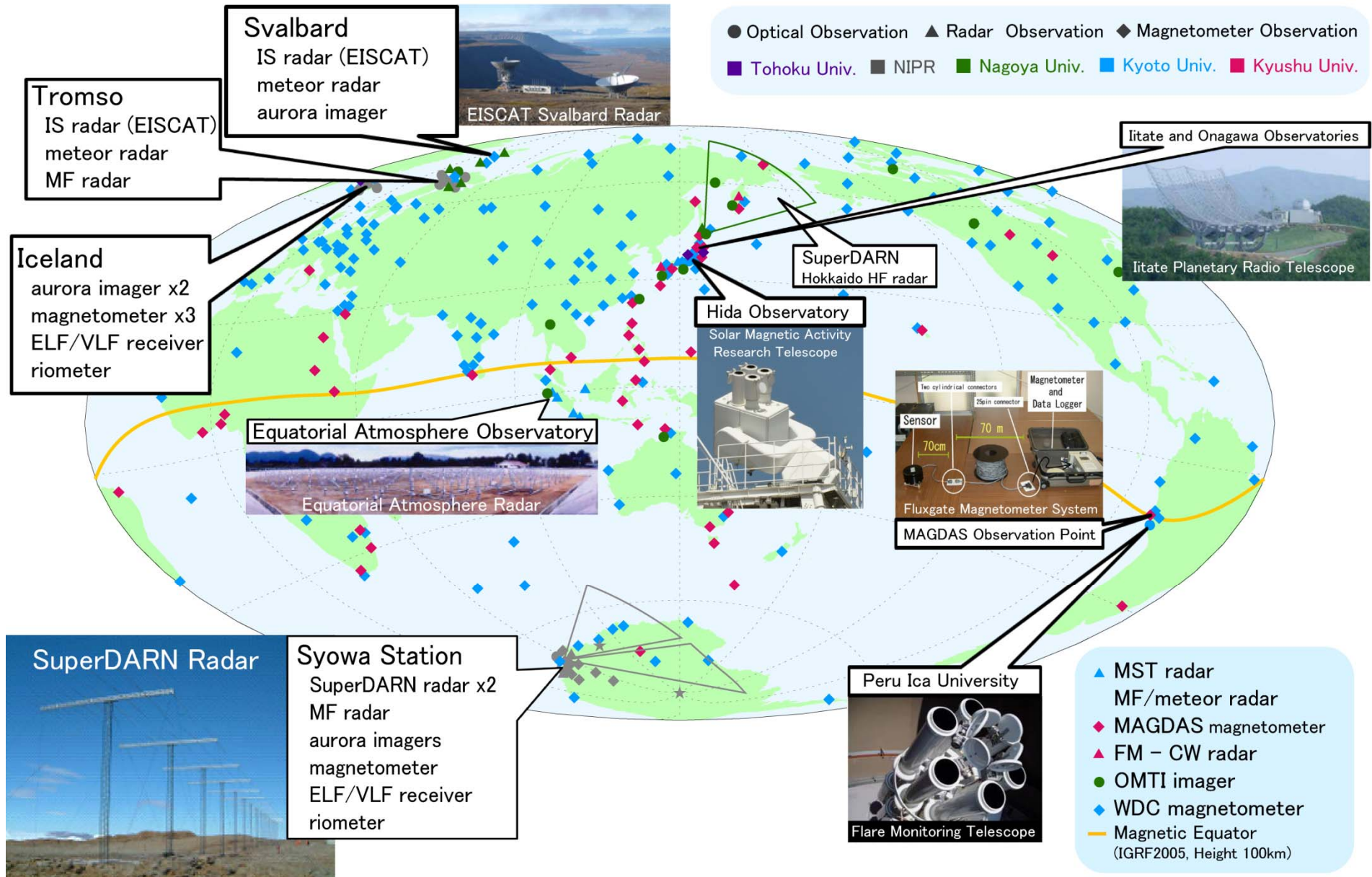


- Various parameters
- Researchers
- Develop the instruments
- Observe the upper atmosphere
- Manage database

- The ground-based observations by the members of IUGONET cover a wide area from the Earth's surface to the Sun and interplanetary space.
- These data play an essential role in the scientific researches in the STP and VarSITI program.

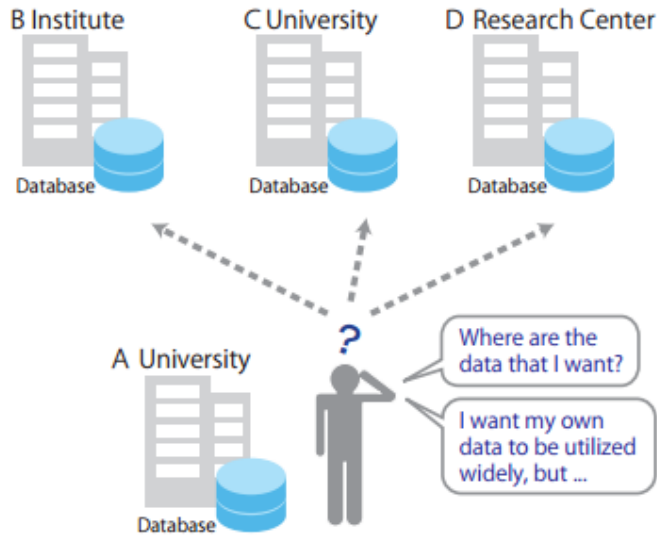


# Global observation network of the IUGONET



# Metadata database

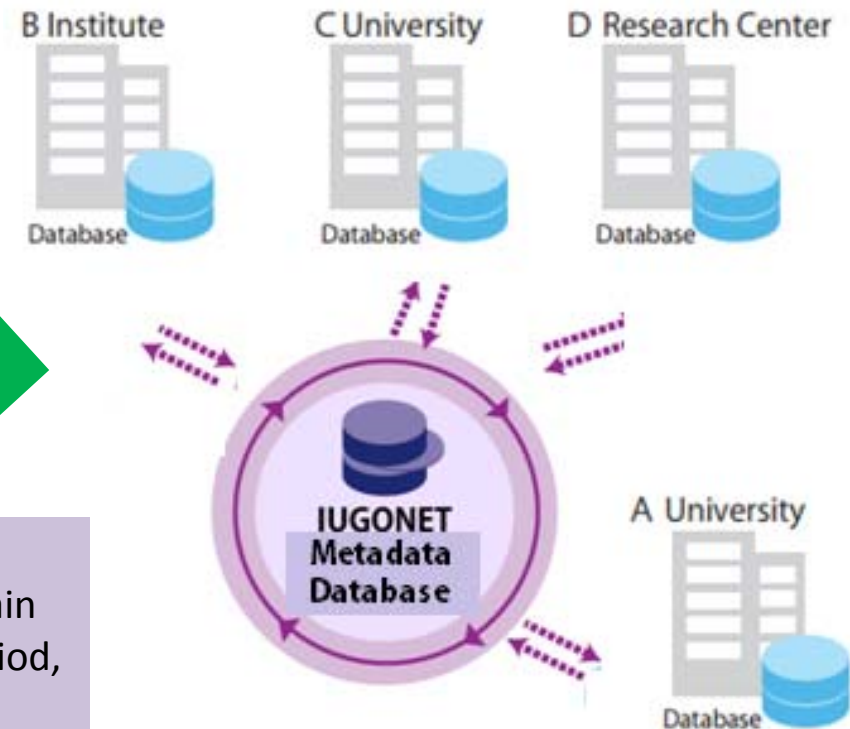
## Problem



Observational data should be quality controlled and managed by the specialists who know the observations.

**For users....It was not easy to reach a necessary information, since databases are distributed in various institution.**

## Solution



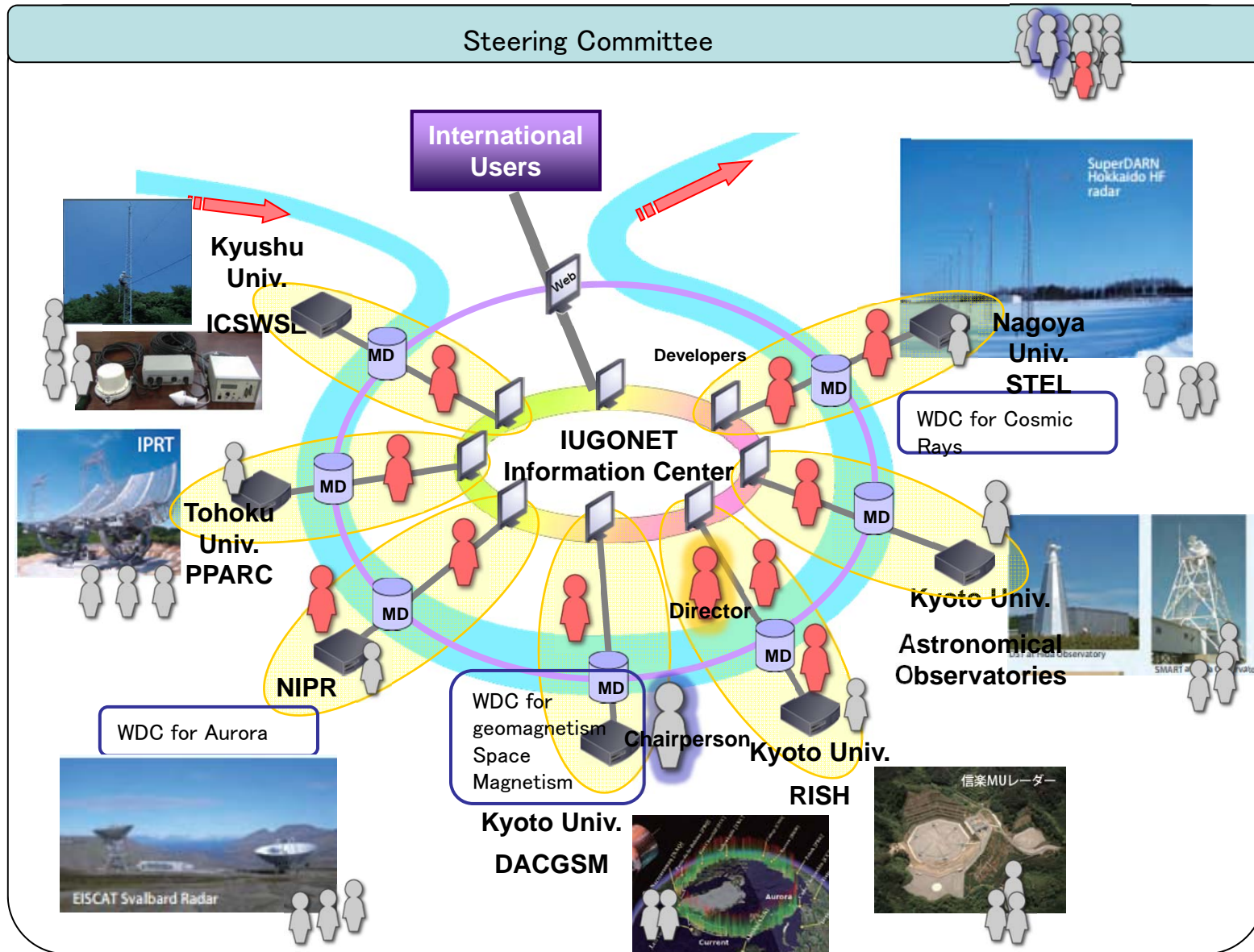
IUGONET provides a new research platform that enables metadata extracted from ground-based observation data to be shared. In addition, IUGONET developed analysis software to access and analyze data in an integrated fashion.

What is Metadata ?

Metadata are defined as data that describe certain Aspects of information of our data (location, period, Instruments used, data location (URL)).

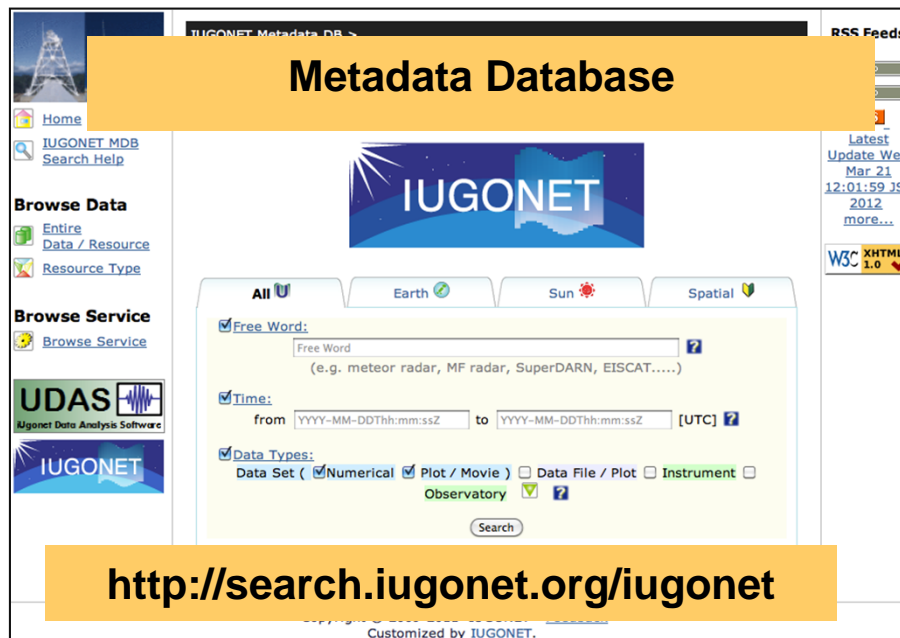


# Overview of the project



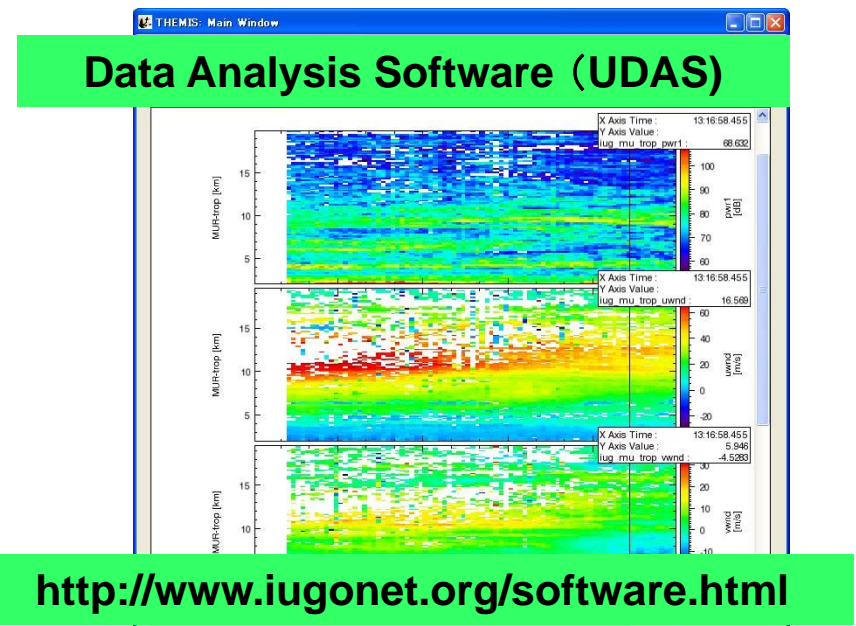
In order to make the data available to many users and promote the interdisciplinary study, we have developed

- **Metadata Database (MDB)** for cross-searching various data distributed across the members of IUGONET,
- **Data Analysis Software (UDAS)** for visualizing and analyzing various data in an integrated fashion.



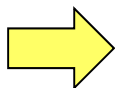
**Metadata Database**

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



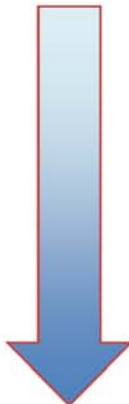
**Data Analysis Software (UDAS)**

<http://www.iugonet.org/software.html>



These tools must be useful for the VarSITI program, which requires the researchers to use various types of data obtained from multiple regions.

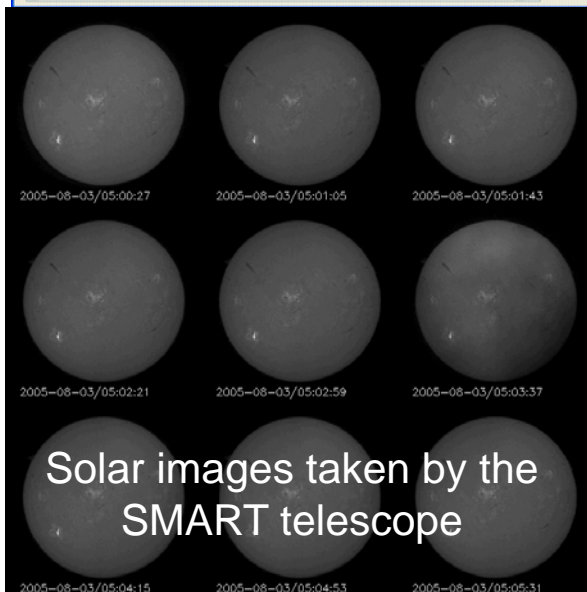
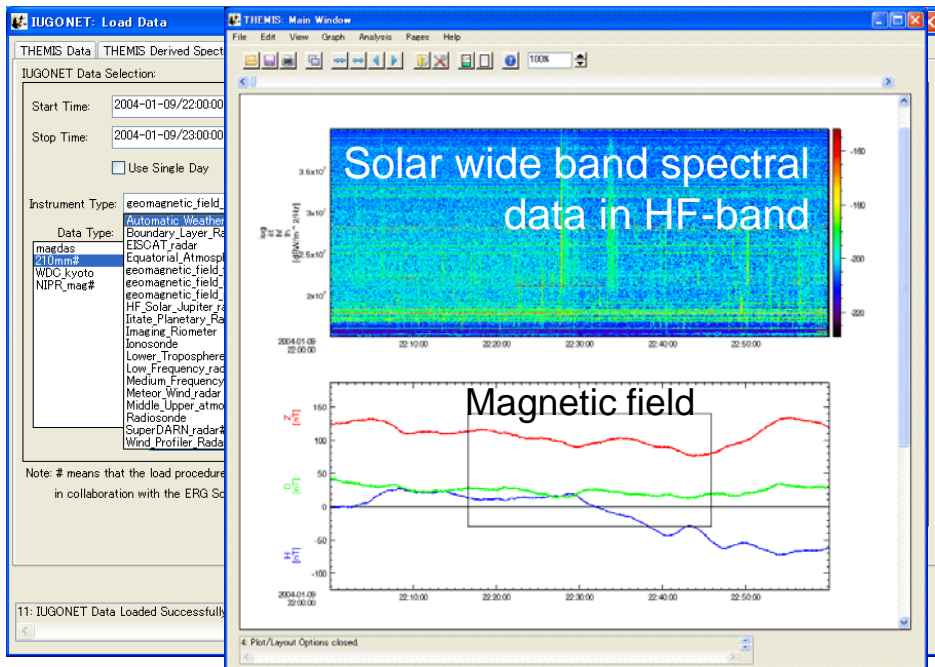
# Number of registered metadata



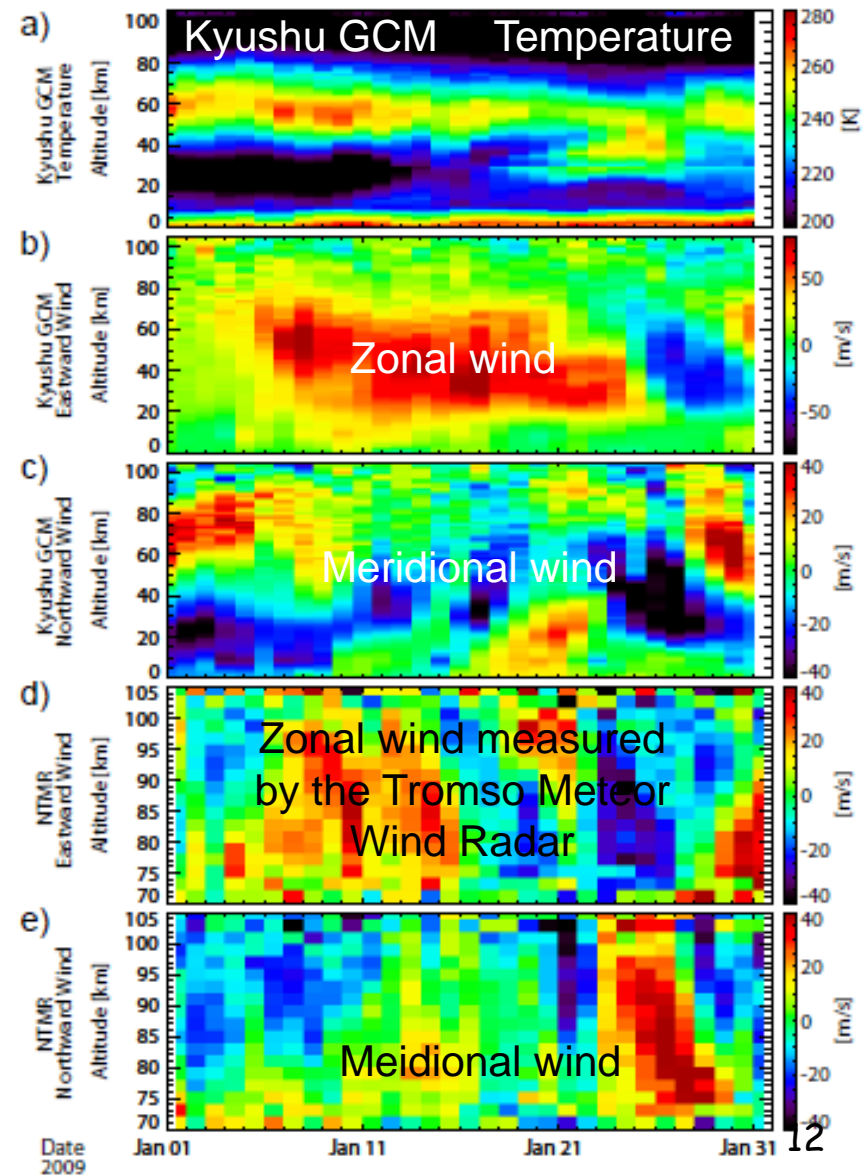
	Number of metadata for dataset	Number of metadata for data	Number of metadata for all data	
2010	260	28,179	28,439	
2011	2,188	514,925	517,113	
2012	2,326 + 45	3,369,503 + 594,025	3,371,829 + 594,077	
2013	2,610 + 110	7,401,505 + 1,637,265	7,404,115 + 1,637,385	
2014	2,850 + 107	8,963,838 + 1,712,401	8,966,688 +1,712,508	IUGONET original data
2015	3,154 +110	9,721,245 +2,012,401	9,724,399 +2,012,511	Other than IUGONET (NAOJ, NICT, JMA etc.)
				合計 11,736,910

**11,736,910 metadata has been registered, as of Sept 17, 2015.**

黒色: IUGONET機関オリジナルデータのメタデータ  
 青色: IUGONET外からの受け入れ分



Solar images taken by the SMART telescope



IUGONETメタデータDB、及び、SPEDAS/UDASの利用者数拡大を目的として、年に2回程度、講習会を開催してきた。

1. **2010/2/25 @極地研**: SuperDARN/EISCAT/れいめい衛星データ解析講習会
2. **2011/7/27 @極地研**: IUGONETデータ解析講習会
3. **2012/2/24 @名大**: 平成23年度国立極地研究所研究集会「地上多点観測データの総合解析による超高層大気研究会」
4. **2012/8/10 @極地研**: 平成24年度国立極地研究所研究集会「地上多点観測データの総合解析による超高層大気研究会」
5. **2013/2/27 @京大RISH**: IUGONETデータ解析講習
6. **2013/8/21 @極地研**: 平成25年度国立極地研究所研究集会「太陽-地球大気の地上多点観測データ総合解析ワークショップ」
7. **2013/11/6 @高知高専**: IDL講習会IN高知
8. **2014/8/20 @極地研**: 平成26年度国立極地研究所研究集会「太陽-地球大気の地上多点観測データ総合解析ワークショップ」
9. **2015/3/6 9:30~12:00@福岡**: 「UN/JAPAN Workshop on Space Weather 2015」の1セッションとして開催。
10. **2015/8/20 @極地研**: 第2回「太陽地球環境データ解析に基づく超高層大気の空間・時間変動の解明」



2013年8月21日に極地研で開催された講習会

これ以外にも、小規模の講習会を複数回開催した。



# Outreach activity of the IUGONET project

To enhance an international use of the IUGONET MDB and UDAS is very important to promote comprehensive studies of mechanisms of long-term variations in the upper atmosphere.

- Mini- training of how to use the IUGONET MDB system and data analysis software (UDAS)

- 2013/1/12, 2/11 : Online lecture (RISH-LAPAN)
- 2014/11/13: Mini-workshop (SPL, India)
- 2014/11/15: Mini-workshop (NARL, India)

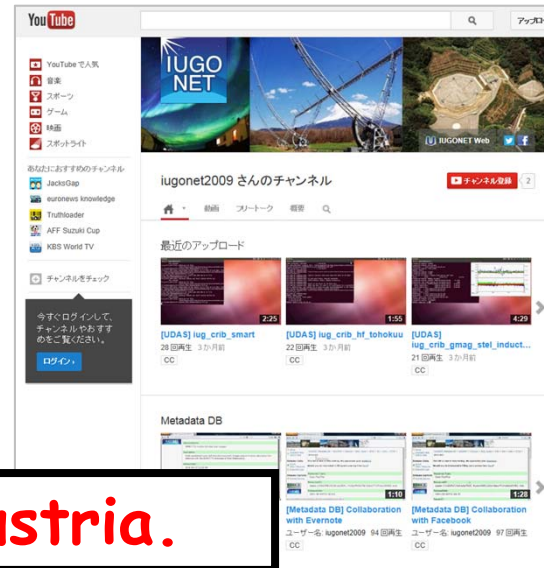


Mini-training workshop at LAPAN in Indonesia on Aug. 2012

- Online tutorial movies

Researchers can learn how to use IUGONET MDB and data analysis software anytime online at the IUGONET's YouTube site.

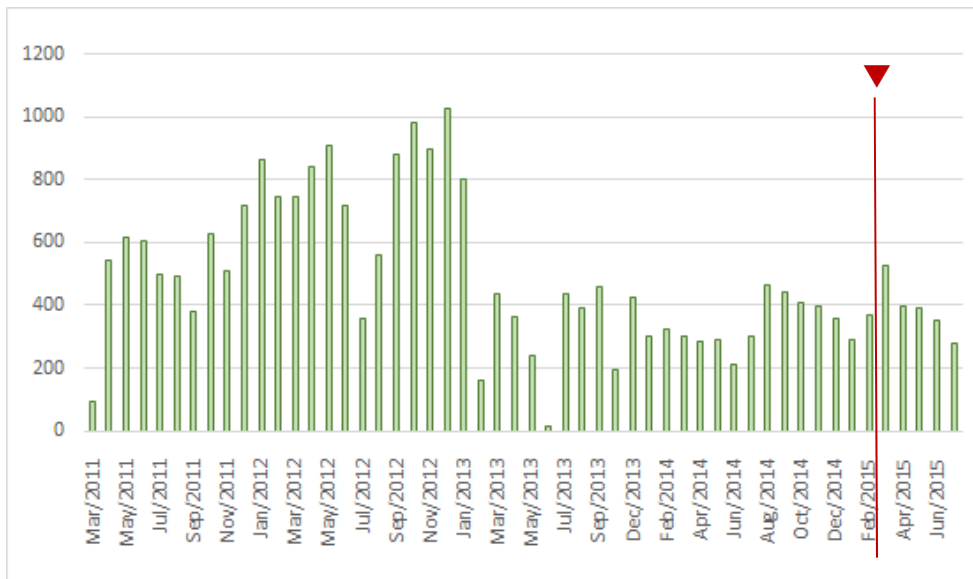
- Updating Web page
- IUGONET mailing list
- IUGONET pamphlet



<http://www.youtube.com/user/iugonet2009>

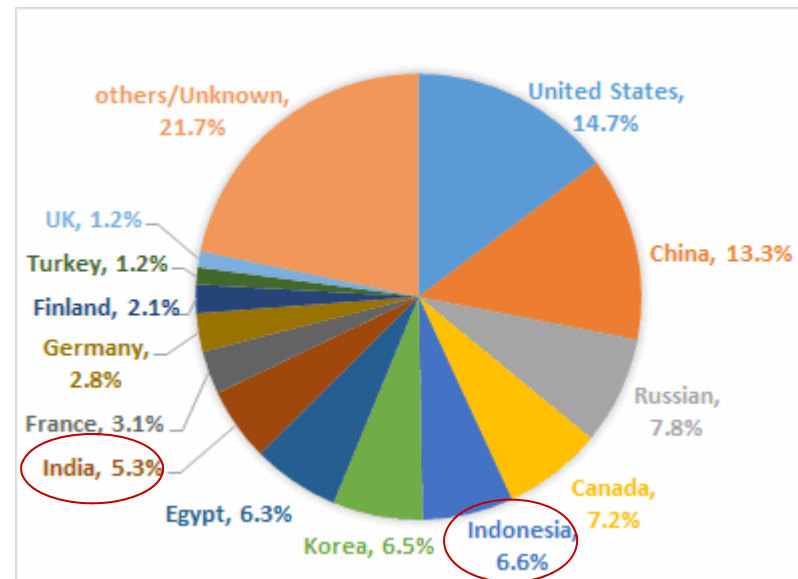
**More schools in Nigeria and Austria.**

## Monthly number of access from unique users



ユニークユーザー数の補足：  
同一ユーザと思われる場合は1月に何度アクセスしても1カウント

## Access from abroad (after 2015.3.1)



国別アクセス数の補足：  
全体に占める割合は日本：83.87%、国外：16.13%

- ・平成27年度のユニークユーザー数は、これまでとほぼ同等で推移。確実にユーザに定着している
- ・インドネシア、インドから、継続的に多数のアクセスあり。国際アウトリーチの成果が継続的に現れている
- ・用語を使った検索に加え、ResourceID を使ったメタデータの取得も目立ってきている(海外含めて)  
操作マニュアルを参照し、ユーザは使いこなしつつある  
XML I/F を使ったメタデータの取得も目立ちつつある (オープンデータなどへのトライ)

# Summary of IUGONET activity

- Started as a 6 year inter-university collaboration project in 2009-2014. (NIPR, Tohoku U., Nagoya U., Kyoto U. Kyushu U.)
- Metadata DB and analysis software of upper atmosphere data by ground-based observations have been developed.
- The 6 year project was very successful, but funding of the inter-university project has been terminated. However, IUGONET is still operated by budget of each member institute (NIPR, STEL, etc.).





[Home](#)

[Important Dates](#)

[Venue](#)

[Links](#)

## **International Symposium on the Whole Atmosphere (ISWA)**

**VarSITI/ROSMIC**

**Date : 14-16 September 2016**

**Venue: Ito Hall, The University of Tokyo, Tokyo, Japan**

Earth's climate changes globally partly because of its inherent nature and partly because of anthropogenic effects. The middle atmosphere is an important component of the earth climate system that exhibits global cooling in response to the increase in greenhouse gases, and in which the ozone layer can be substantially destroyed leading to the formation of the Antarctic ozone hole. Recent developments in observational techniques and the extension of