Inter-university Upper atmosphere Global Observation NETwork (IUGONET)

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IUGONET project team

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The objective of IUGONET Project

- develop a metadata database of the upper atmosphere data by ground-based observation accumulated over 50 years since IGY by Japanese universities/institutes.
- promote effective use of the observational data spread across the institutes/universities, which leads to interdisciplinary, comprehensive studies of the upper atmosphere .
- investigate mechanism of long-term variation in the upper atmosphere

Participating universities and research institutes

NIPR, PPARC, Tohoku Univ., STE Lab., Nagoya Univ., RISH, Kyoto Univ., WDC/Kyoto, Kyoto Univ., Kwasan and Hida Observatories, Kyoto Univ., and ICSWSE, Kyusyu Univ.

Observations by IUGONET institutes

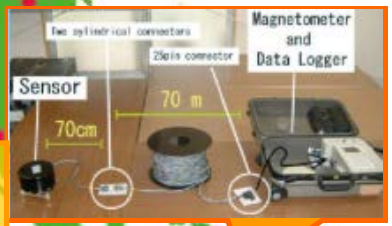
Iceland
aurora imager x2
magnetometer x3

Svalbard: IS radar (EISCAT), meteor radar, aurora imager

Toromso
IS radar (EISCAT)
meteor radar
MF radar

MU radar @Shigaraki

SuperDARN Hokkaido HF radar



Solar observatory (Kyoto Univ.)

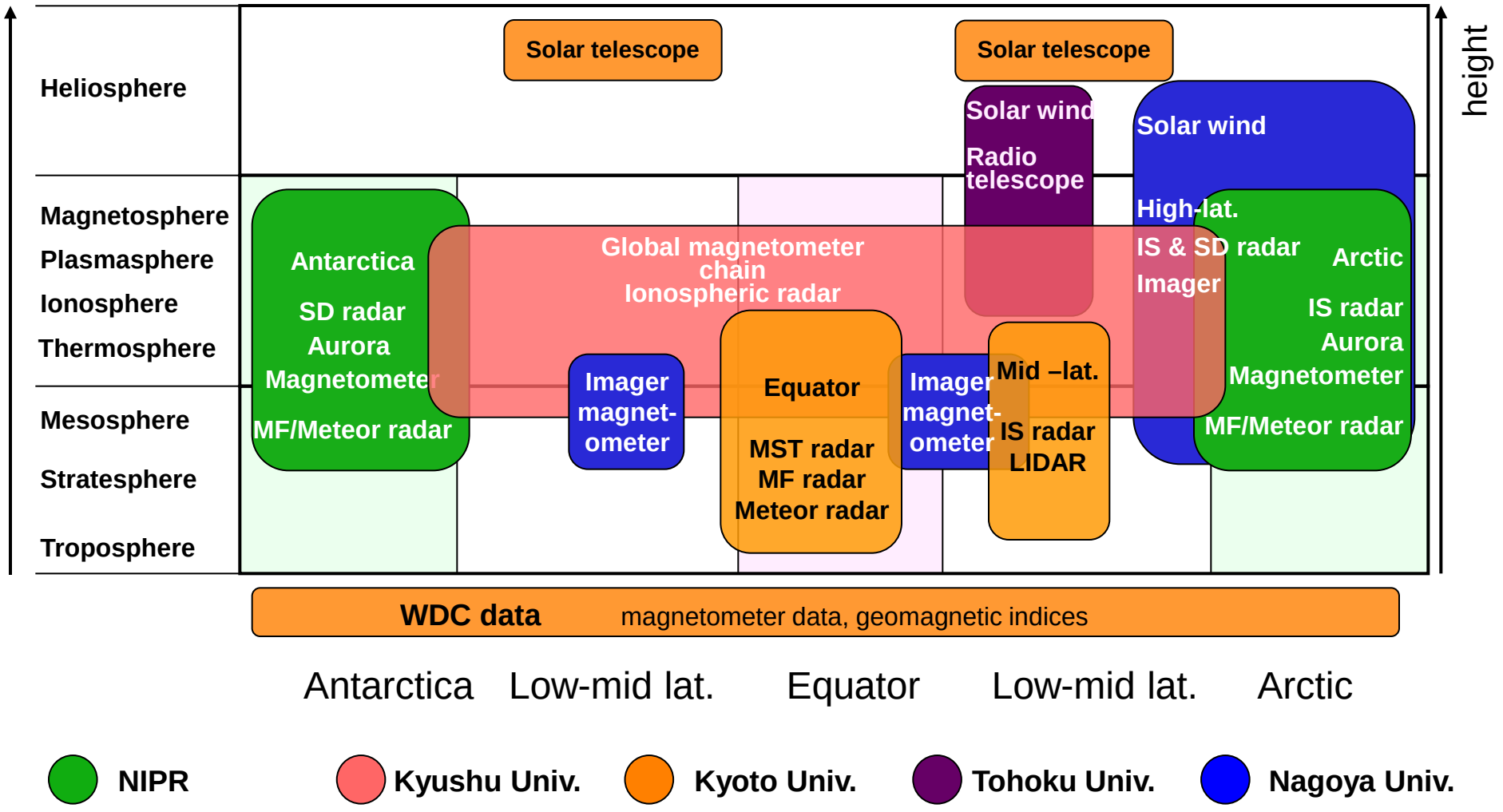
Equatorial Atmospheric Radar (EAR)

Iitate, Onagawa radio teloscope magnetomter

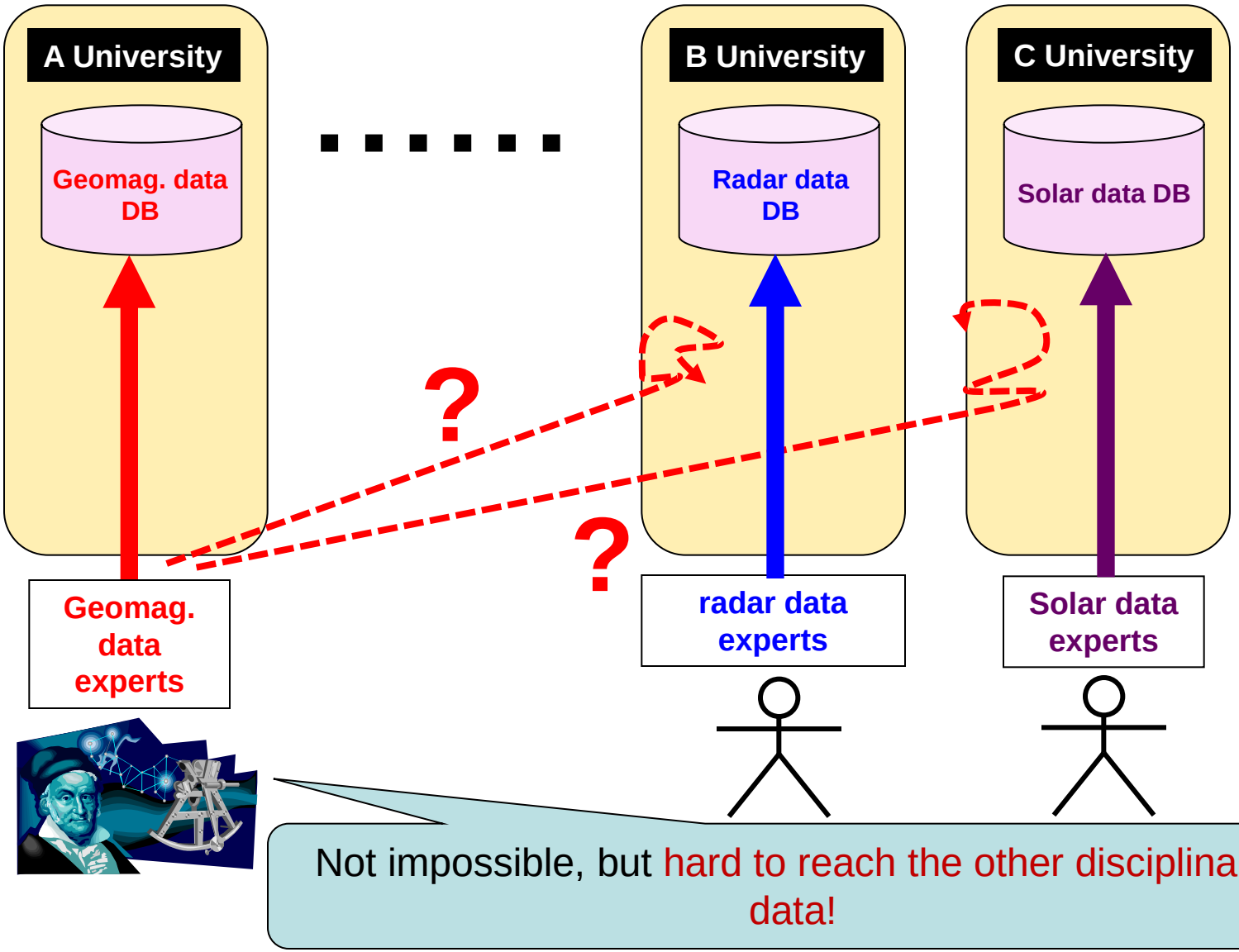
SYOWA base
SuperDARN radar x2
MF radar
aurora imagers
magnetometer chain
ELF obs. (conjugate with Onagawa)

- MST radar
- MF / meteor radar
- MAGDAS magnetometer
- FM-CW radar
- OMTI imager
- WDC magnetometer

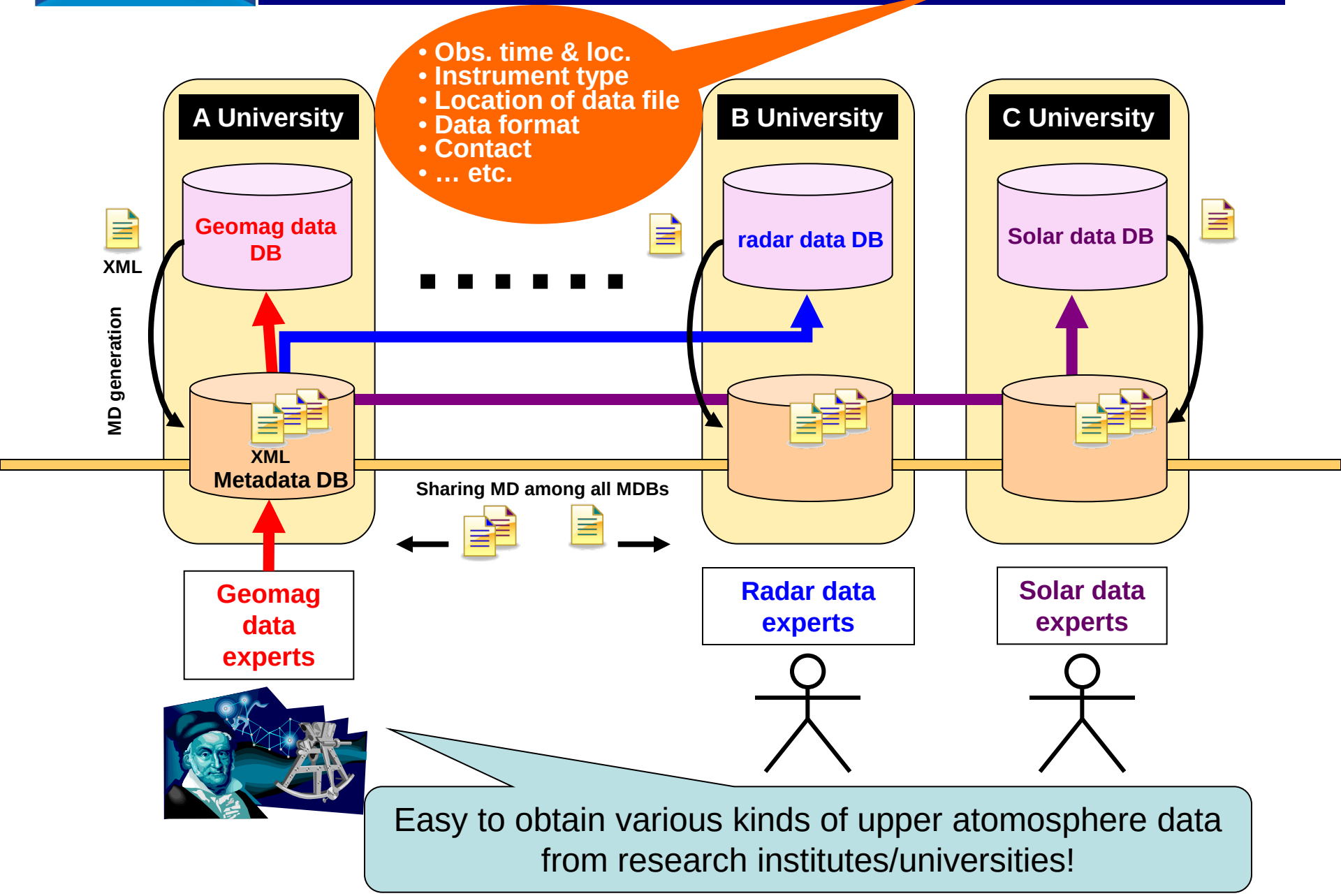
Altitude coverage of observations



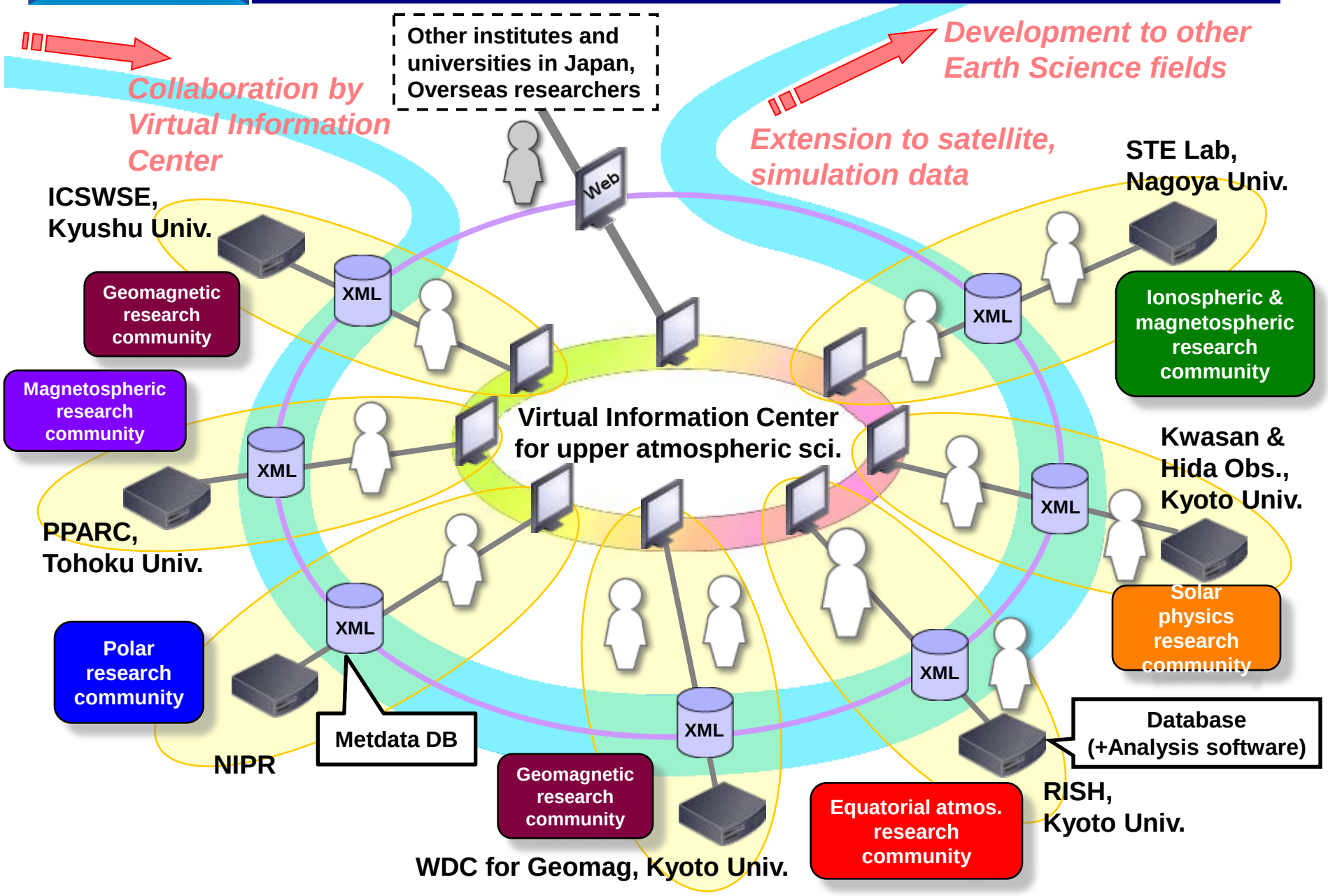
Problem with databases



Database access through metadata DB



Project Schematic



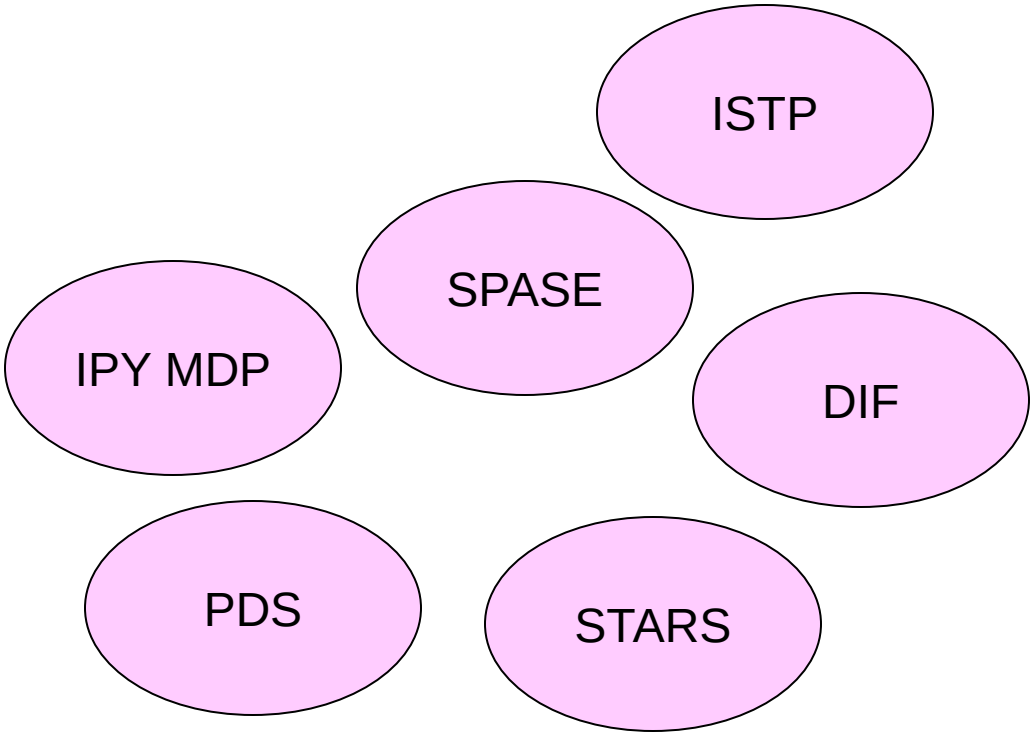
Project Timeline

Task	Y2009	Y2010	Y2011	Y2012	Y2013	Y2014	Detail
Virtual information center (VIC) of UA studies	System installation	Normal operation		System update			Construct the integrated research environment (TV-conference system, ..)
Development of metadata DB system	Prototype system devel.	Regular system devel.	Open to public				Design and develop the metadata DB system
Design the Metadata format standards	Ver.1 format	Update & document					Release the format ver.1 and keep updating if necessary
Development of data analysis software	Specifications and basic design	Programming	Open to public				Develop and release analysis softwares for UA data
Maintenance&extension of existing DBs of Observation data		Maintenance of obs. DBs & exam. of non-digital dataset		Effort focused on old data from Y2012 on			Incorporate non-DB'd data into the DBs
Metadata generation		Collecting metdata from each obs. DB		Effort focused on old data from Y2012 on			Generate metadata in the designated format and add to metadata DB
Operation of metadata DB							Release the metadata DB for community
VIC extension to related fields							Wrap up the project and discuss further extension

IUGONET metadata format description

We investigate many existing metadata formats in diverse way and choice one format for our base metadata format.

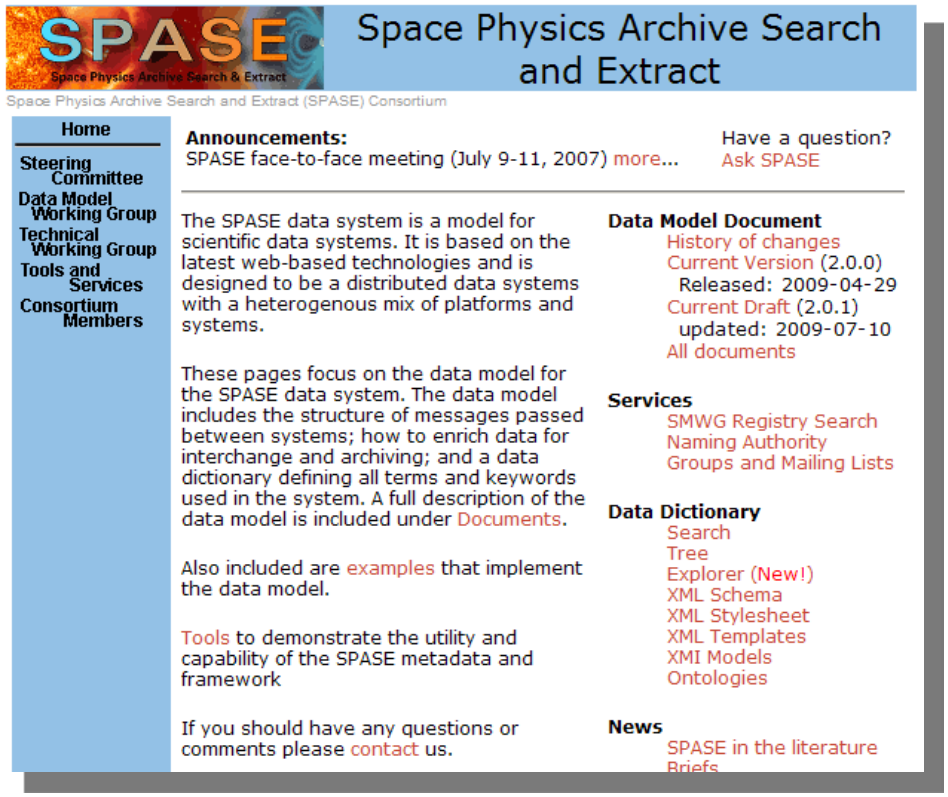
項目	IPY MDP, DIF	STARS, ISTP	SPASE	PDSラベルフォーマット
やり取りする時のフォーマット	XML	XML	XML	テキスト
どの科学分野、どのDBが使っているか	IPYDID, GCMD	STP分野 STARS-DB, CDAWeb	STP, Heliospheric VHO,VMO,ViRBO	Planetary PDS
数値データセットを説明する要素の有無	○	○	○	○
カタログデータセットを説明する要素の有無	○	○	○	△
非デジタルデータを説明する要素の有無	△	×	○	○
データファイルを説明する要素の有無	×	○	○	○
可視化属性の有無	×	○	○	△
必須(null不許可)の要素数	8+18	21+72+18+26 (DB全て)	15+7+7+6+3	8(+20)
新しい要素、単語の追加が容易	×	△	○	△
ドキュメント、公開ツールが揃っているか	△	△	○	○



Design of metadata format

IUGONET metadata format = SPASE + modifications

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



What's SPASE?

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)**

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 examples

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**

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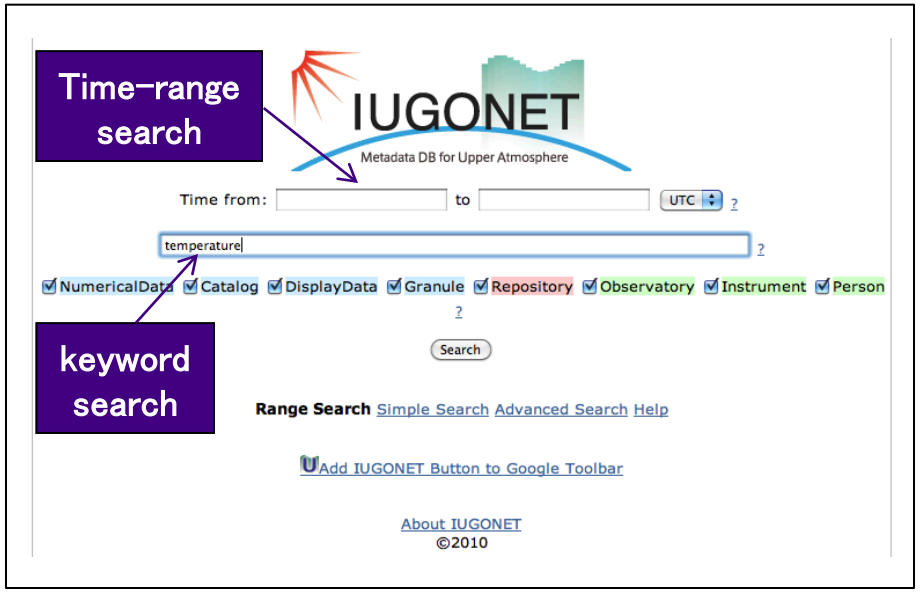
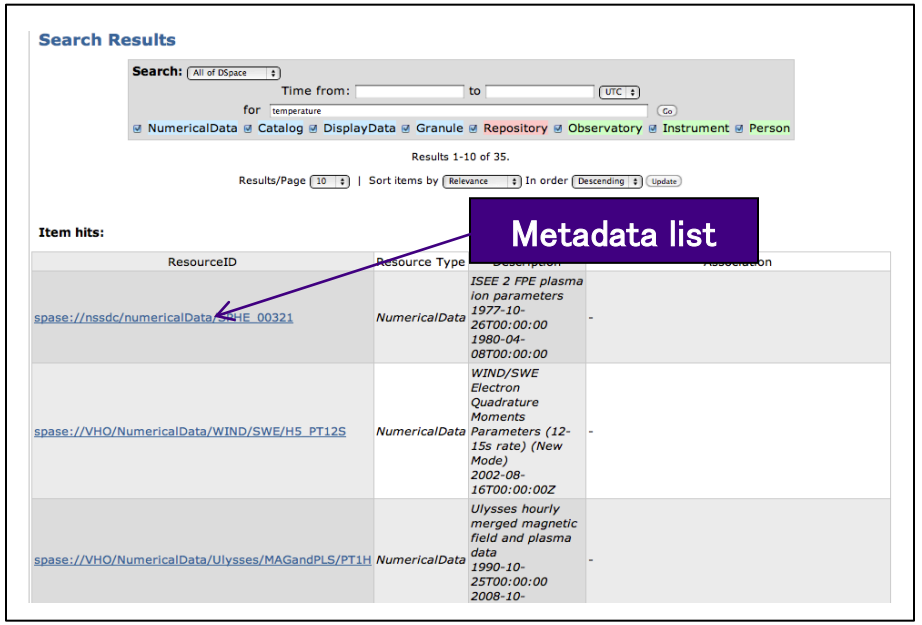
Development of MDB system

IUGONET MDB system is based on 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 university repositories)

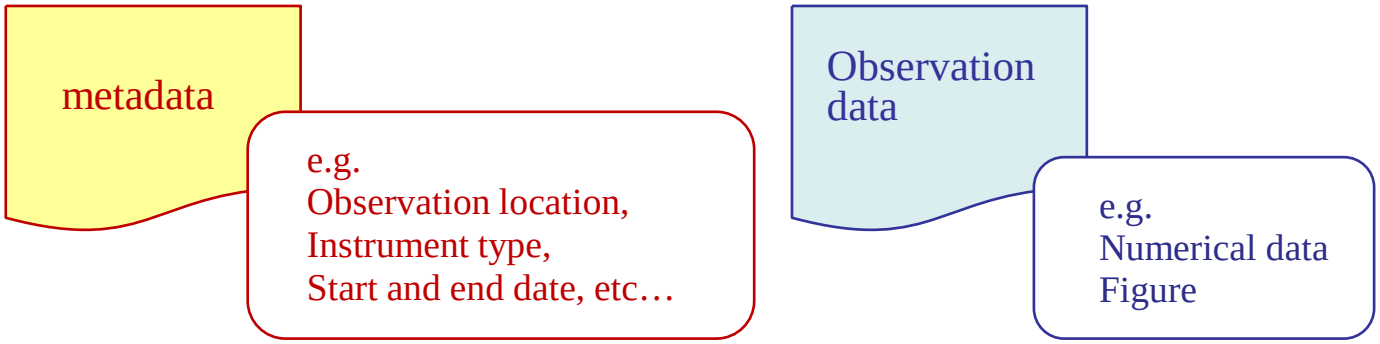




What is metadata? What is metadata database

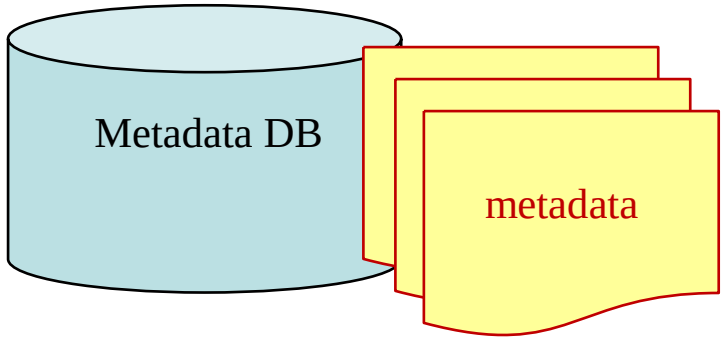
Metadata

Metadata, is often used as “data about data”, has the information about the observation data. e.g. observatory location, instrument type, start date, end date, data location, etc…



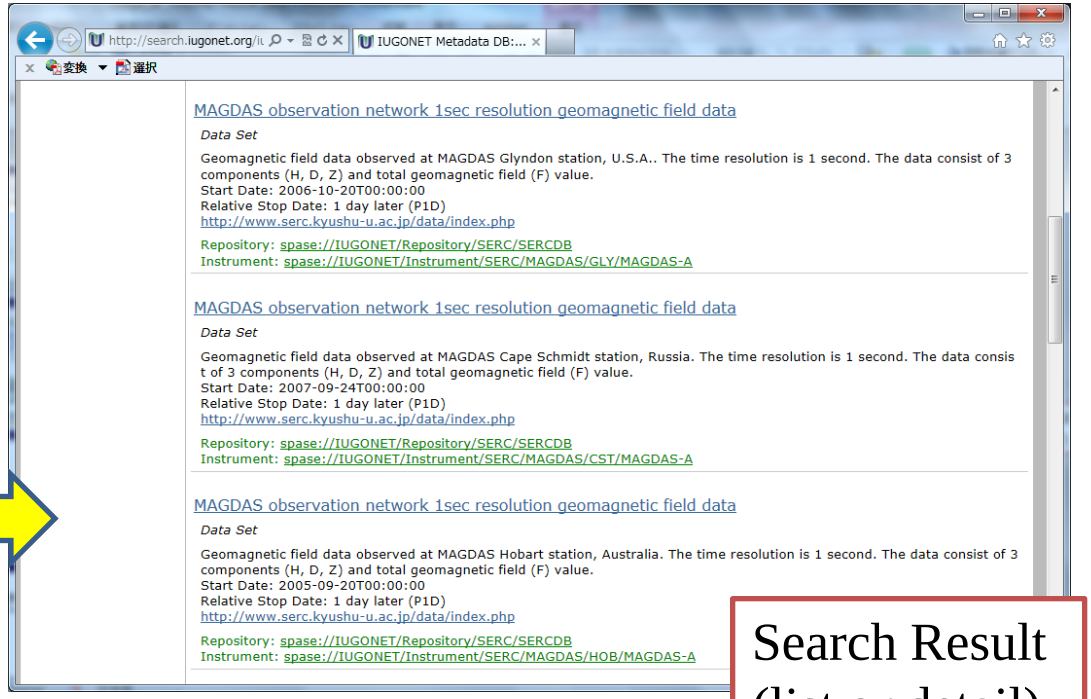
Metadata database

Database which can control (gathering, searching, etc…) many metadata.



What is IUGONET metadata DB

Freeword Search,
Data type Selection,
Visualized search, etc…



Search Result
(list or detail)

- IUGONET MDB provides the service for cross-searching observational data distributed across the IUGONET institutions.
- IUGONET MDB brings a remarkable advancement in accessibility to the observational data and accelerate the interdisciplinary study.

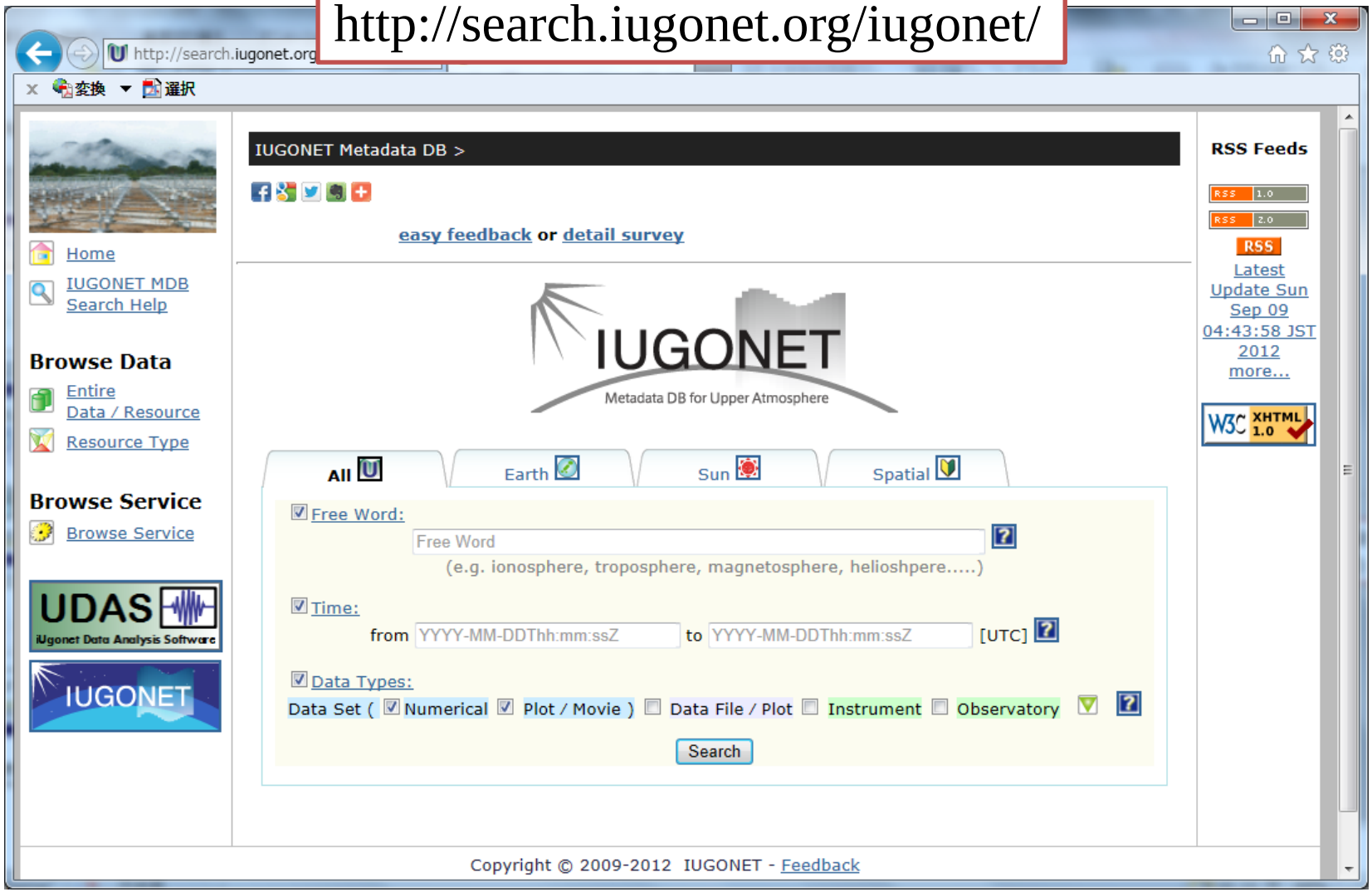
Note for using IUGONET MDB

- No registration
  - IUGONET MDB is welcome to any user. People can search and refer all metadata in our database
- Data usage restriction
  - If you want to use real data, conform to the data usage rules at each institute, and refer to acknowledgement section in metadata

Access to IUGONET MDB

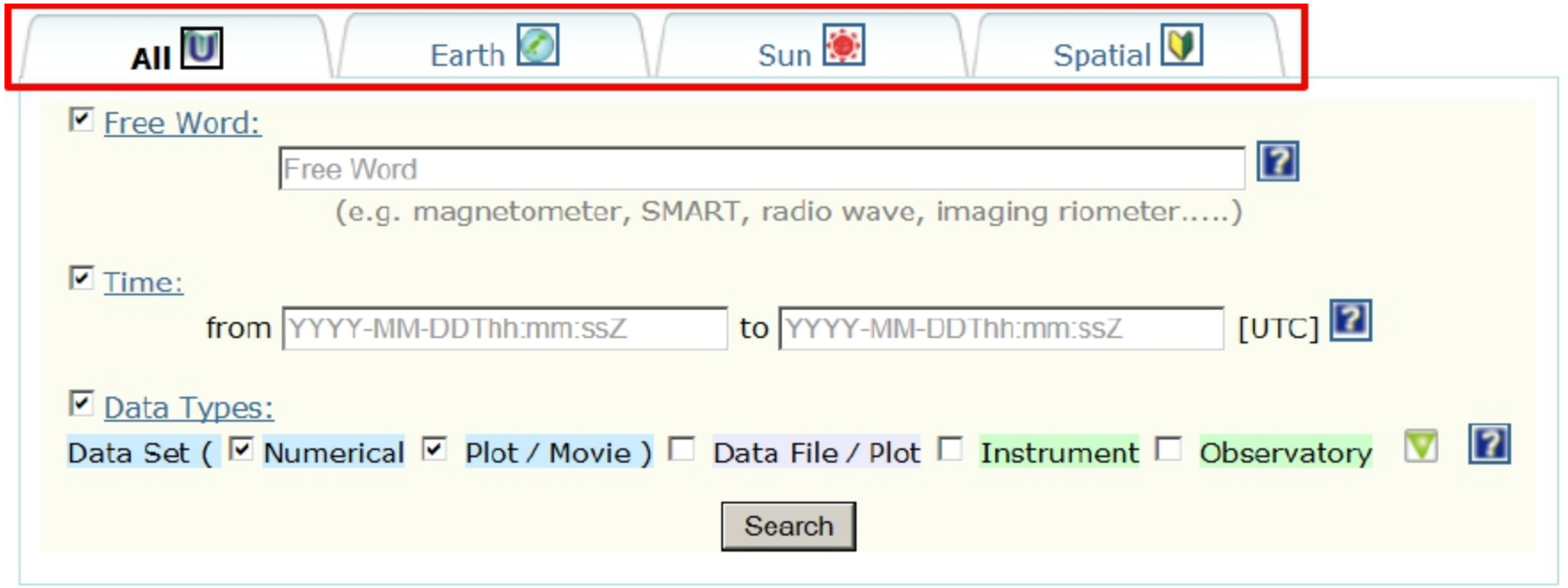
Open your proper web browser, and access

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



Appearance of IUGONET MDB

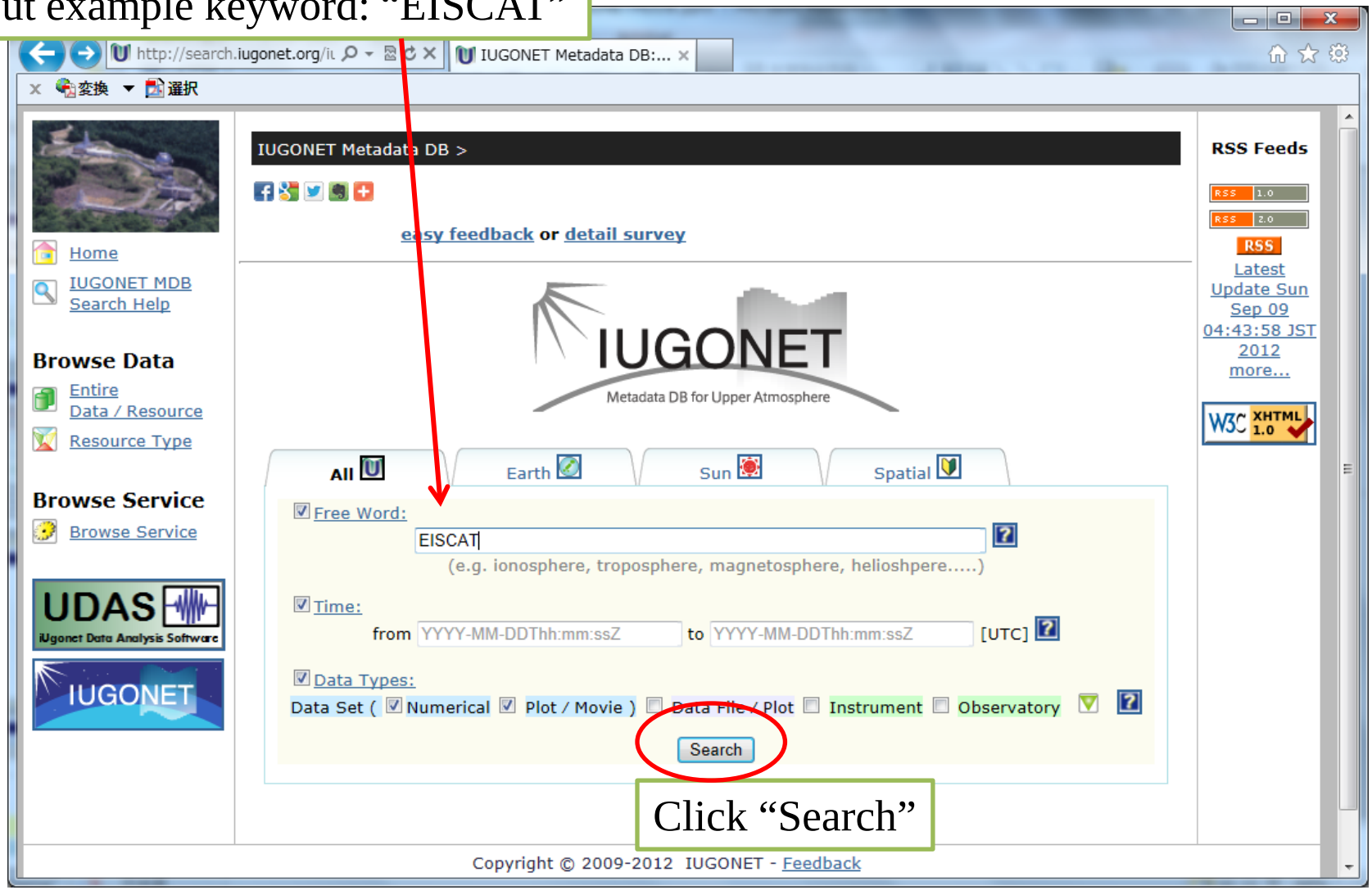
Tabs for a variety of search objectives



All	Simple search for all metadata
Earth	Advanced search for all metadata except solar image metadata
Sun	Advanced search for solar image metadata
Spatial	Visualized spatial search from observation network picture

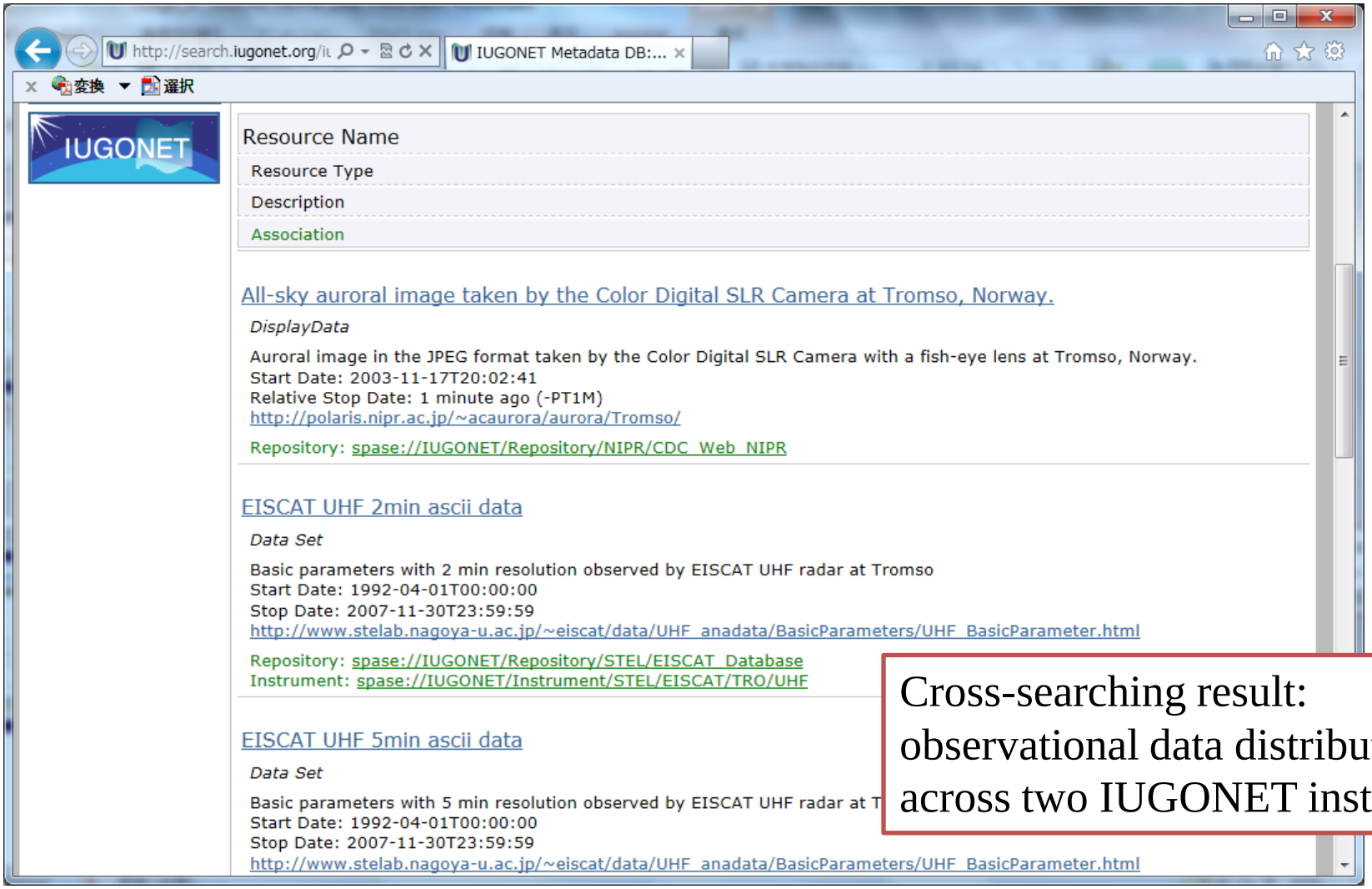
Freeword search

Input example keyword: “EISCAT”



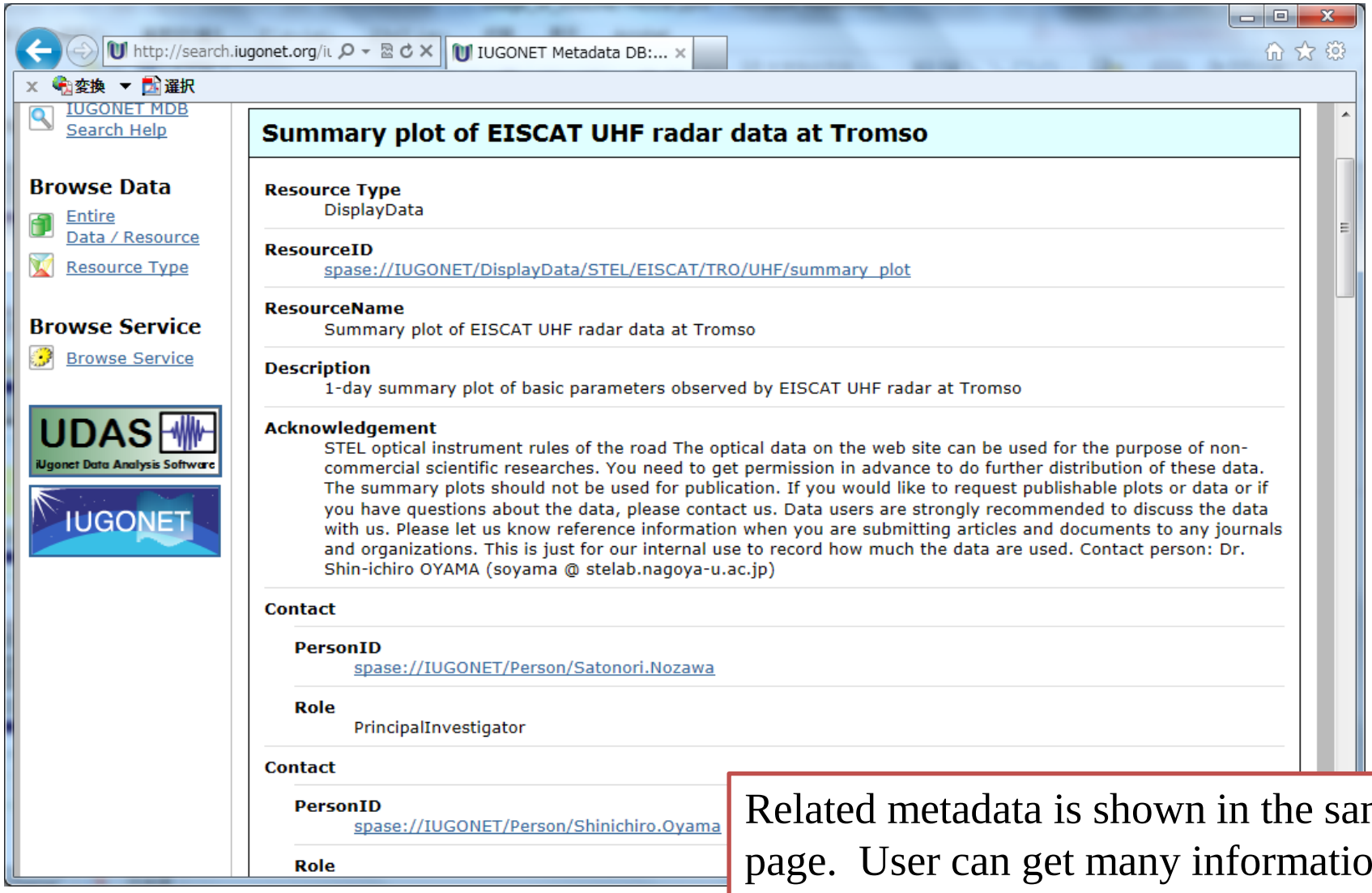
Click “Search”

Search Result (list)



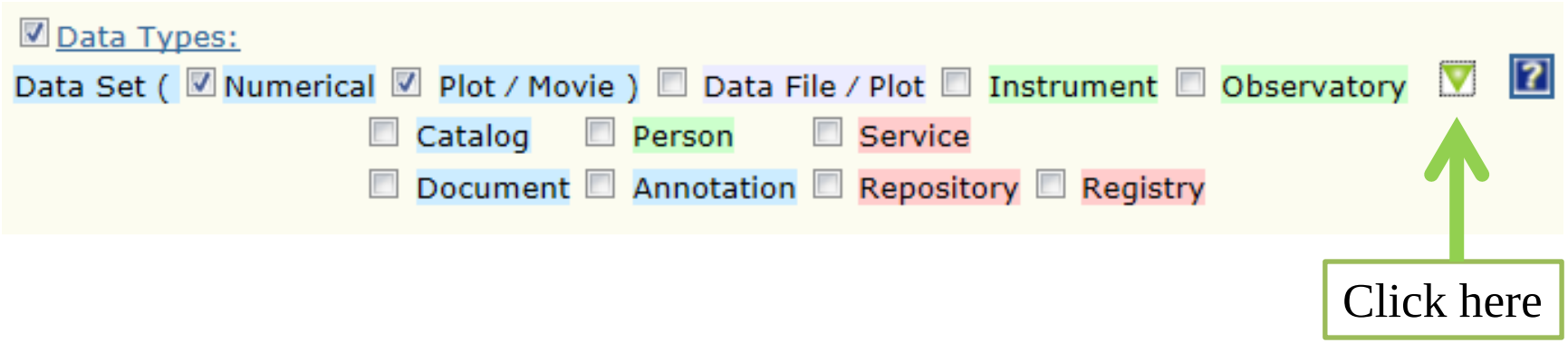
Cross-searching result:
observational data distributed
across two IUGONET institutions

Search Result (detail)



Related metadata is shown in the same page. User can get many information just one query.

What is data type?

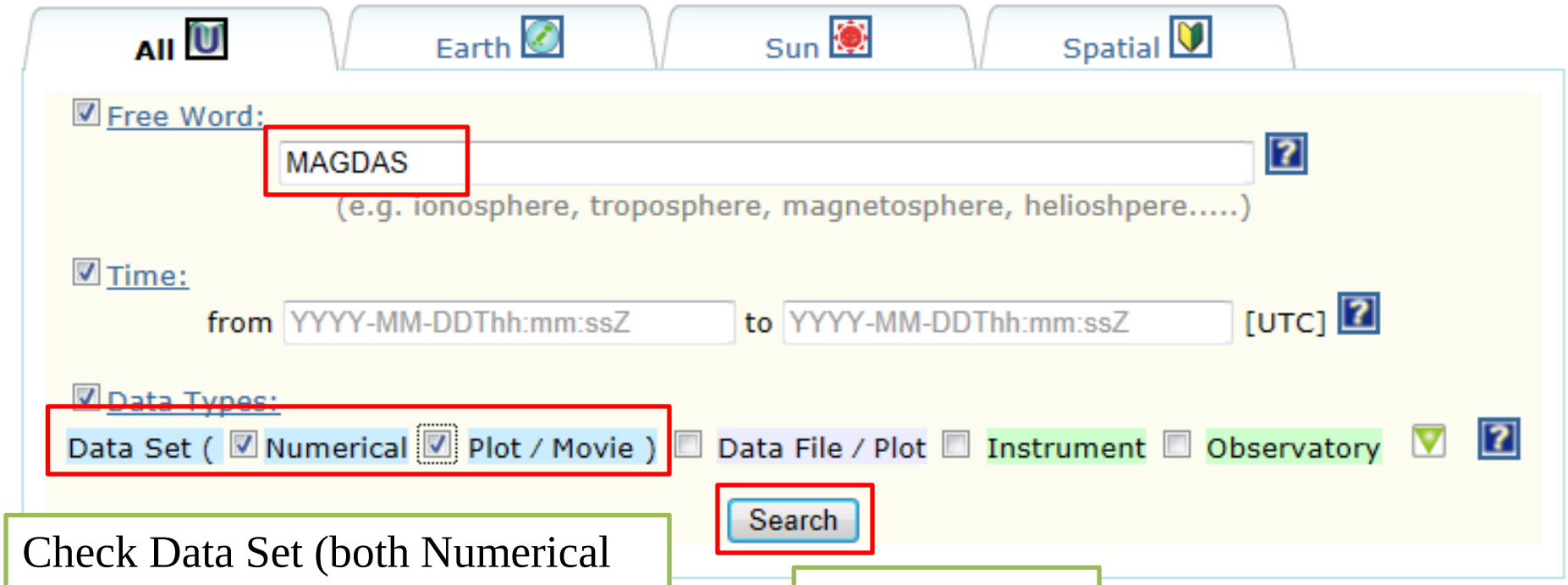


Data type indicates the type of metadata (Another name: Resource Type)

Numerical	Sample or observation values	Person	Information about the person
Plot/Movie	Data products can be images and movies	Service	Locations for functions
DataFile/Plot	individual files	Document	Information about the document
Instrument	Information about the instrument	Annotation	Assessments of a resource
Observatory	Information about the observatory	Repository	Locations for data
Catalog	Event lists	Registry	Locations for metadata

Advanced Search: Data Set

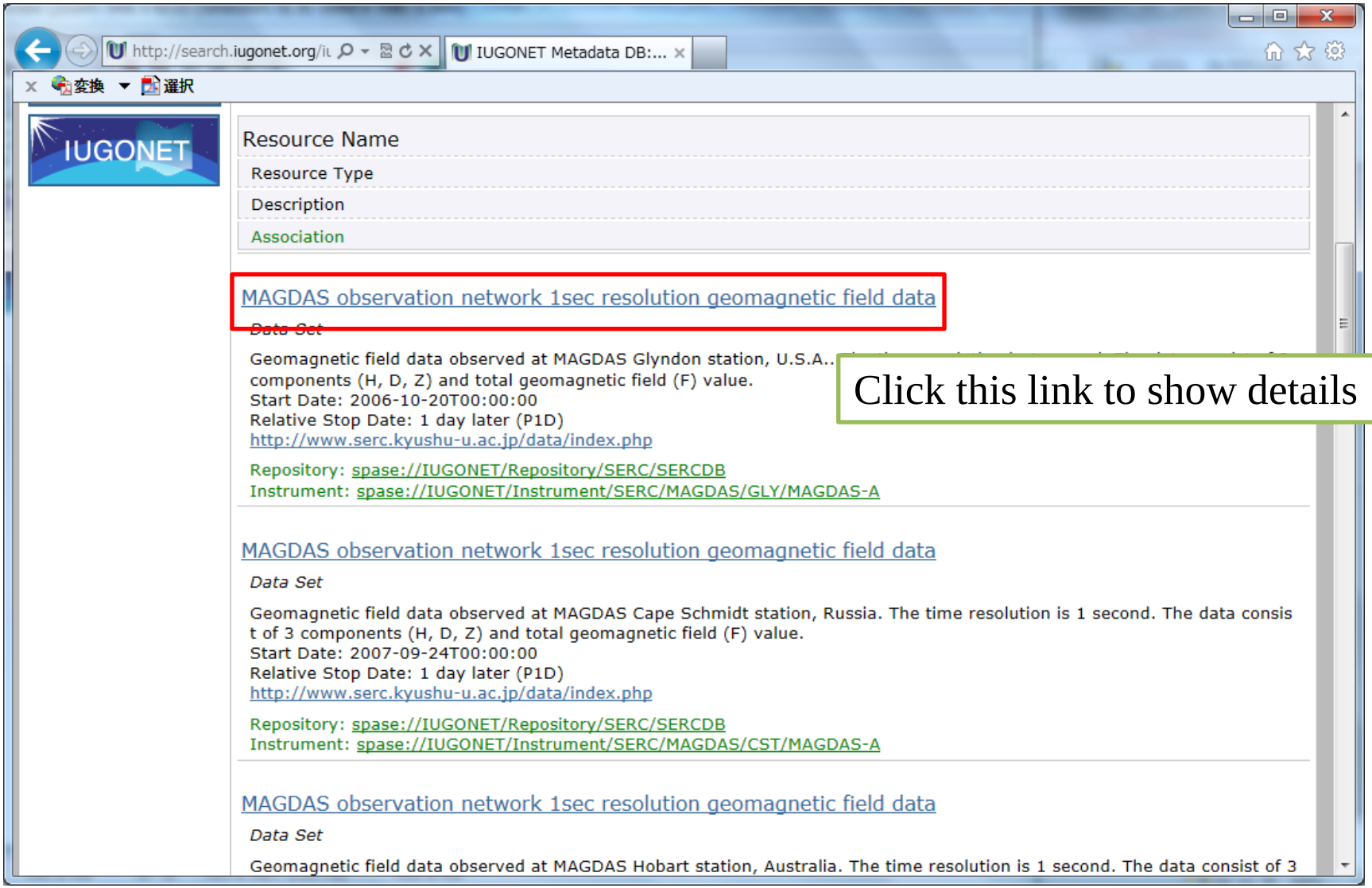
Input keyword: “MAGDAS”



Check Data Set (both Numerical and Plot/Movie)

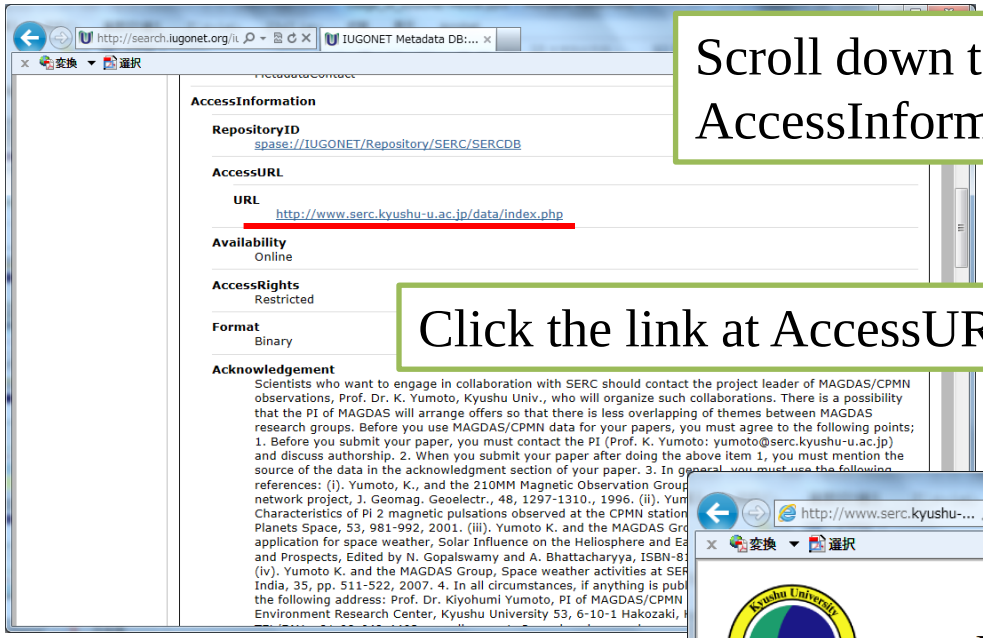
Click “Search”

Advanced Search Result: Data Set



Click this link to show details

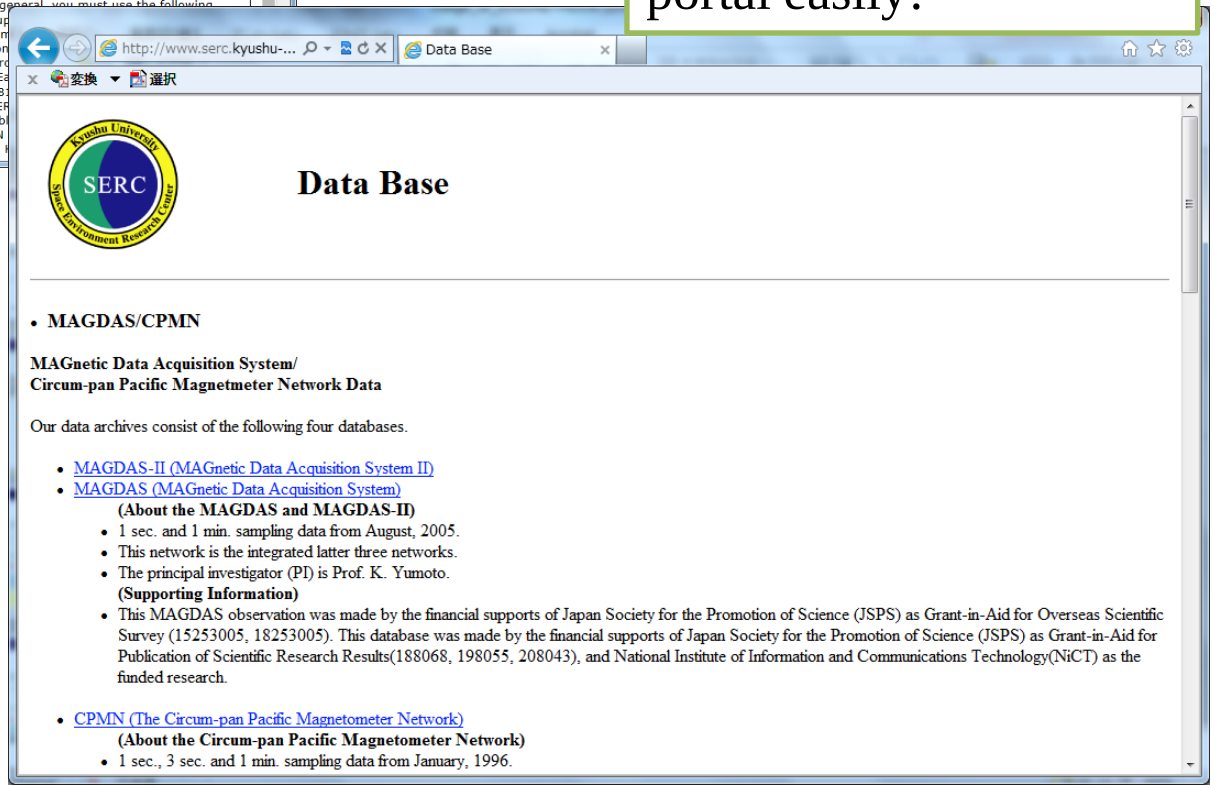
Advanced Search Result: Data Set



Scroll down to AccessInformation

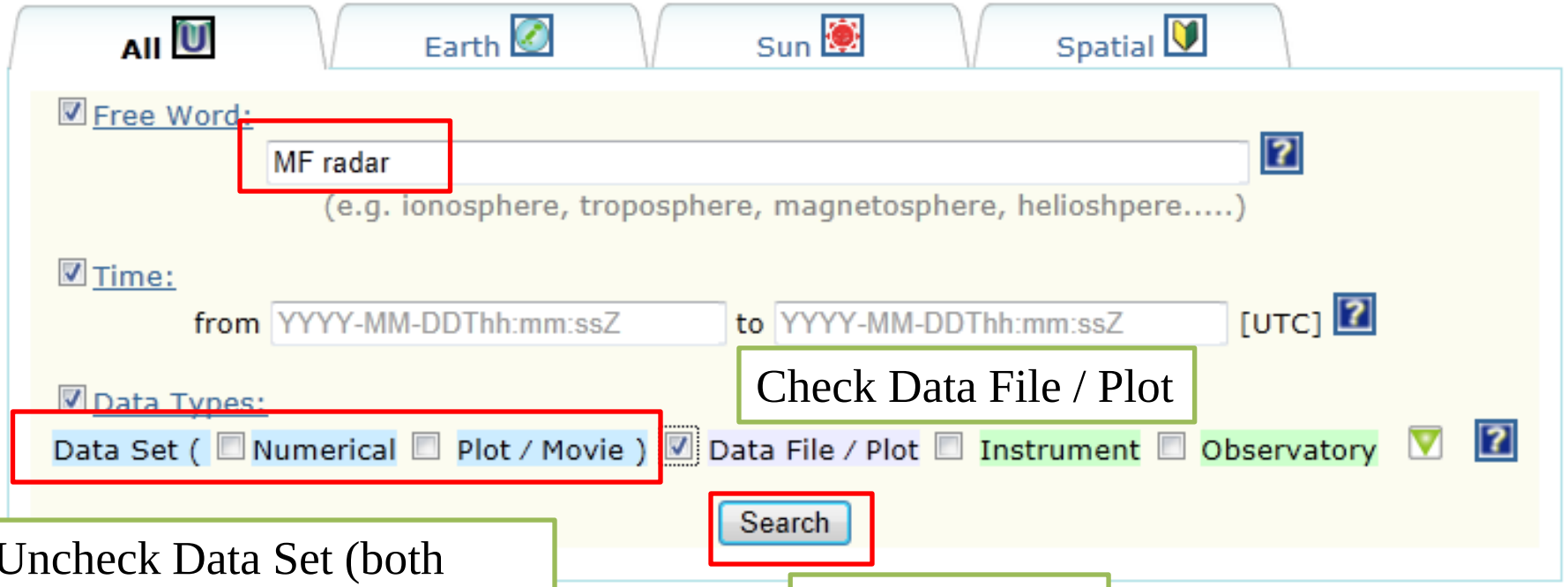
Click the link at AccessURL

You can access MAGDAS data website portal easily!



Advanced Search: Data File

Input keyword: “MF radar”



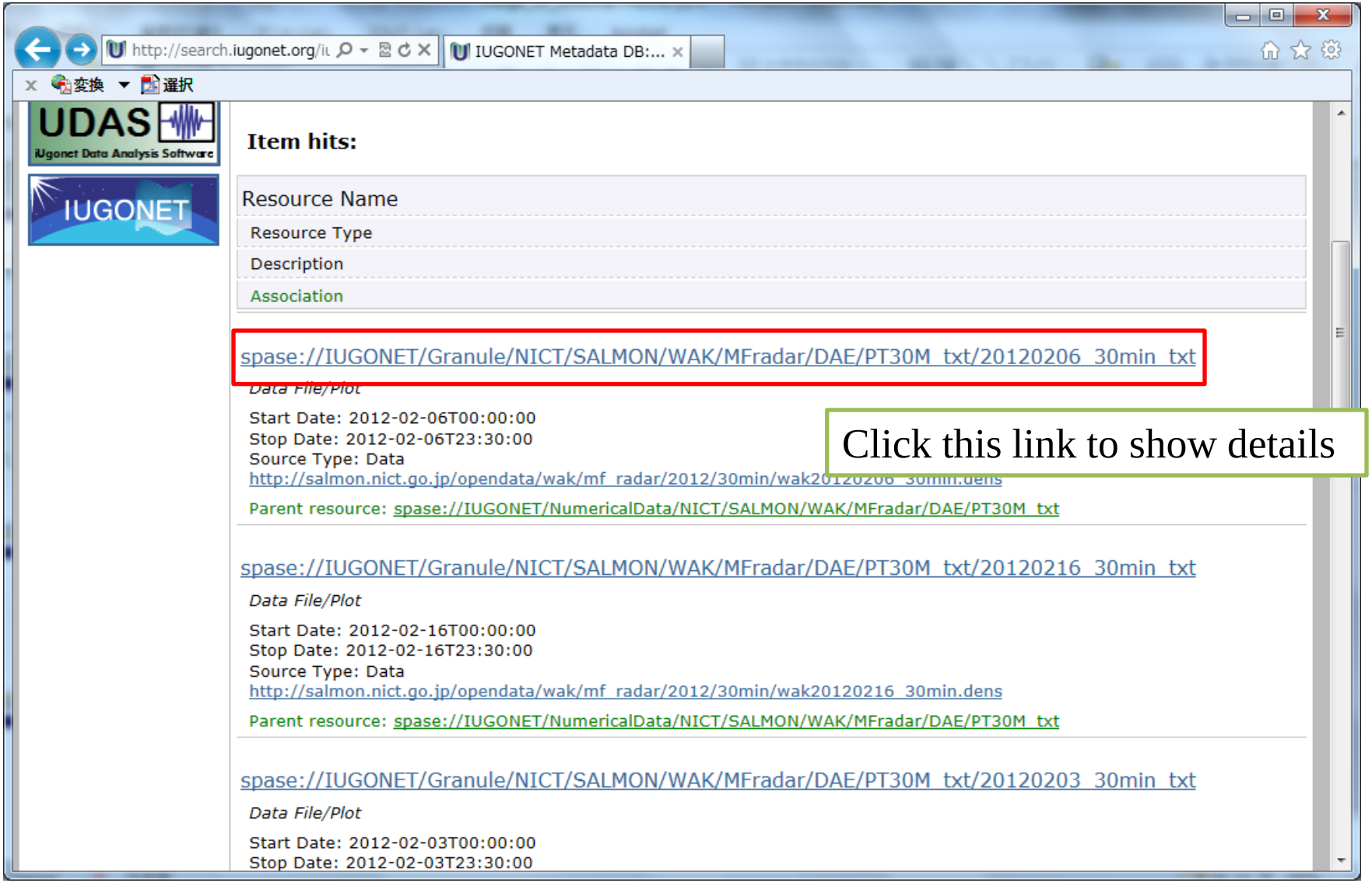
Check Data File / Plot

Uncheck Data Set (both Numerical and Plot/Movie)

Click “Search”

Advanced Search Result: Data File

We got 85210 search results

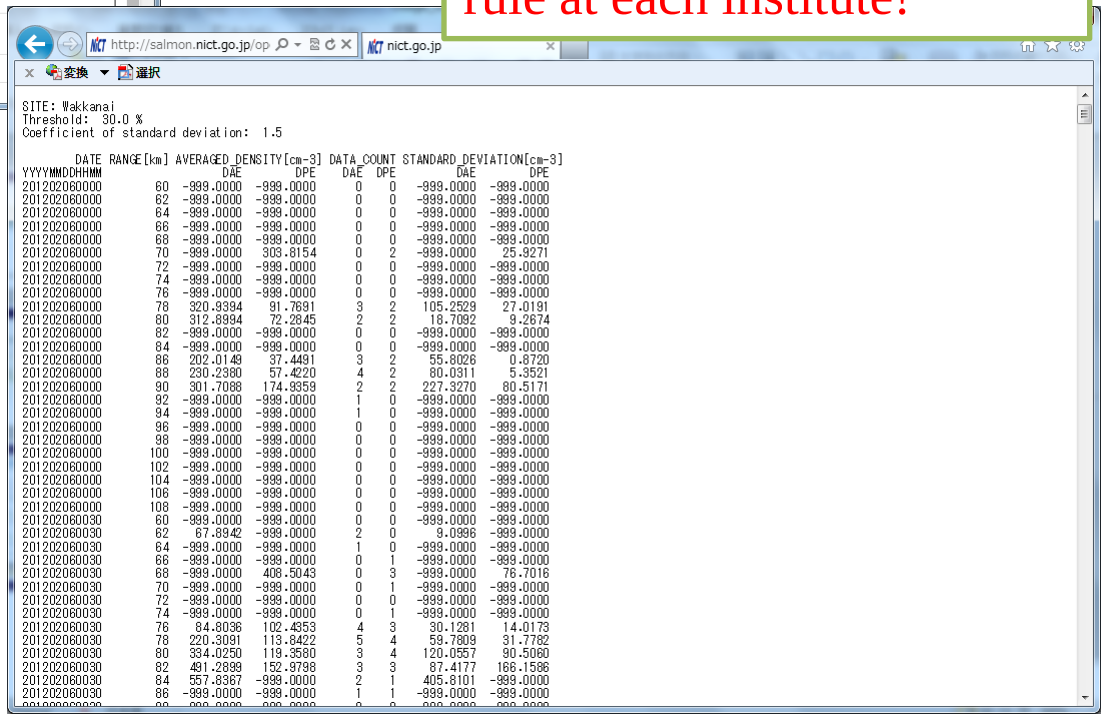


Click this link to show details

Advanced Search Result: Data File

Scroll down to Source

Click the URL



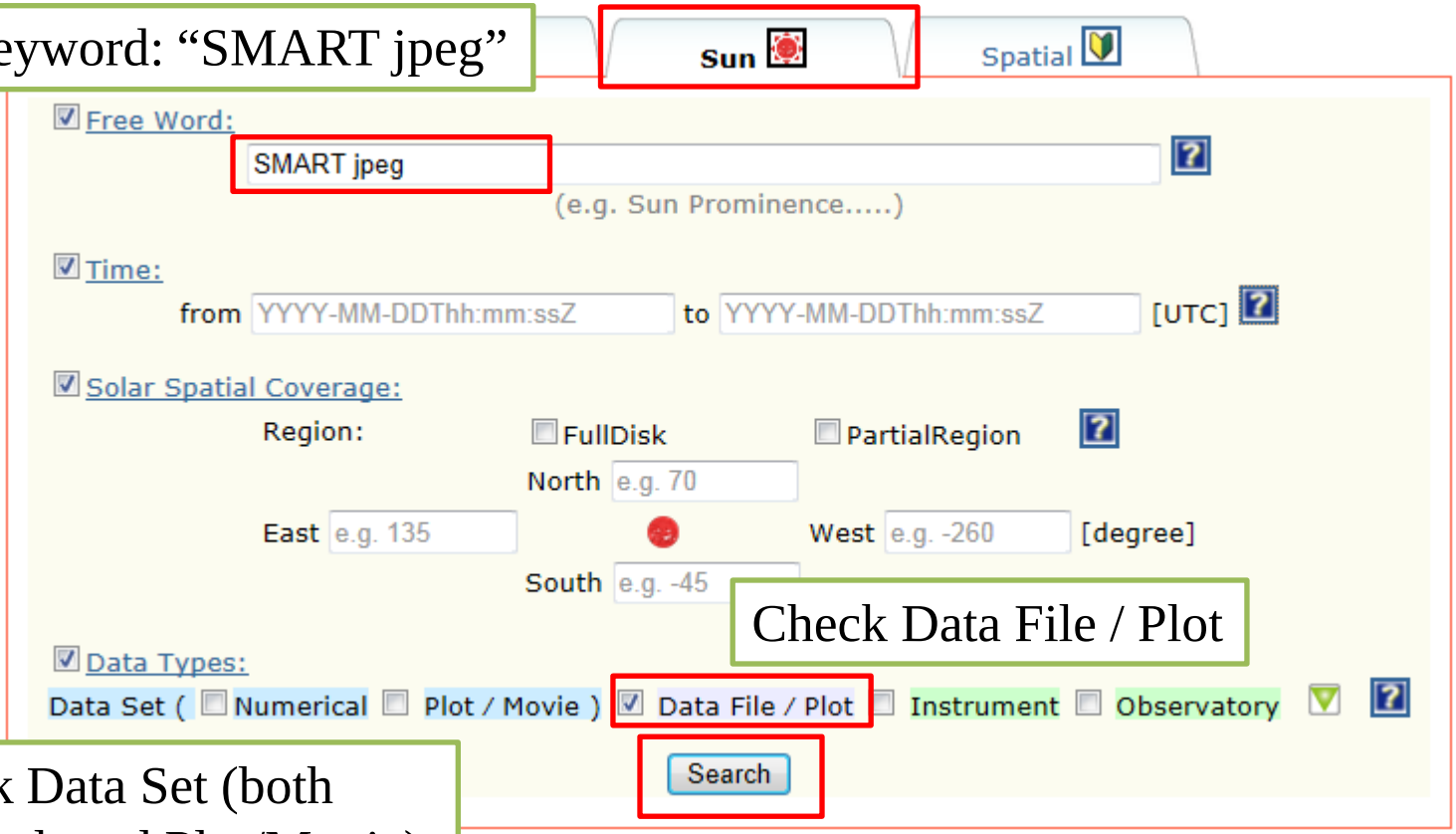
You can access the numerical data.

Note: Respect data usage rule at each institute!

Advanced Search: Solar Image

Select tab: “SUN”

Input keyword: “SMART jpeg”



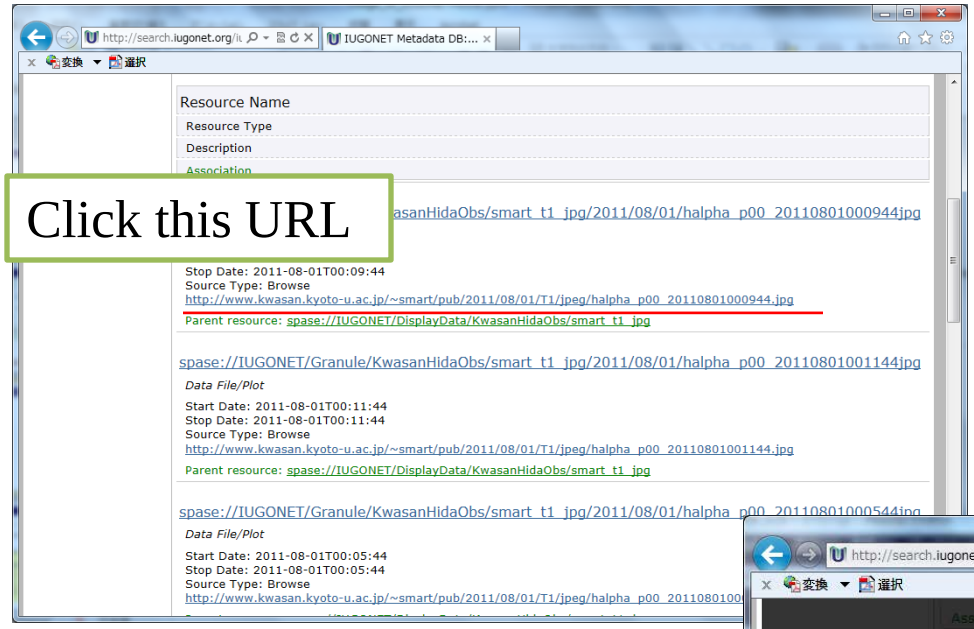
Check Data File / Plot

Uncheck Data Set (both Numerical and Plot/Movie)

Click “Search”

In this example, we use keyword “jpeg” to see solar image on the web browser.

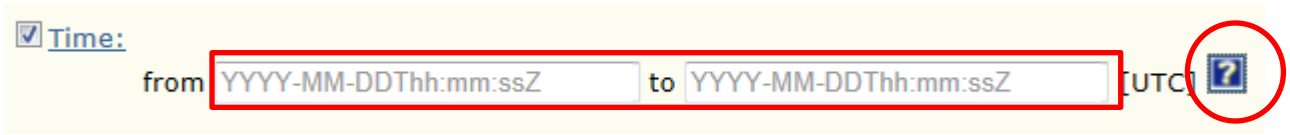
Advanced Search Result: Solar Image

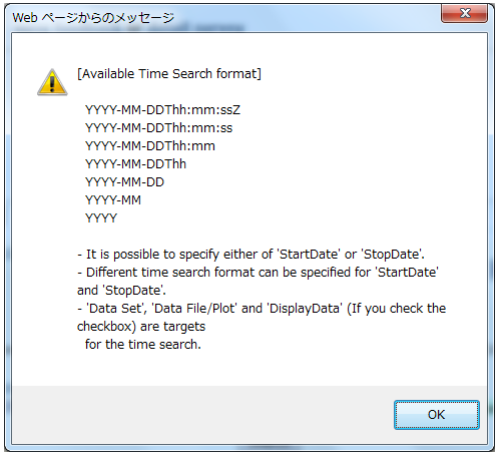


Click this URL

Seamless browsing in IUGONET MDB

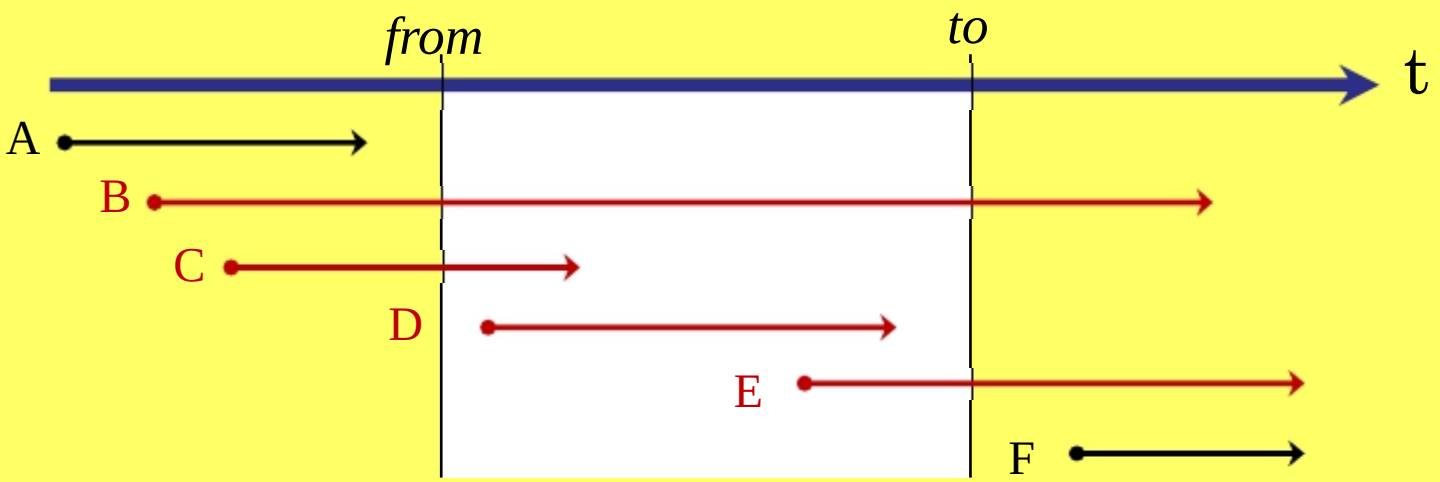
Advanced Search: Time Range





Input start date (from) and end date (to) which you interest in. To show the date format , please click icon [?].

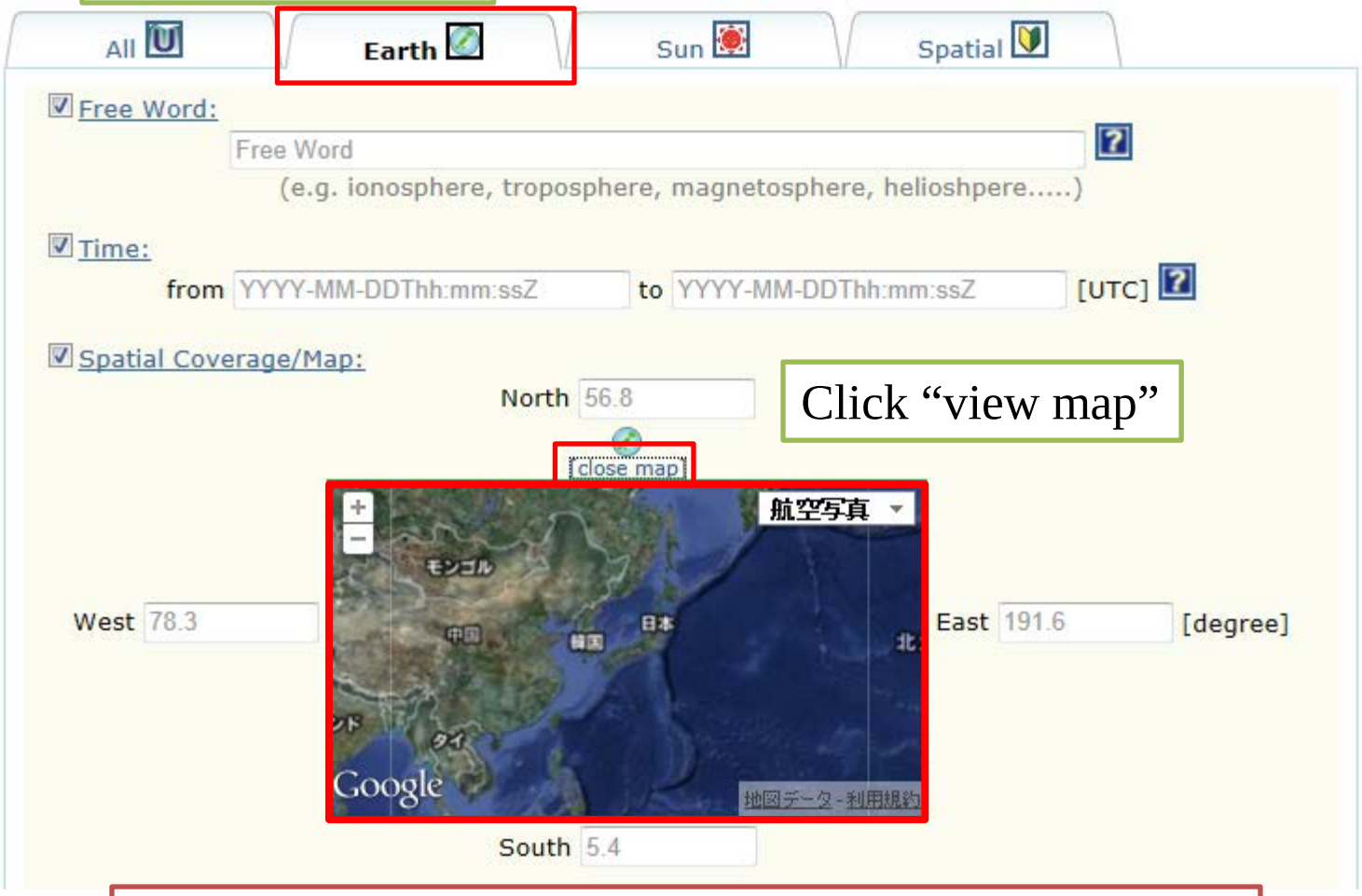
Relationship between metadata start/end date and search scope



In this case, IUGONET MDB search metadata B,C,D, and E

Advanced Search: Spatial Search using GoogleMap

Select tab: “Earth”

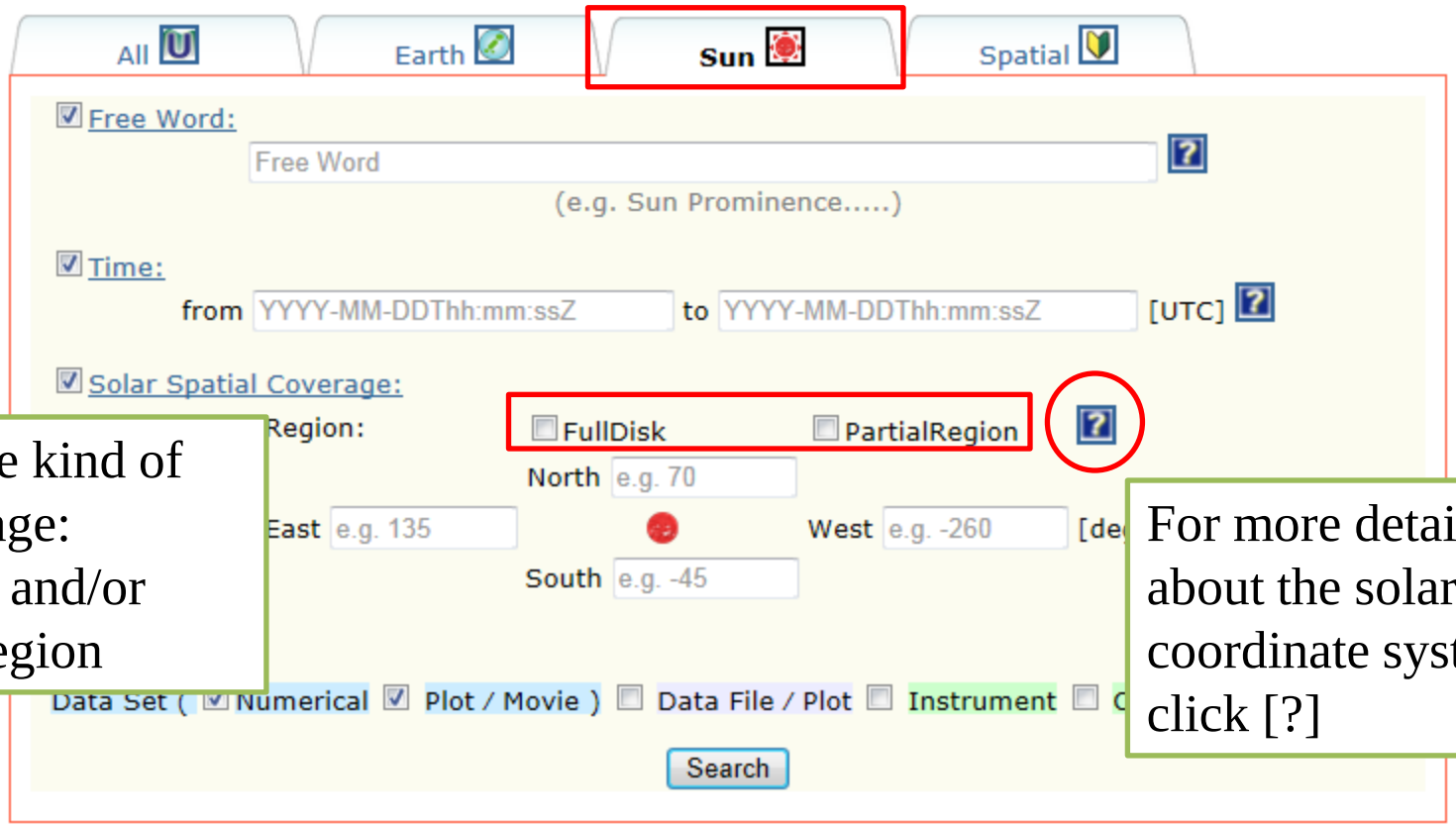


Click “view map”

Visualized spatial coverage search via GoogleMap API

Advanced Search: Spatial Search (SUN)

Select tab: “Sun”

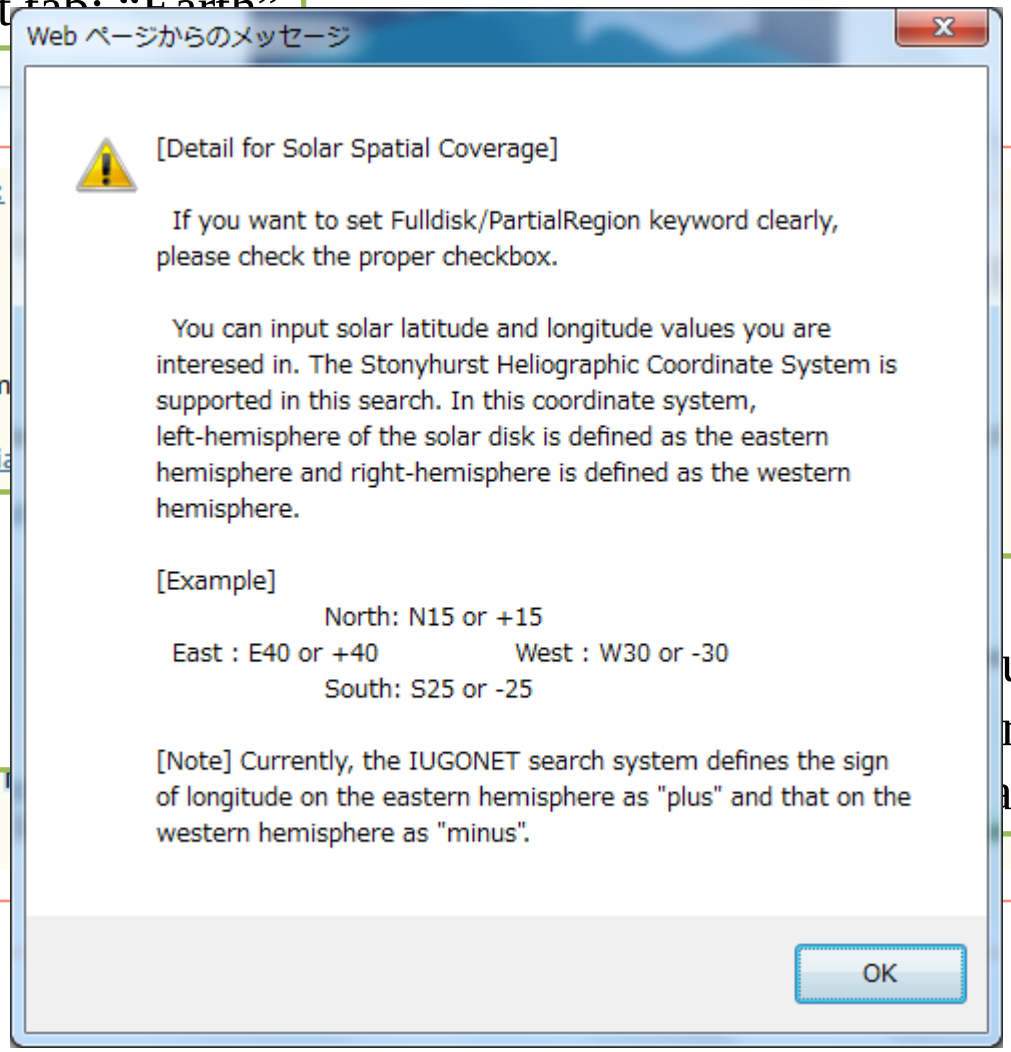


Select the kind of solar image: FullDisk and/or PartialRegion

For more detail about the solar coordinate system, click [?]

Advanced Search: Spatial Search (SUN)

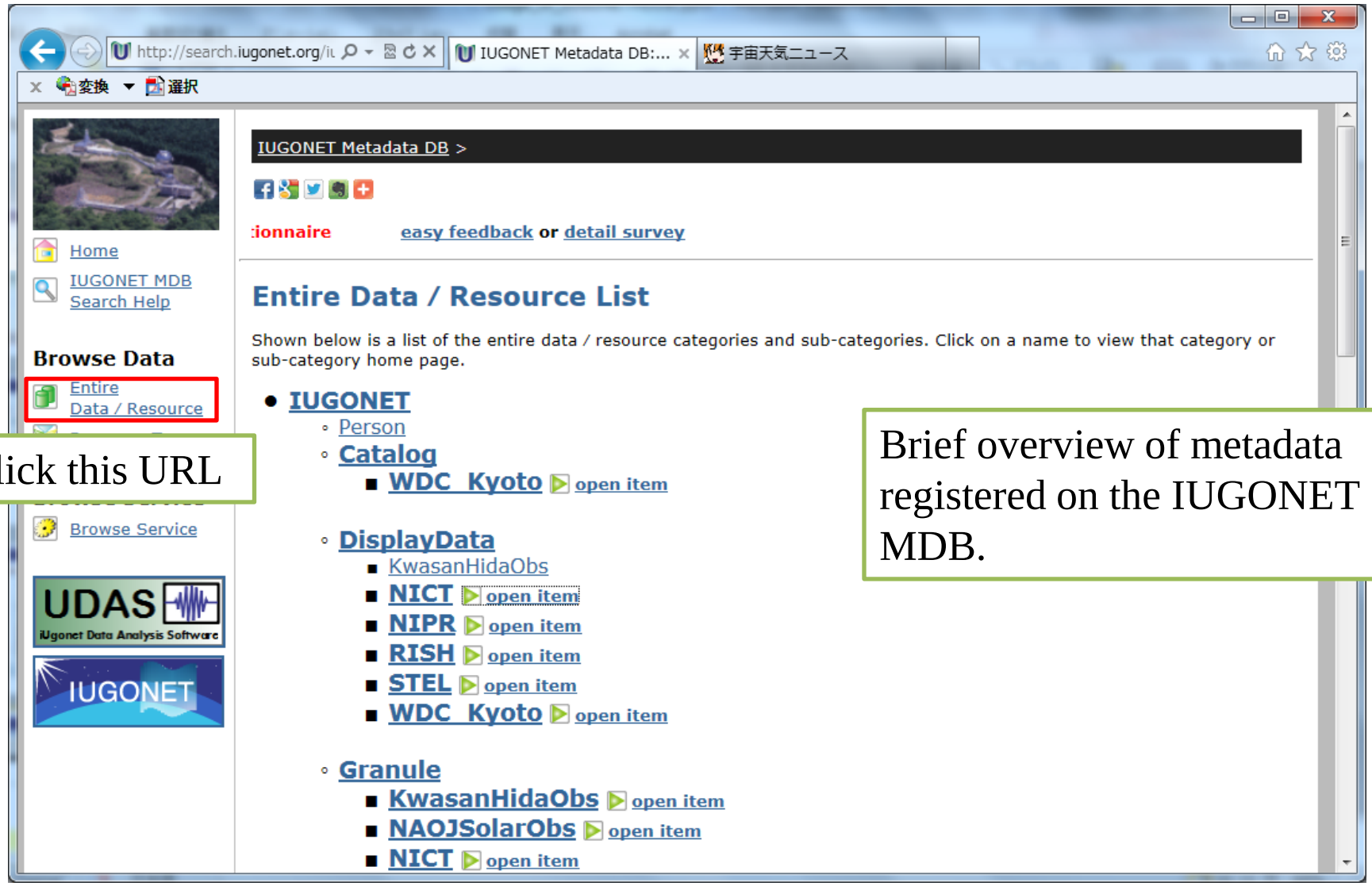
Select tab: "Earth"



You can select the kind of solar image: FullDisk and/or PartialRegion

more detail
ut solar
rdinate system,
ase click [?]

Advanced Search: Entire Data / Resource List

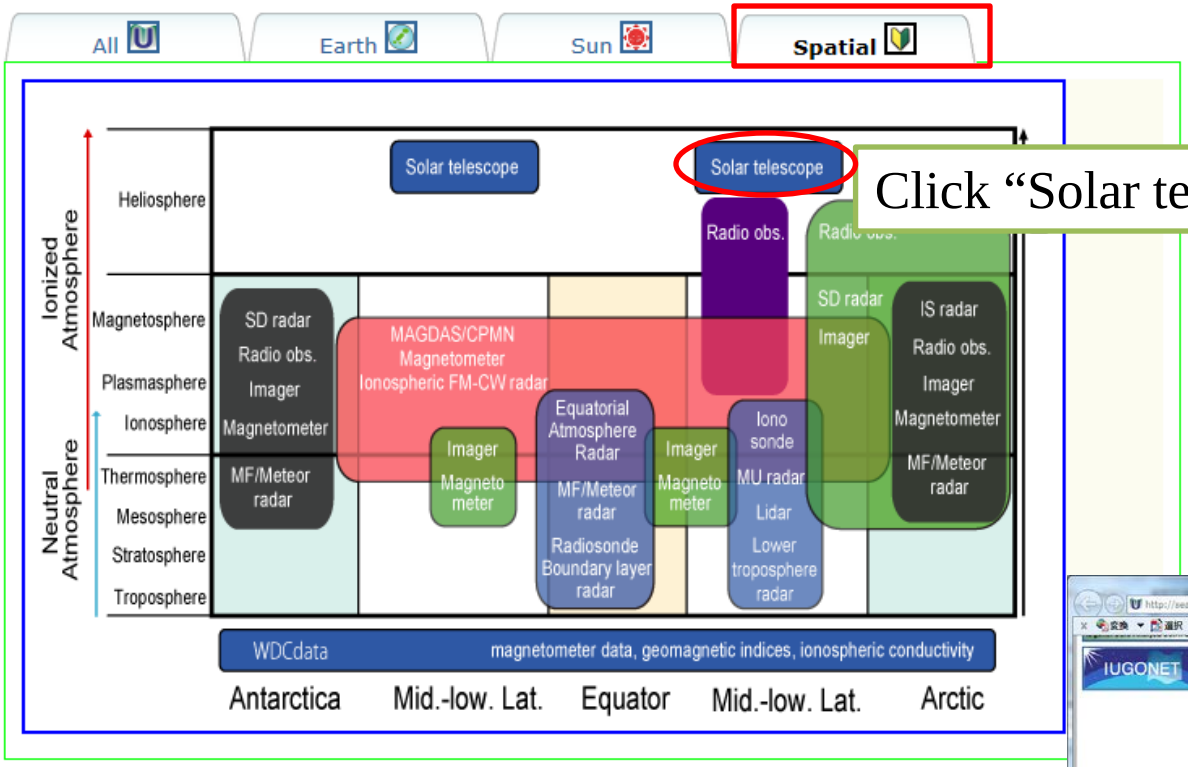


Click this URL

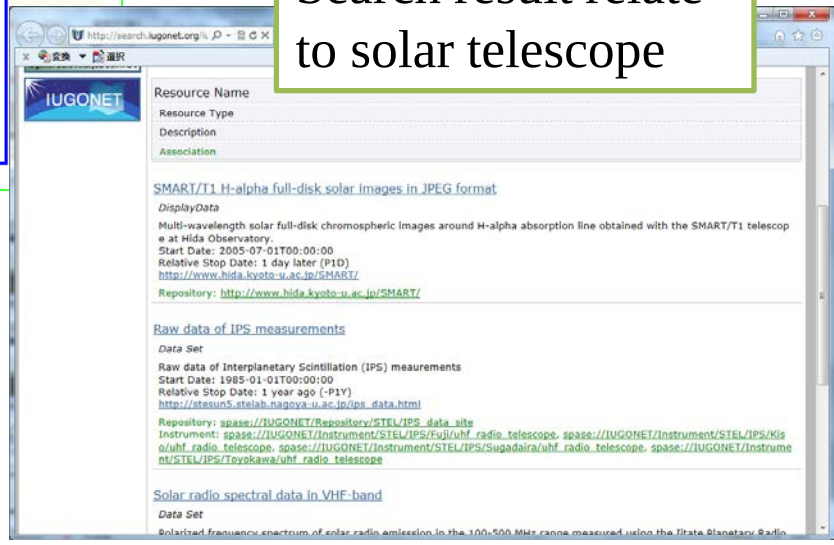
Brief overview of metadata registered on the IUGONET MDB.

Advanced Search: Visualized Spatial Search

Select tab: “Spatial”



Click “Solar telescope”



Search result relate to solar telescope

Help movie

Home

IUGONET MDB Search Help

Click this URL

Entire Data / Resource

Resource Type

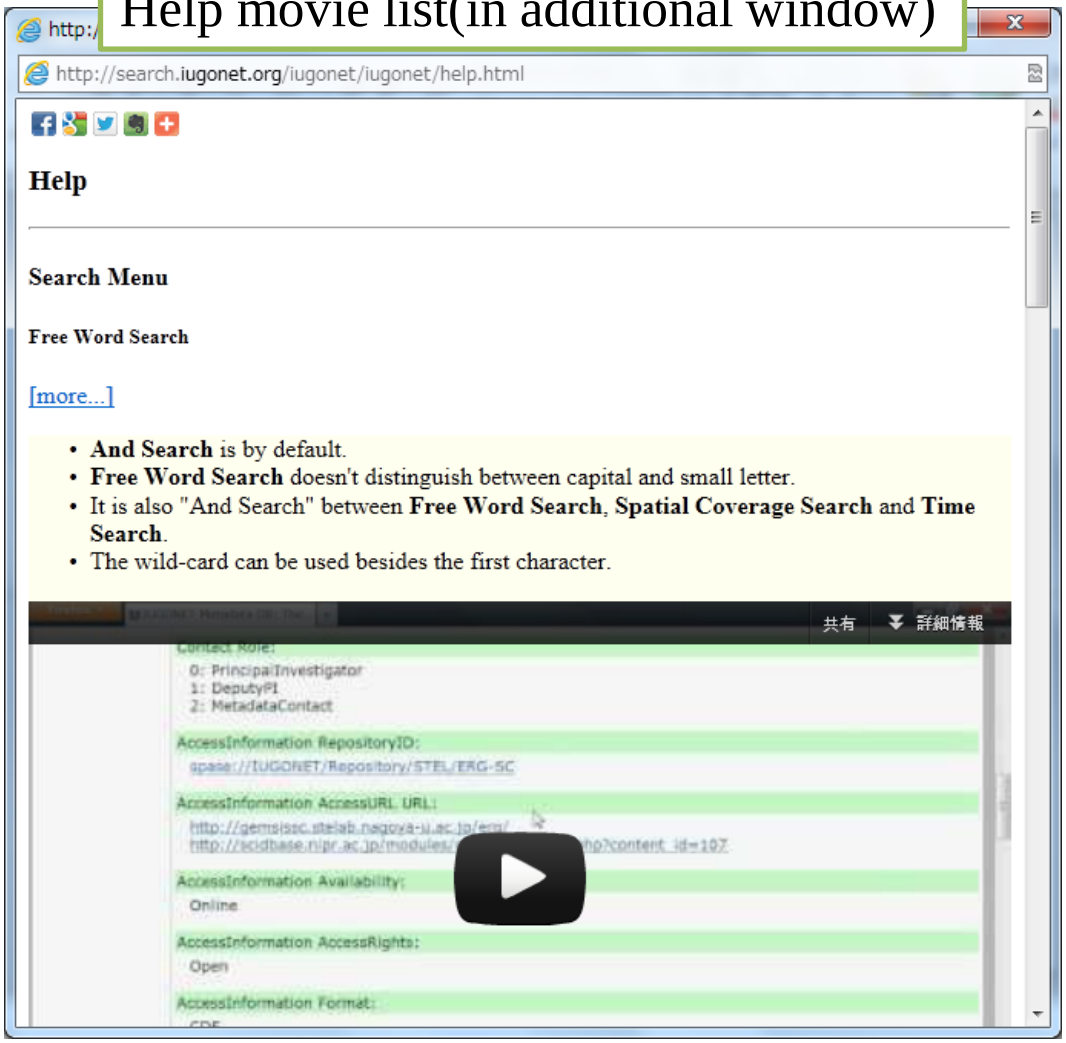
Browse Service

Browse Service

UDAS iUgonet Data Analysis Software

IUGONET

Help movie list(in additional window)



Search Tips for the IUGONET MDB

Method	Example	Explanation
Search for all word(default)	magnetogram kyoto or magnetogram AND kyoto	Include space or AND (capitalized) between the words
Search for either word	magnetogram OR kyoto	Include OR (capitalized) between the words
Combination	EISCAT (NIPR OR STEL) EISCAT AND (NIPR OR STEL)	Put a phrase in parentheses
exact word or phrase	“magnetogram”	Use quotes to search for an exact word or set of words in a specific order
Exclude a word	STEL-EISCAT	Add a dash (-) before a word

Every resource has a unique identifier (ResourceID) so that it can be tracked and referenced within a system.

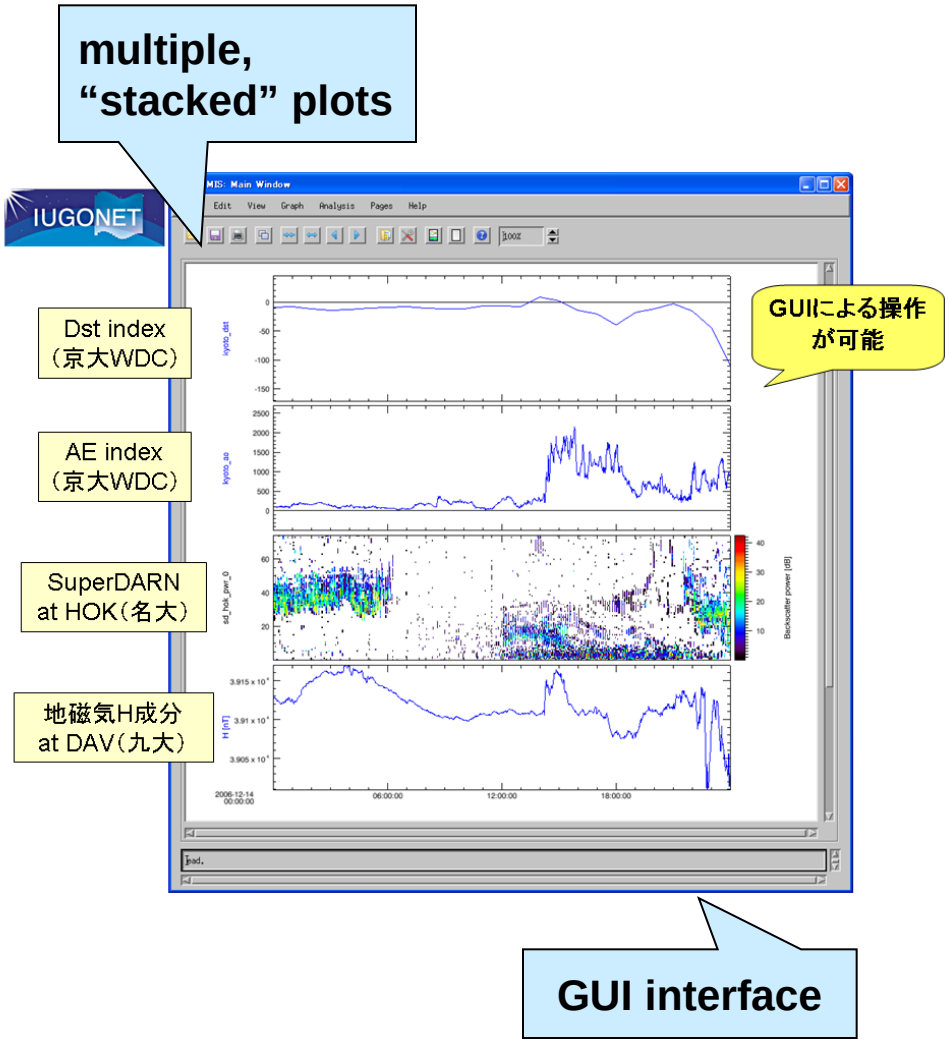
Method	Example and explanation
Unique search	ResourceID:spase¥://IUGONET/Granule/STEL/Induction/ATH/induction/64hz_ergsc_cdf/stel_induction_ath_2010032623_cdf
（explanation）	Include “ResourceID:” before ResourceID. In this case, apply an escape sequence to spase://. Use backslash (spase¥://).
Tree search	ResourceID:spase¥://IUGONET/Granule/STEL/Induction/ATH/induction
（explanation）	View all metadata including this ResourceID

Project Timeline

Task	Y2009	Y2010	Y2011	Y2012	Y2013	Y2014	Detail
Virtual information center (VIC) of UA studies	System installation	Normal operation		System update			Construct the integrated research environment (TV-conference system, ..)
Development of metadata DB system	Prototype system devel.	Regular system devel.	Open to public				Design and develop the metadata DB system
Design the Metadata format standards	Ver.1 format	Update & document					Release the format ver.1 and keep updating if necessary
Development of data analysis software	Specifications and basic design	Programming	Open to public				Develop and release analysis softwares for UA data
Maintenance&extension of existing DBs of Observation data		Maintenance of obs. DBs & exam. of non-digital dataset		Effort focused on old data from Y2012 on			Incorporate non-DB'd data into the DBs
Metadata generation		Collecting metdata from each obs. DB		Effort focused on old data from Y2012 on			Generate metadata in the designated format and add to metadata DB
Operation of metadata DB							Release the metadata DB for community
VIC extension to related fields							Wrap up the project and discuss further extension

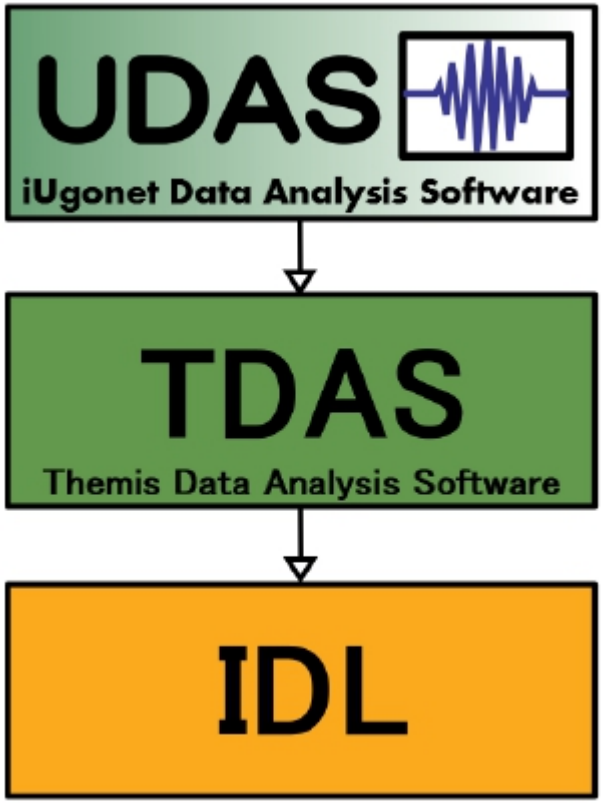
Development of analysis software

- **Development of analysis and quick-look software for our observation data is on progress, in collaboration with the ERG Science Center.**
- **The software is produced with the THEMIS science Data Analysis (TDAS) IDL libraries and is functioned on the free IDL Virtual Machine.**
- **We discussed with TDAS team about our plug-in software package including GUI many times.**



What is UDAS?

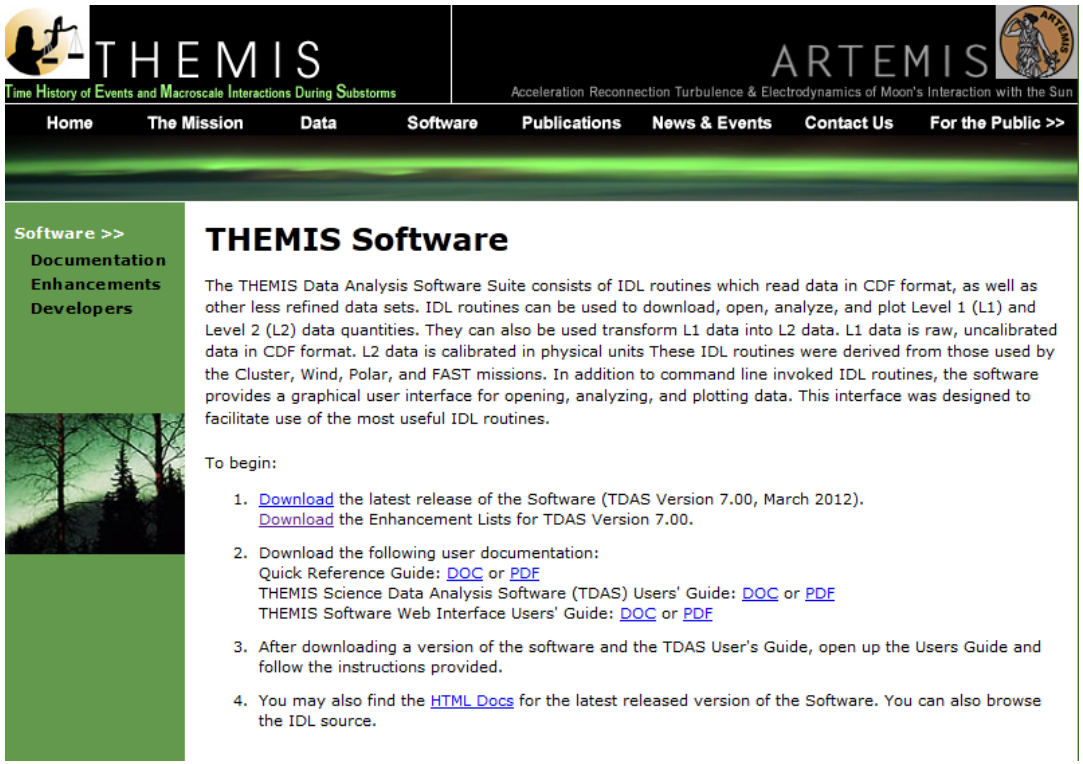
- The IUGONET Data Analysis Software (UDAS) is the plug-in software for THEMIS Data Analysis Software suite (TDAS)
- The IUGONET data (e.g., geomagnetic data, aurora data, radar data, and so forth), sattelite data (THEMIS, GOES, WIND, and ACE) can be handled.
- It is possible to use many routines to visualize and analyze time series data.
- It accesses the IUGONET data through the Internet, and then the data are automatically downloaded onto the user's computer



Relationship between UDAS, TDAS, IDL

TDAS（THEMIS Data Analysis Software suite）

- ✓Developer
  - UCB, UCLA
- ✓Language
  - IDL
- ✓Data format
  - CDF



http://themis.ssl.berkeley.edu/software.shtml

UDAS Website

UDAS website： http://www.iugonet.org/en/software.html

IUGONET

Inter-university Upper atmosphere
Global Observation NETwork

Google™ Custom Search

Analysis Soft. Metadata DB Project 日本語

いいね！ 送信 「いいね！」と言っている友達はまだいません。

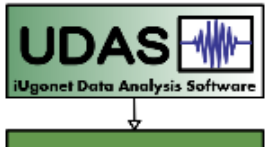
UDAS (IUGONET Data Analysis Software)

Topics

- UDAS v2.00.1 was released. (Apr 19, 2012)

What is UDAS?

The IUGONET Data Analysis Software (UDAS) is the plug-in software for THEMIS Data Analysis Software suite (TDAS).



- The IUGONET data (e.g., geomagnetic data, aurora data, radar data, and so forth), sattelite data

UDAS Load Procedure v2.00.1

http://www.iugonet.org/en/software/loadprocedures.html

RadioTelescope

<Heliosphere>

UDAS load procedures			
iug_load_iprt	Solar HF radio spectrum	Tohoku Univ.	

Radar

<Magnetosphere, ionosphere and atmosphere>

UDAS load procedures	Observations data	Institutes	Photos/Movies/Docs
iug_load_blr_rish	Boundary layer radar	RISH, Kyoto Univ.	
iug_load_ltr_rish	L-band Lower Troposphere radar	RISH, Kyoto Univ.	
iug_load_ear	Equatorial atmosphere radar	RISH, Kyoto Univ.	
iug_load_mu	MU radar	RISH, Kyoto Univ.	
iug_load_meteor_rish	Meteor radar	RISH, Kyoto Univ.	
iug_load_mf_rish	MF radar	RISH, Kyoto Univ.	
iug_load_wpr_rish	Wind Profiler radar	RISH, Kyoto Univ.	
erg_load_sdfit	SuperDARN radar	NIPR; Nagoya Univ.; NICT	
erg_load_eiscat	EISCAT radar	NIPR; Nagoya Univ.	

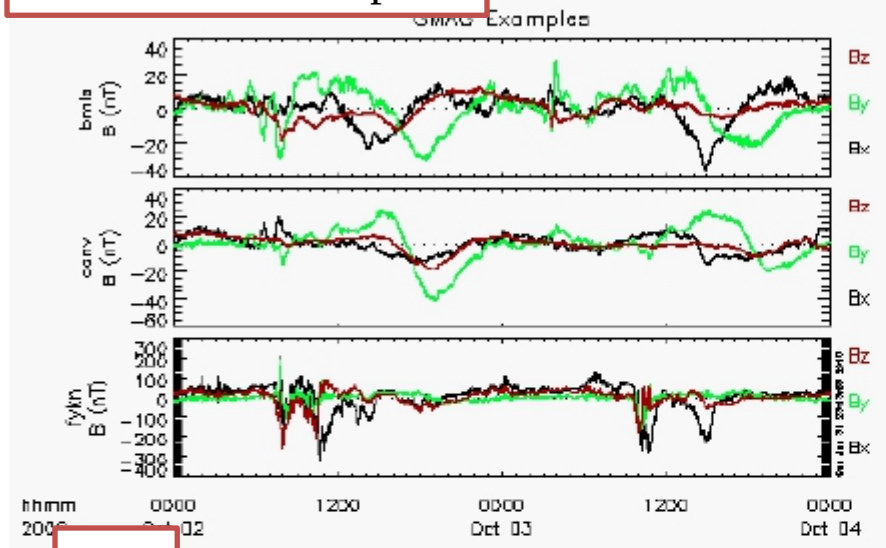
Geomag

<Geomagnetism and its activities>

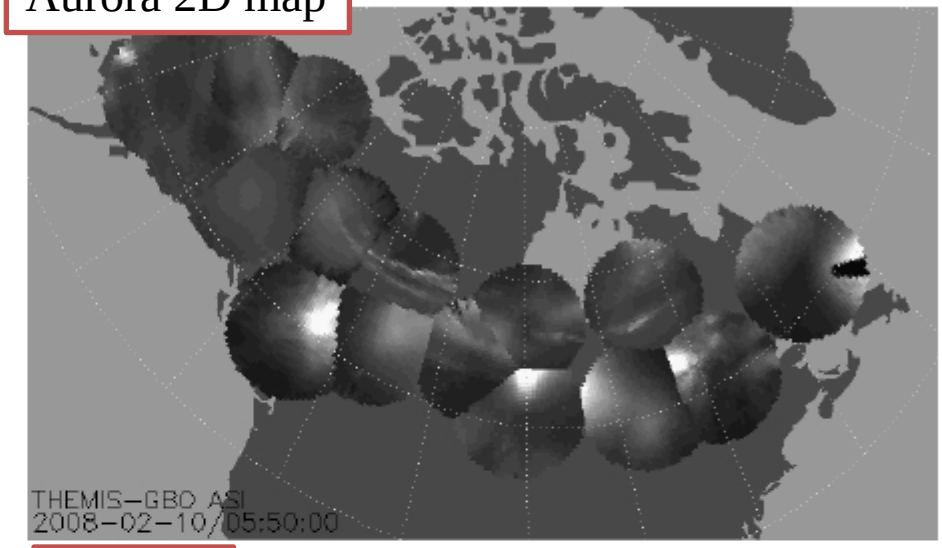
UDAS load procedures	Observations data	Institutes	Photos/Movies/Docs
iug_load_gmag_wdc	AE, Dst, ASY/SYM indices, Geomagnetic Field Data at the Observatories (hourly values, 1 minute values)	WDC, Kyoto Univ.	
erg_load_gmag_nipr (iug_load_gmag_nipr)	Geomagnetic Field Data at Syowa and Iceland stations	NIPR	
erg_load_gmag_mm210 (iug_load_gmag_mm210)	210-degree Magnetic Meridian magnetometer network	Nagoya Univ.; Kyushu Univ.	
iug_load_gmag_serc	MAGDAS ground magnetometer	Kyushu Univ.	

Example of visualization by using TDAS

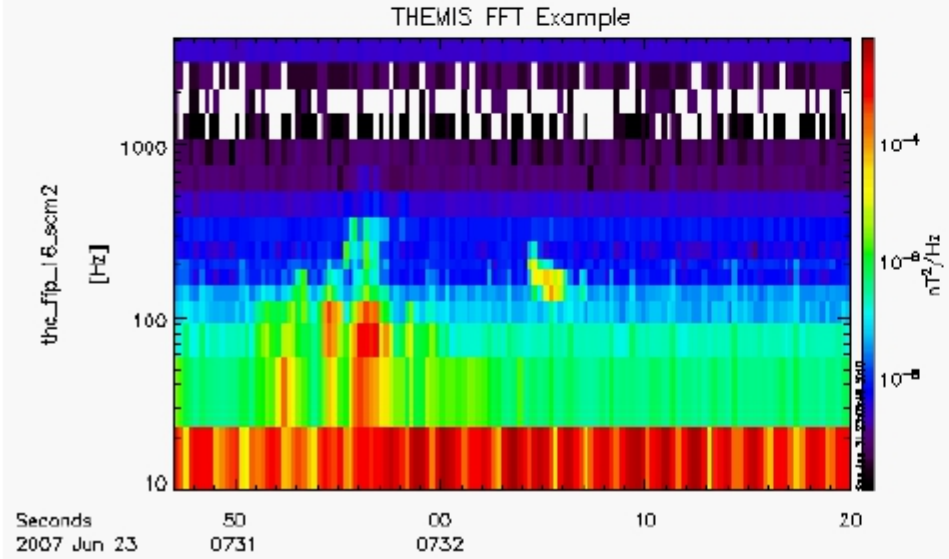
Time series stack plot



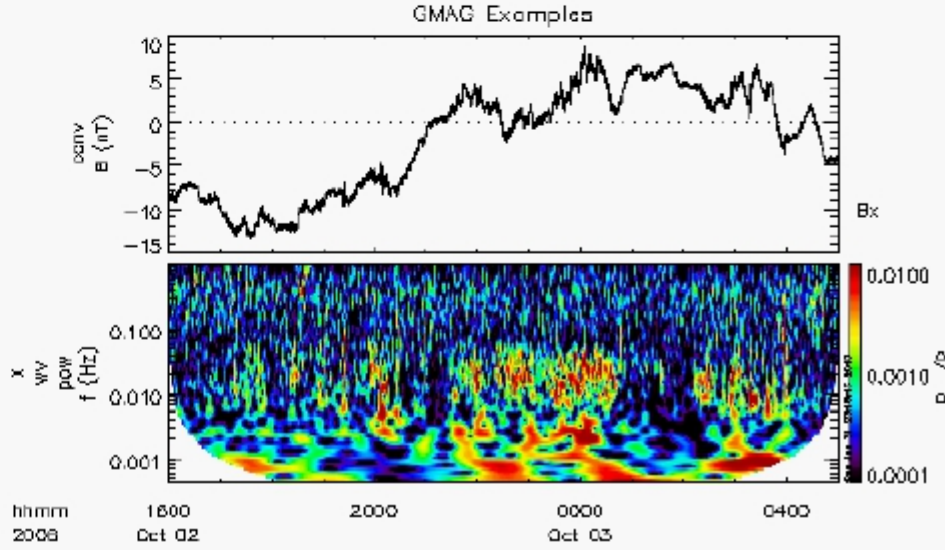
Aurora 2D map



FFT

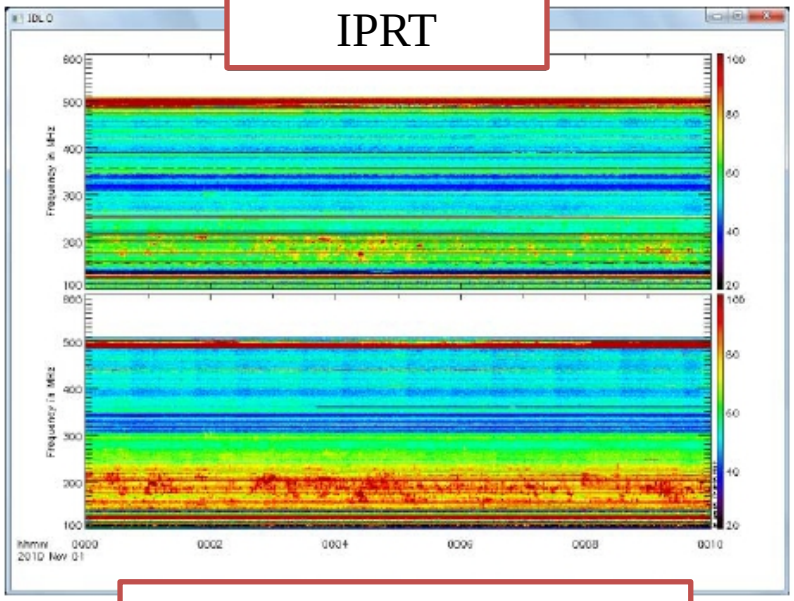


Wavelet

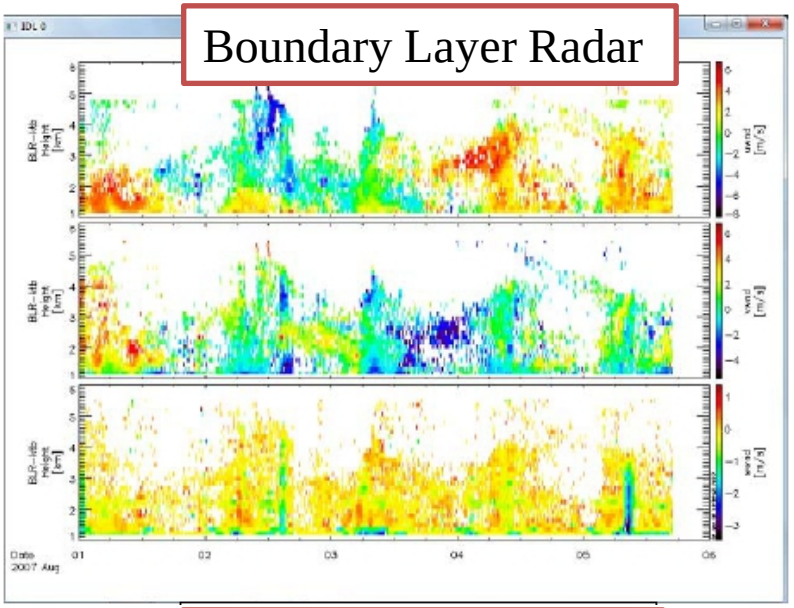


Example of visualization by using UDAS

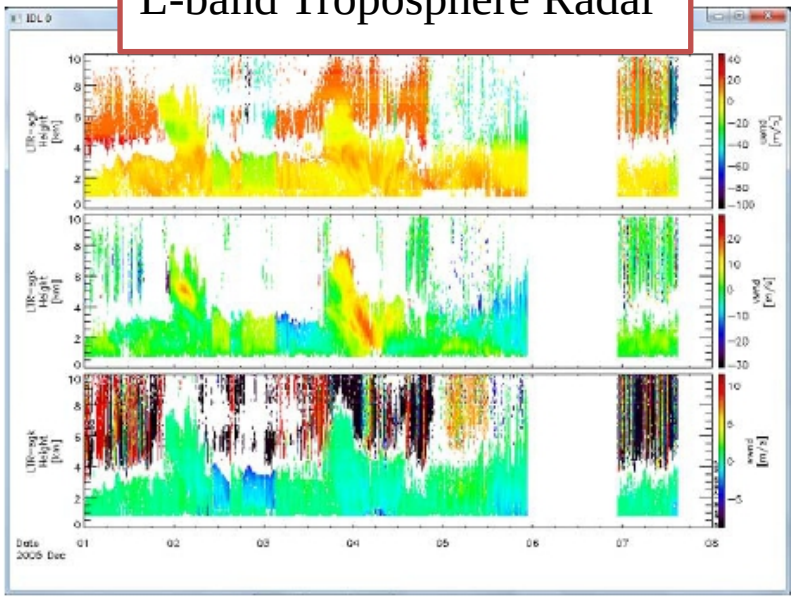
IPRT



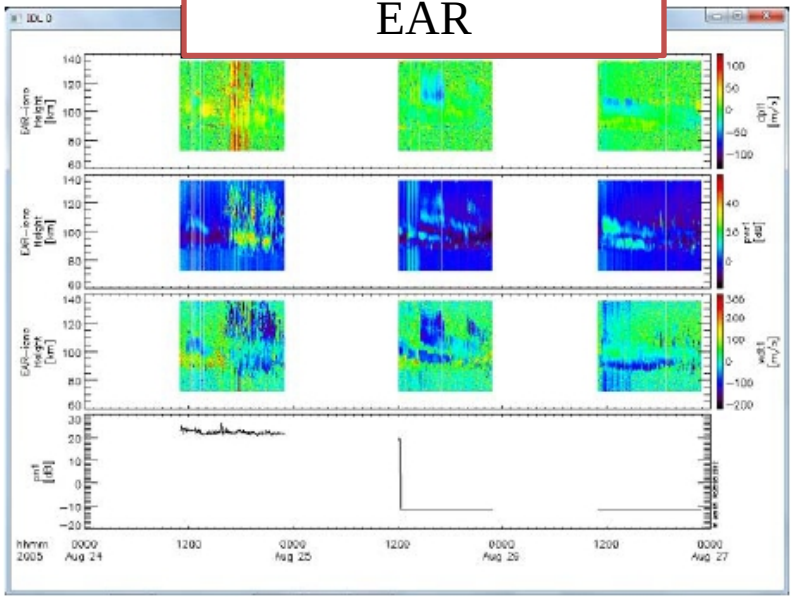
Boundary Layer Radar



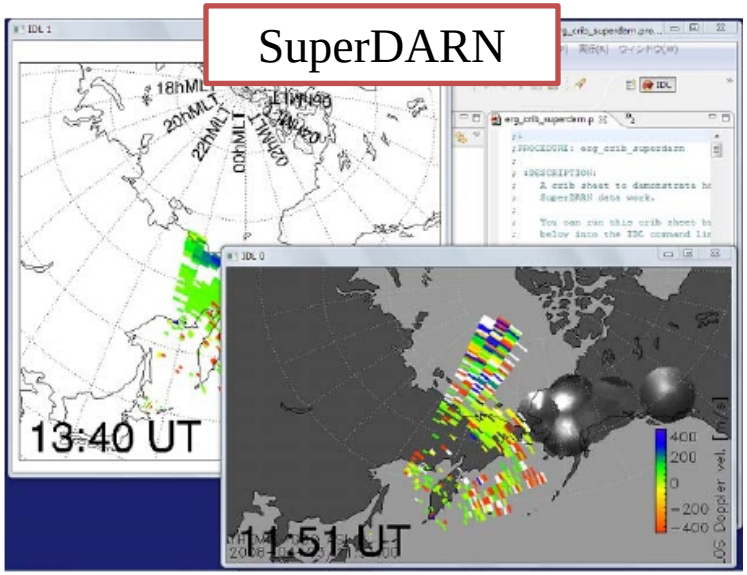
L-band Troposphere Radar



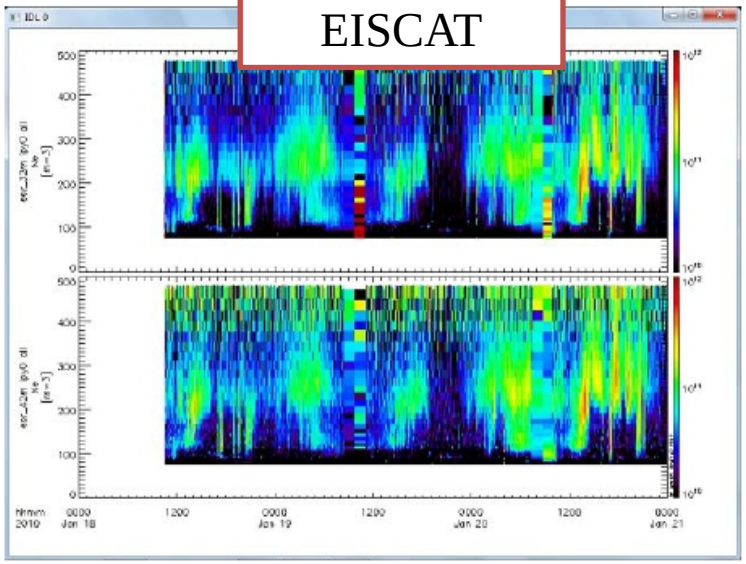
EAR



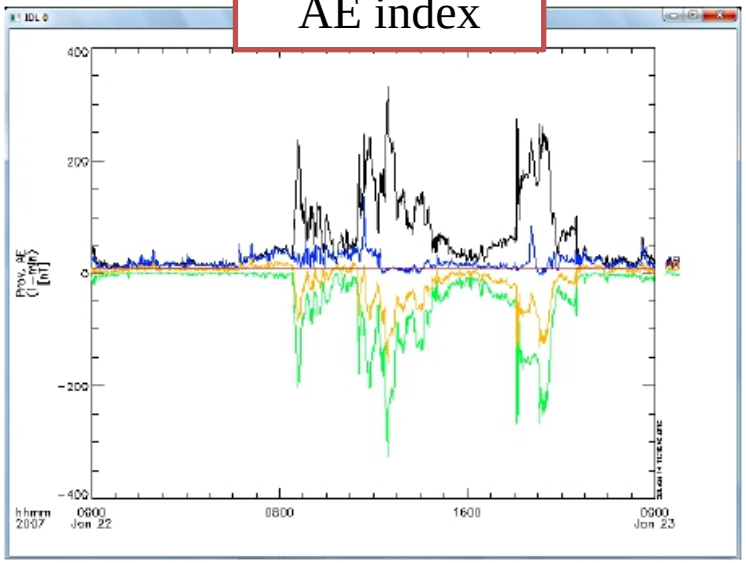
SuperDARN



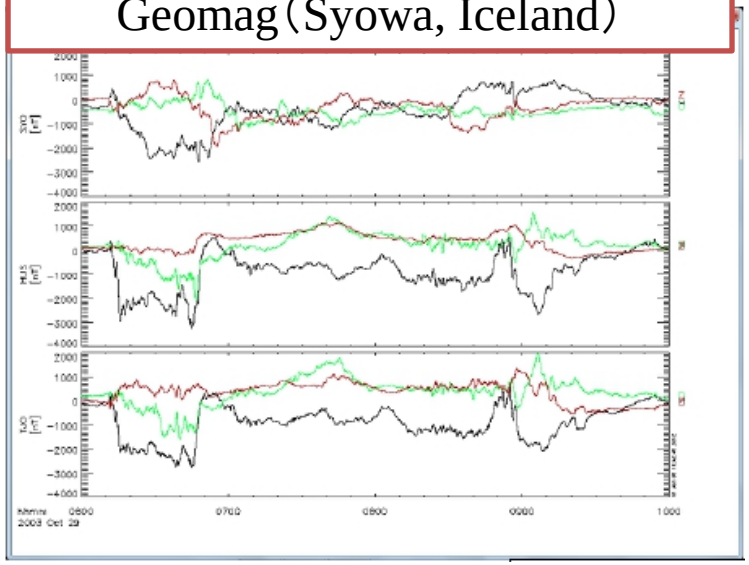
EISCAT



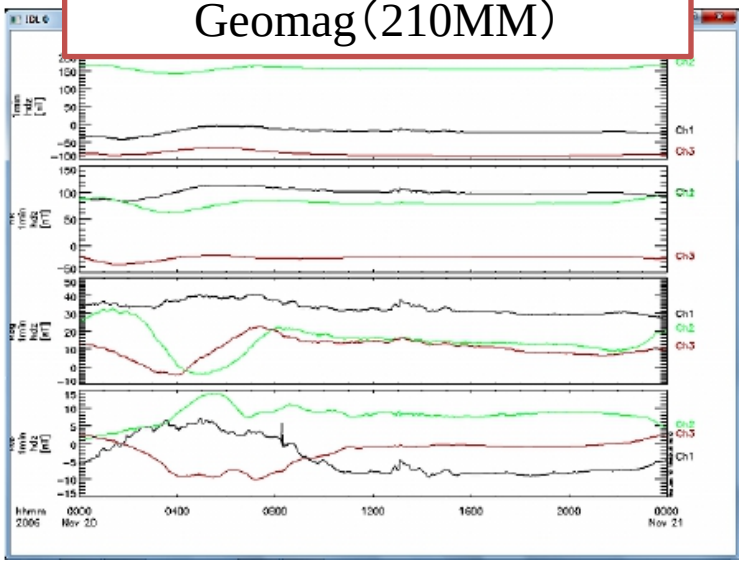
AE index



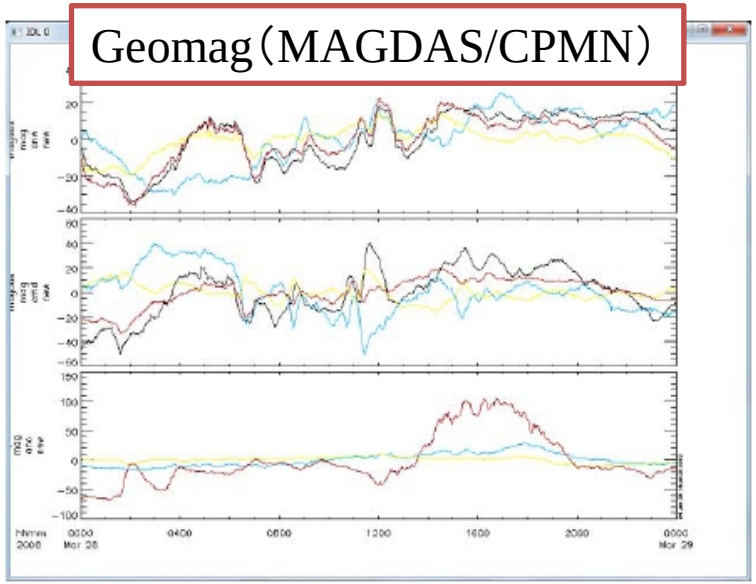
Geomag（Syowa, Iceland）



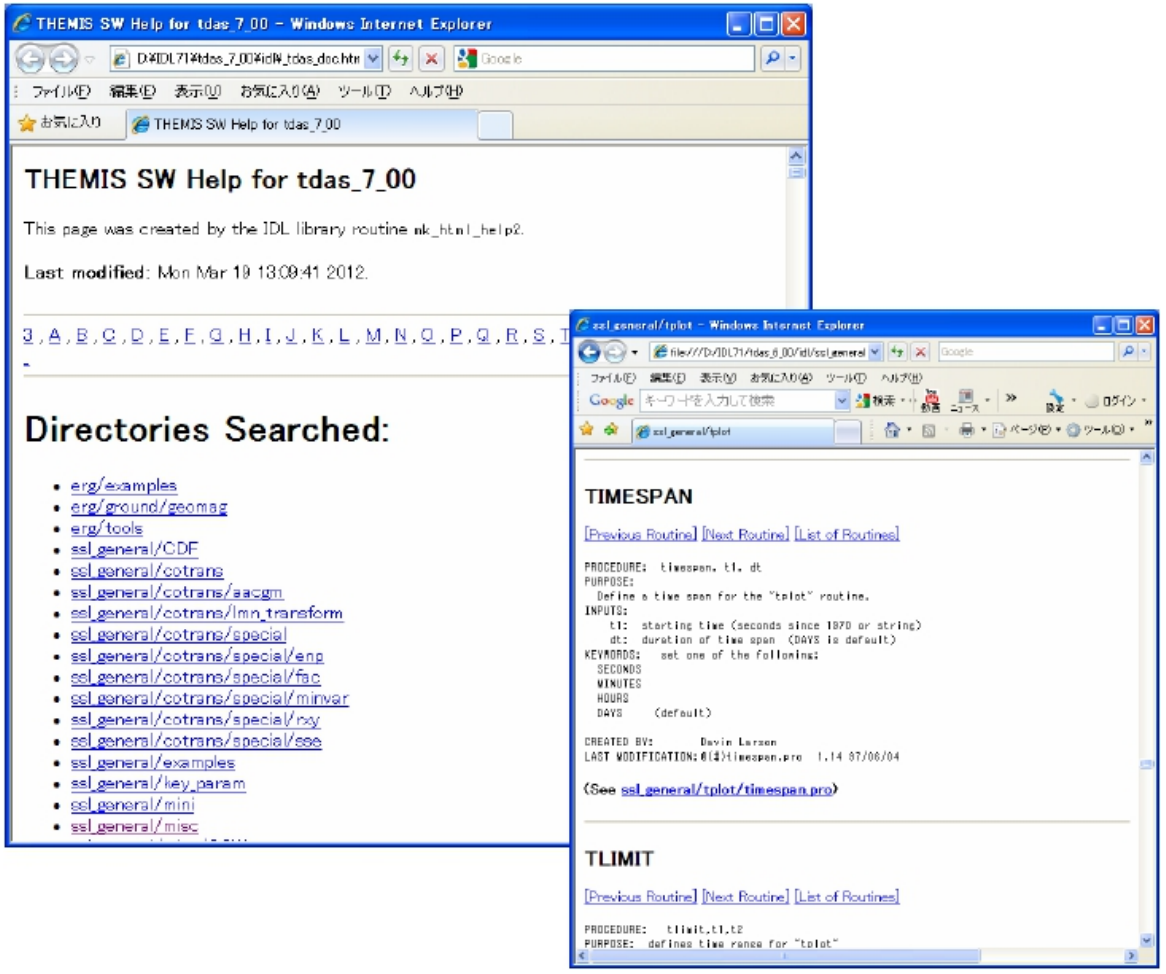
Geomag（210MM）



Geomag（MAGDAS/CPMN）



Help documents



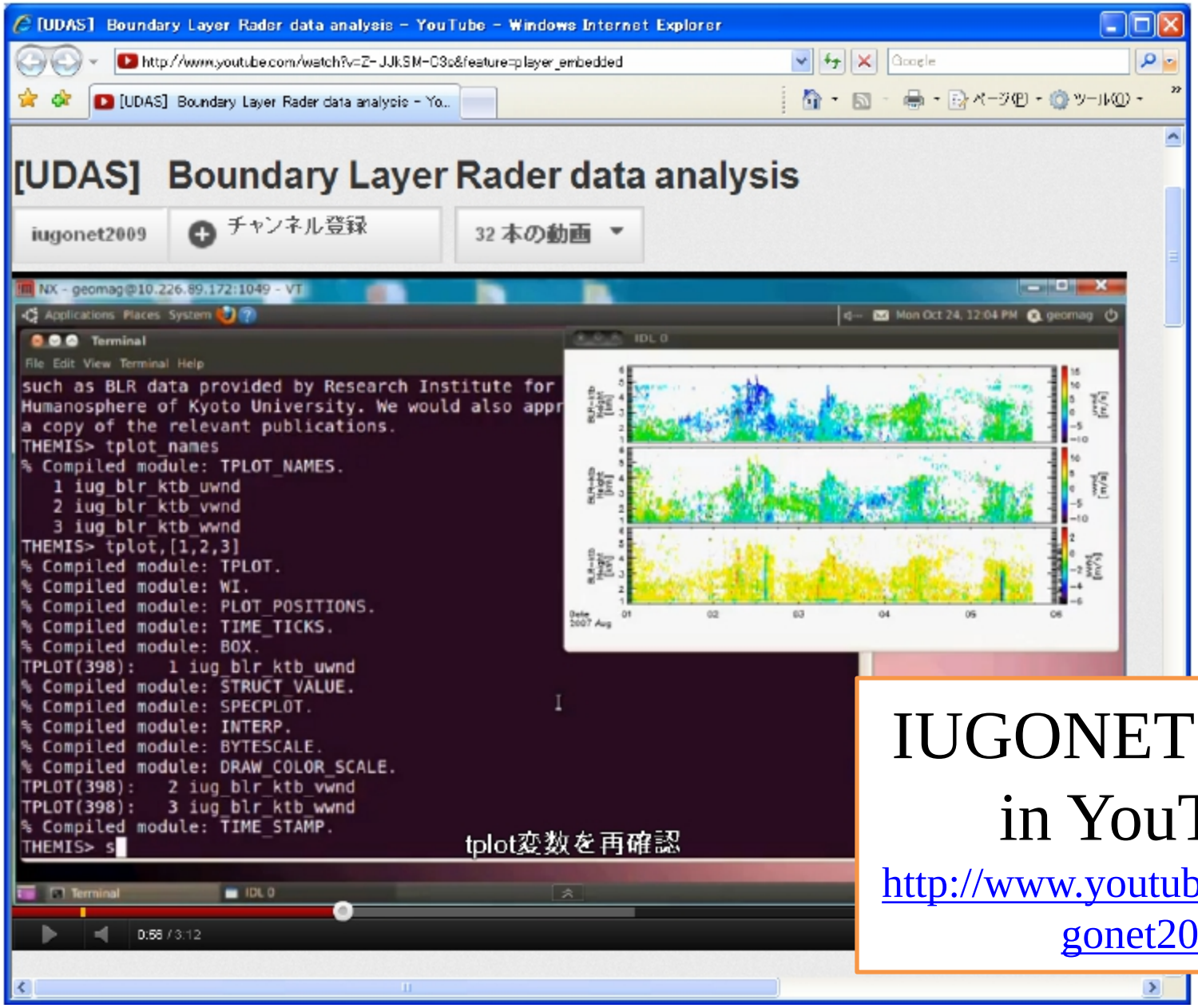
Command Reference HTML

http://themis.ssl.berkeley.edu/socware/tdas_7_00/idl/_tdas_doc.html

tdas_7_00/idl/_tdas_doc.html

udas_2_00_1/_udas_doc.html

Movies (How to use UDAS)



IUGONET channel in YouTube

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

UDAS GUI operation on IDL-VM

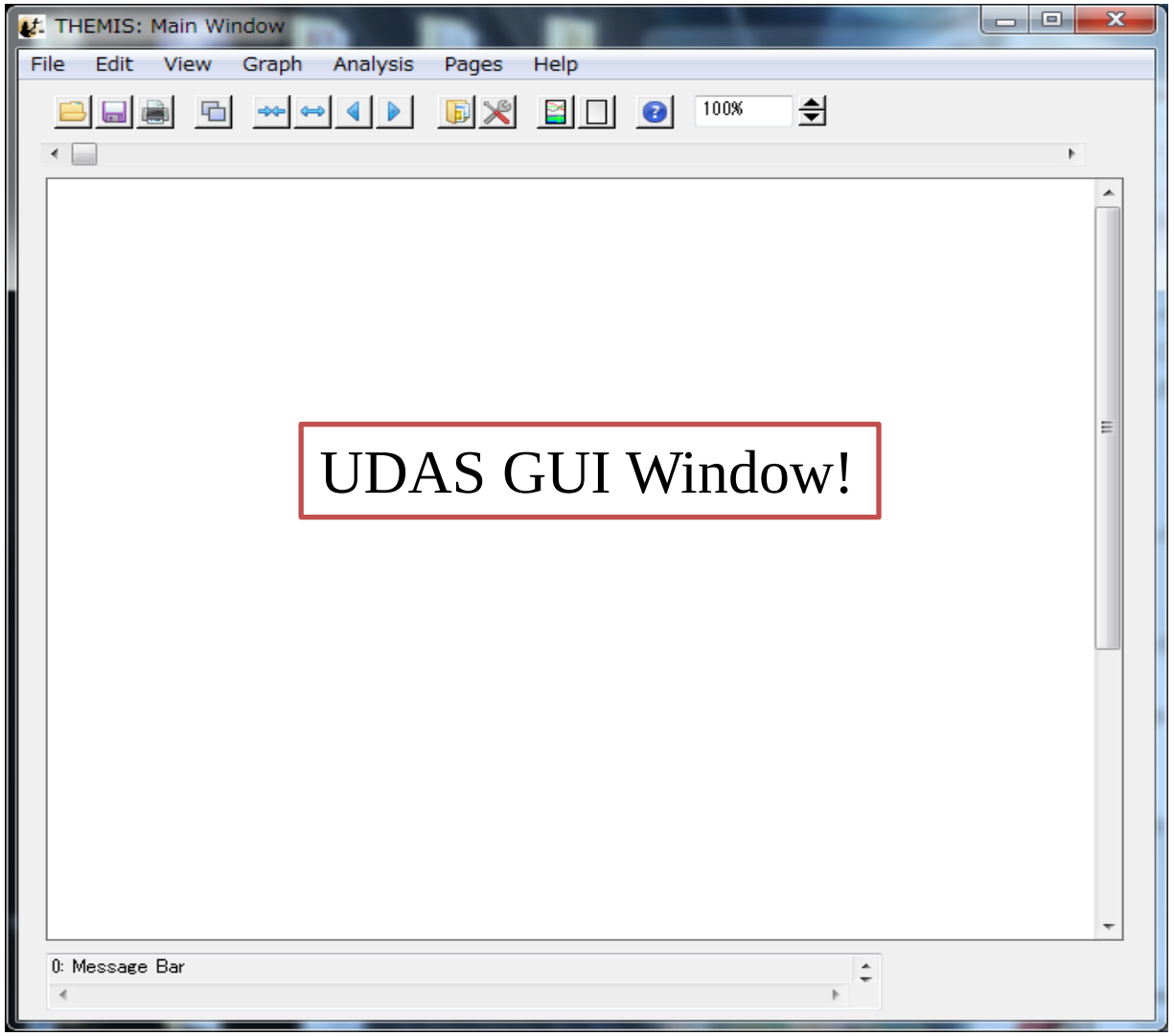
Note:
UDAS VM is ***not released yet*.**
Please wait for a while until the UDAS VM will be released(in near future), or use UDAS under licensed IDL software.

UDAS on IDL Virtual Machine

0. Get IDL Virtual Machine Environment
1. Get UDAS Virtual Machine application
2. Extract zip file to your proper directory
3. Start IDL Virtual Machine

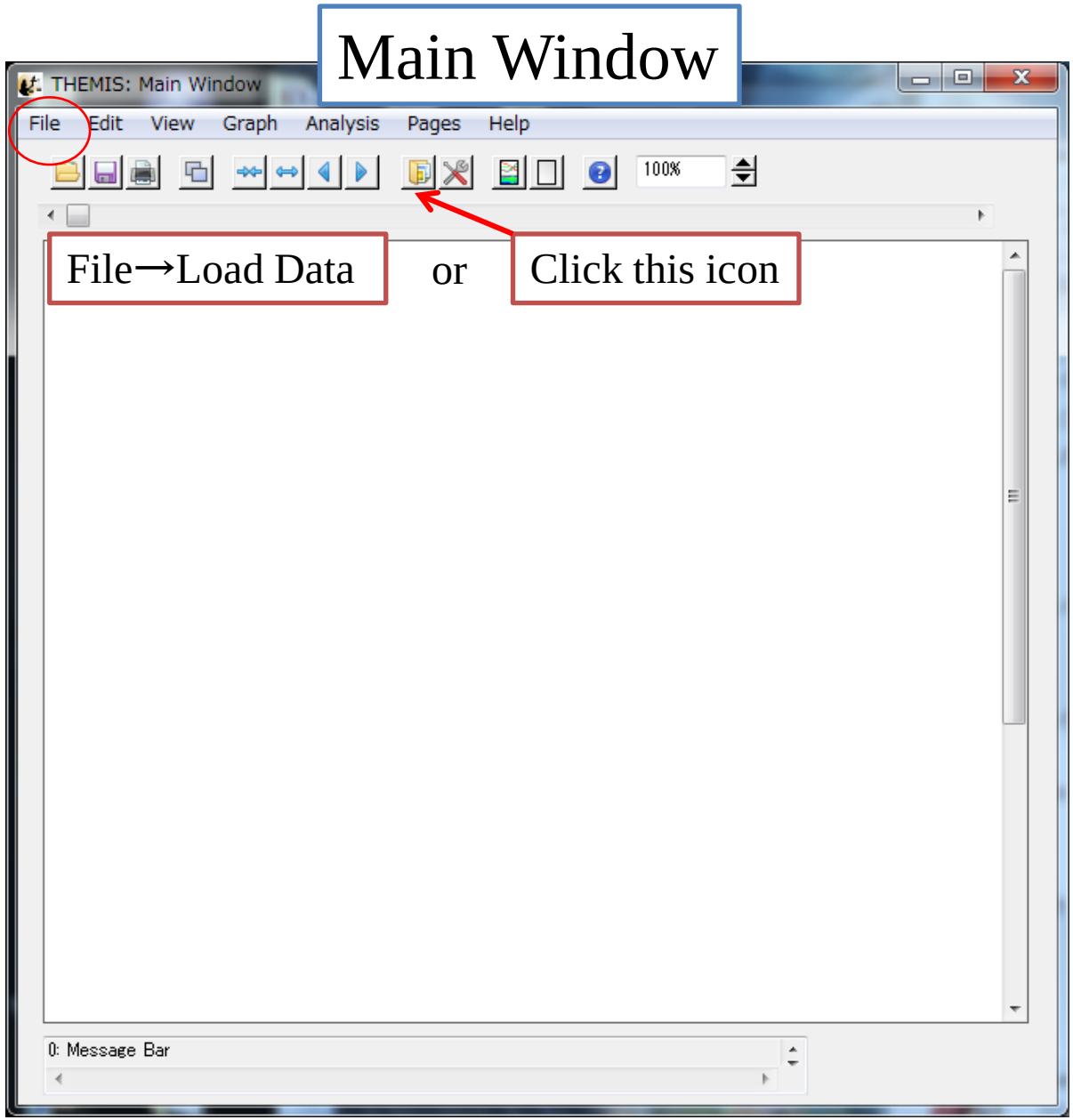
4. Select file
   thm_gui_new.sav

UDAS on IDL Virtual Machine



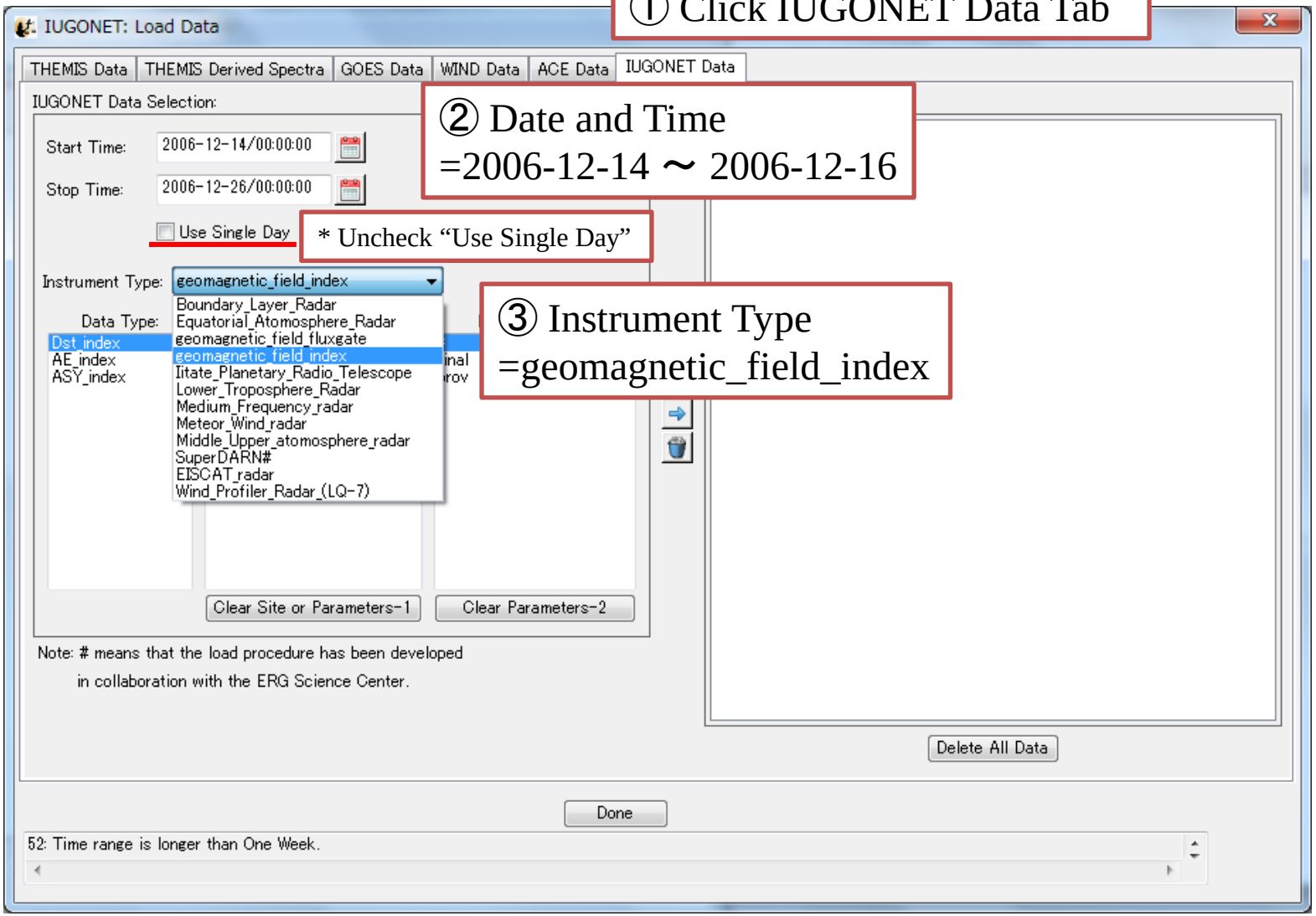
GUI Basic Operation

Example:
Load Dst index



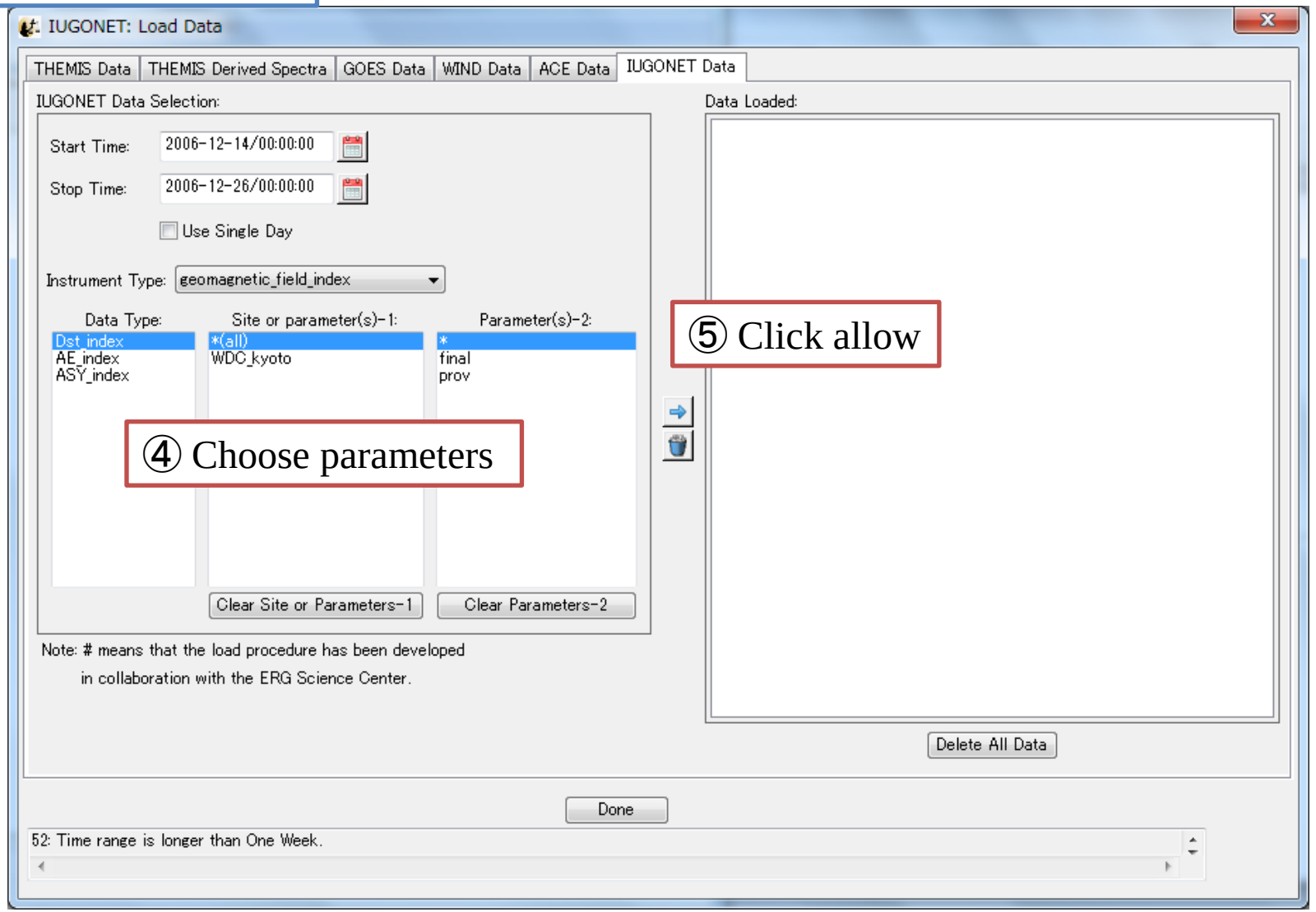
GUI Basic Operation

Load Data Window



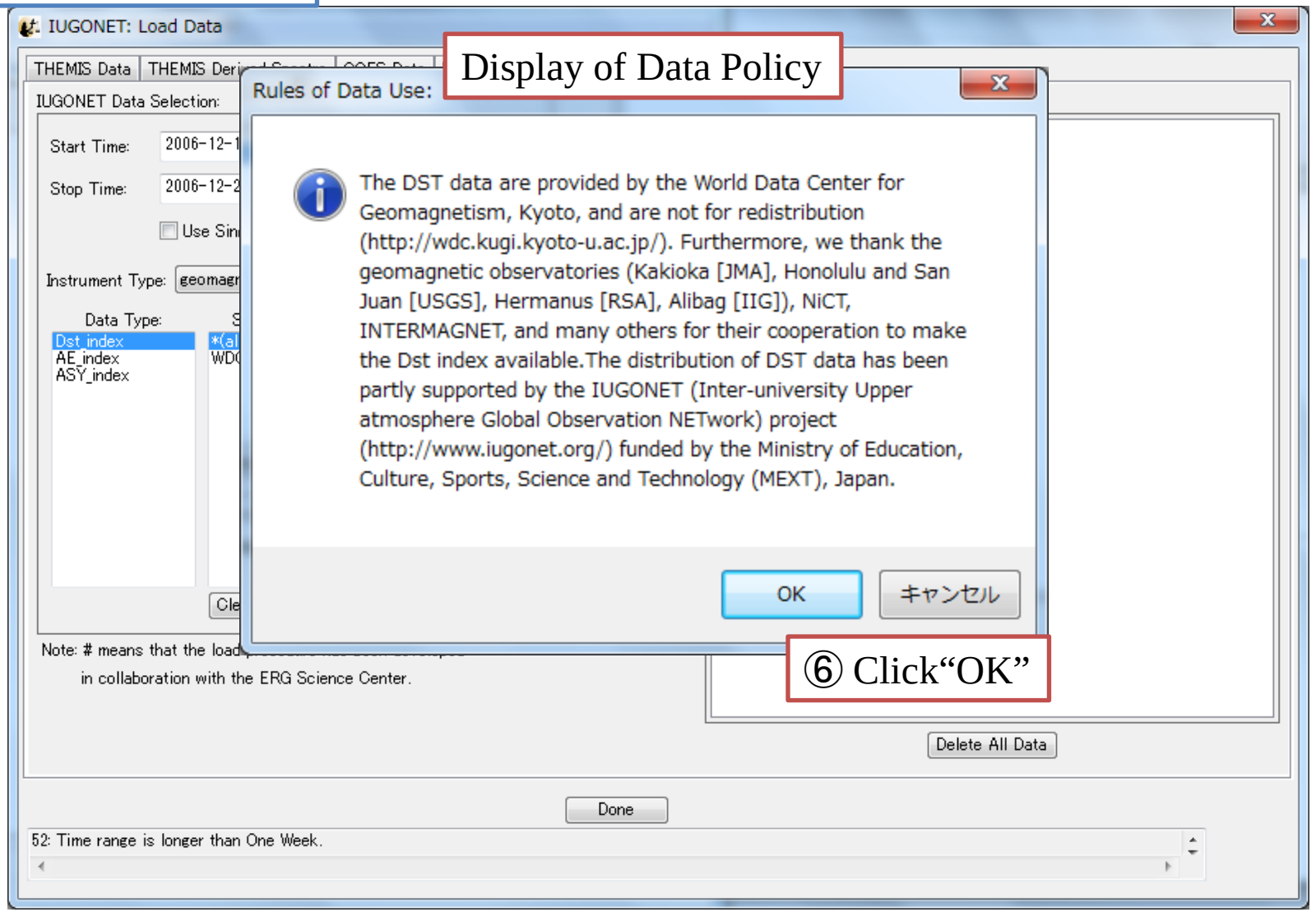
GUI Basic Operation

Load Data Window



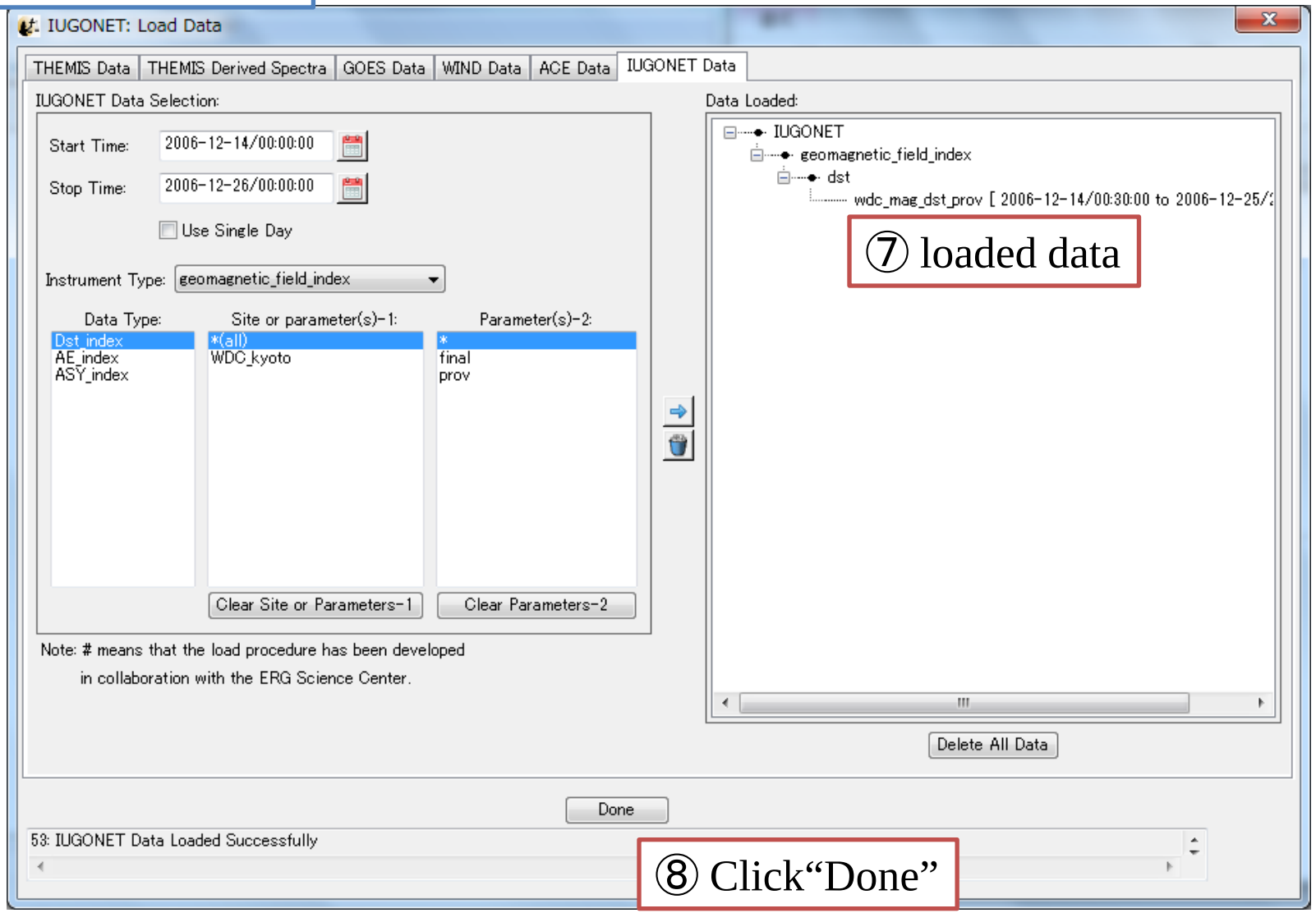
GUI Basic Operation

Load Data Window



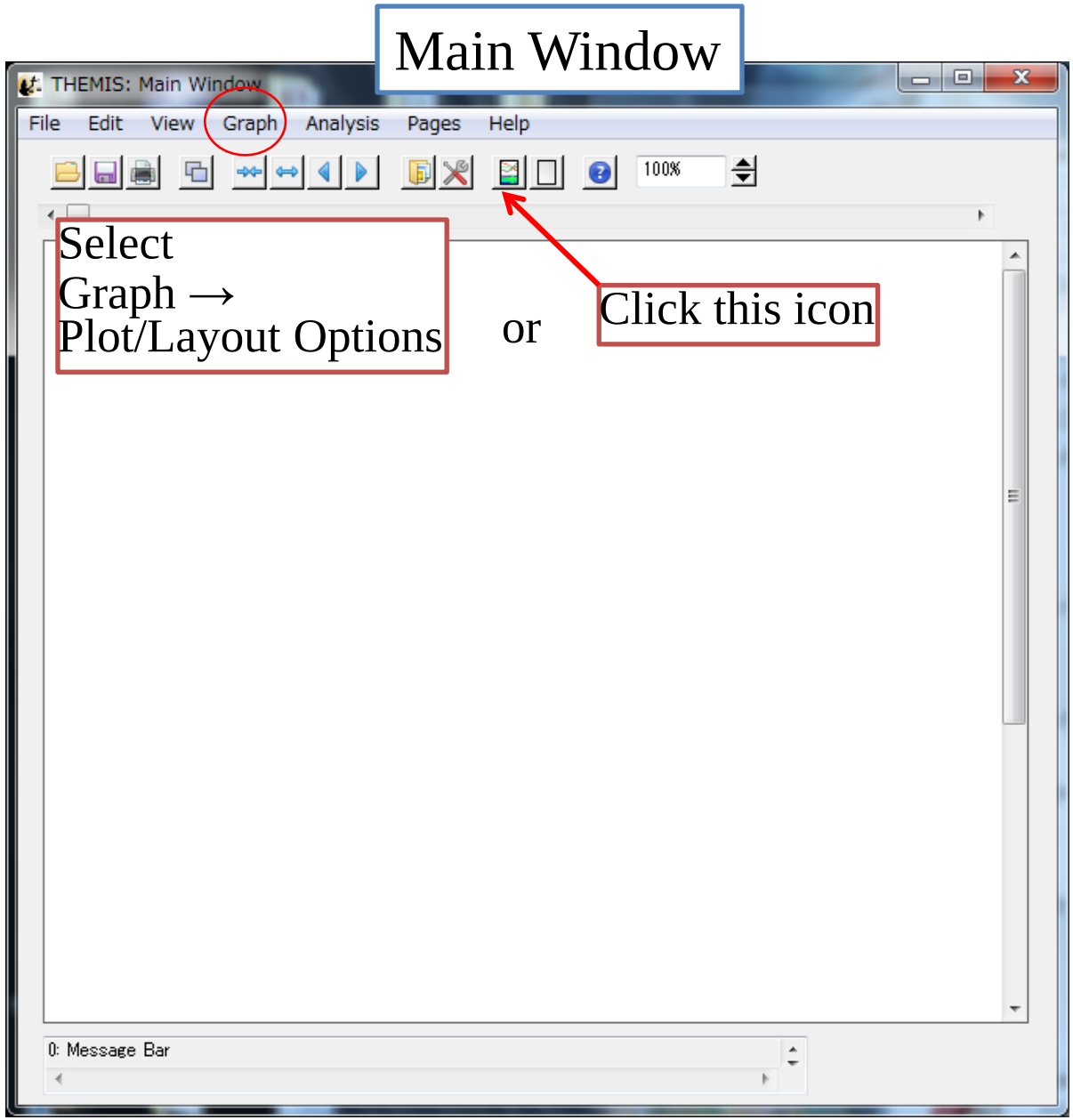
GUI Basic Operation

Load Data Window



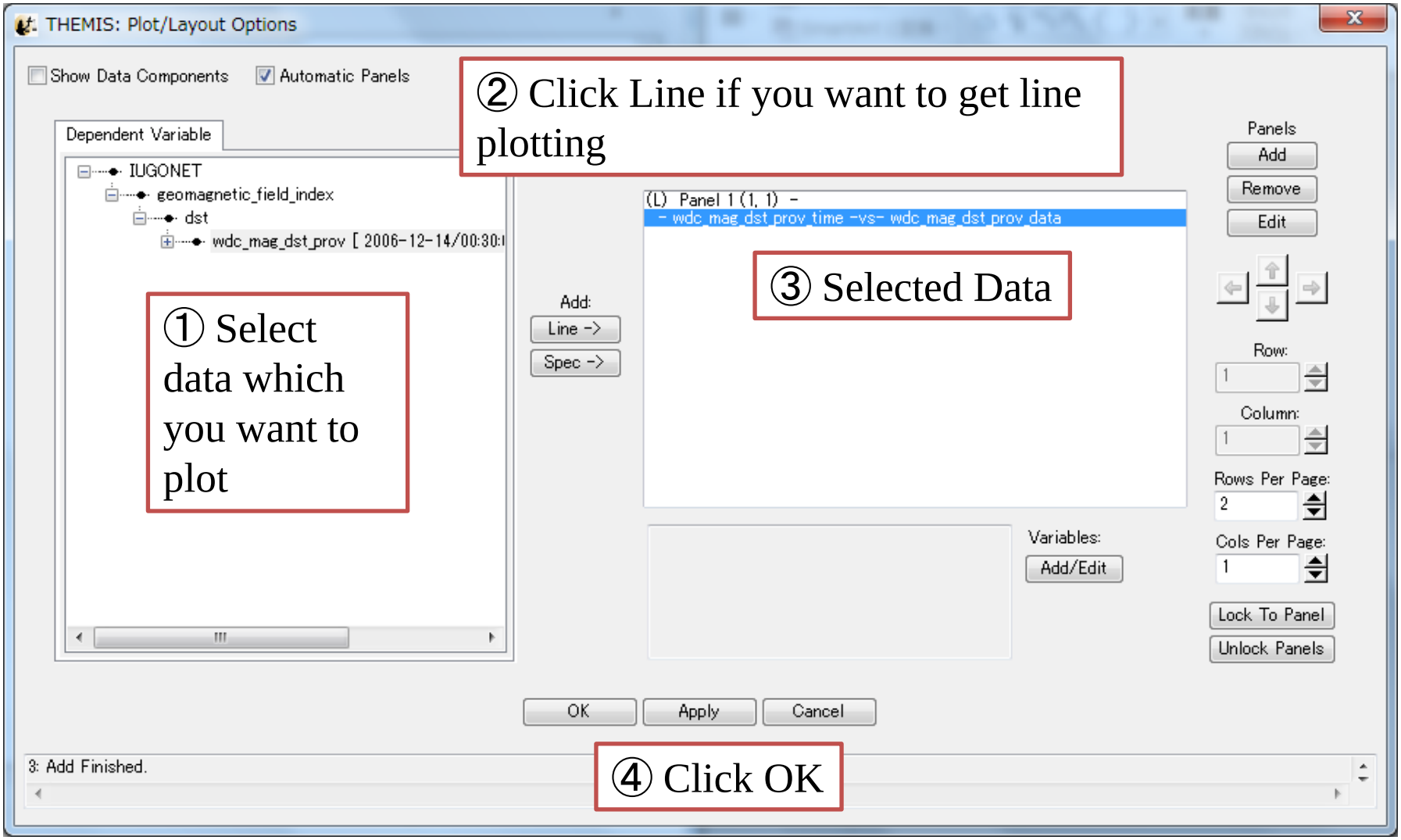
GUI Basic Operation

Next: Plot Dst index



GUI Basic Operation

Plot/Layout Options Window



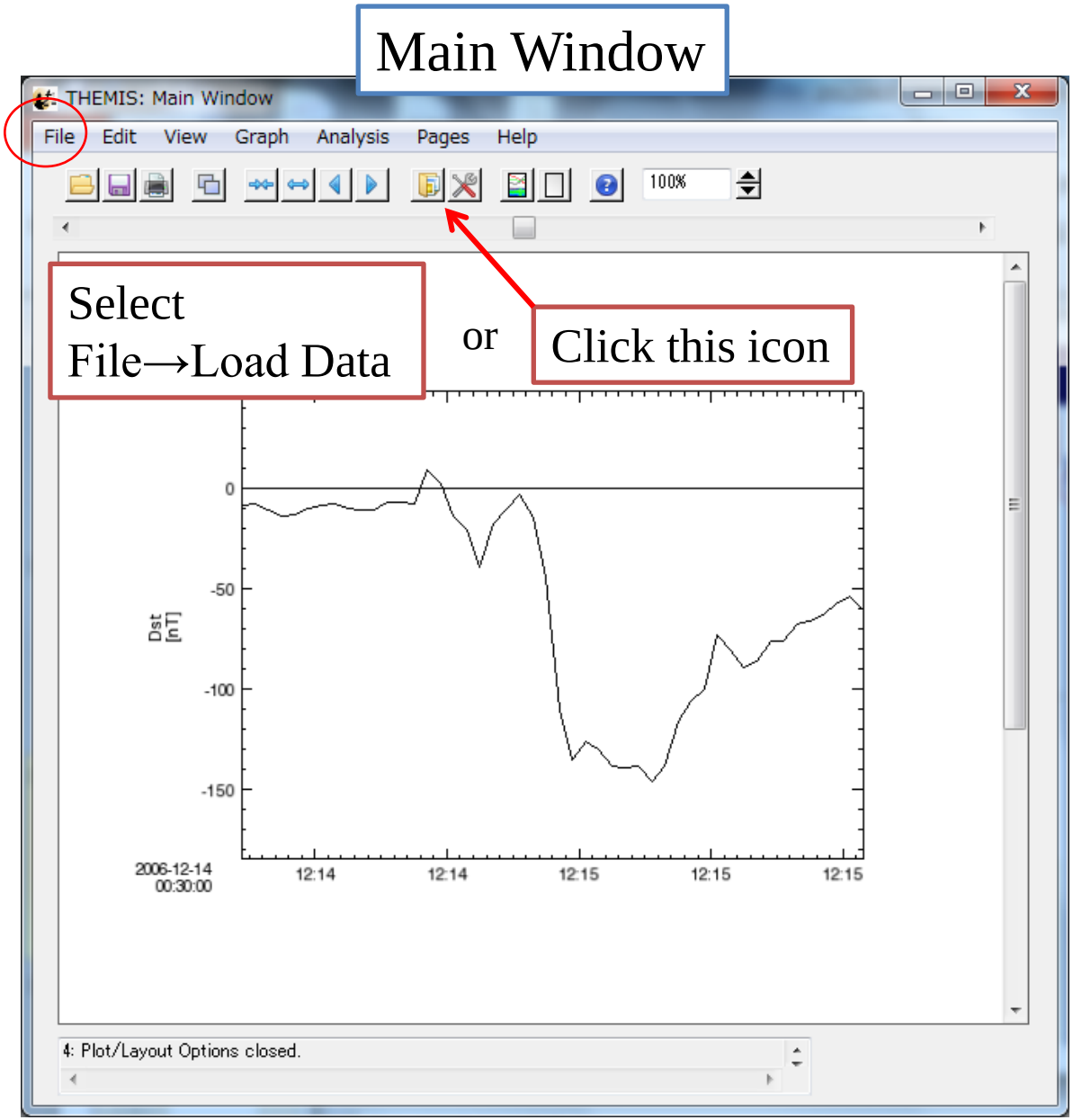
GUI Basic Operation

Next: Load other data

Let's load following data:
ACE satellite
Instrument: MFI
Type: h0
Parameter: BGSM

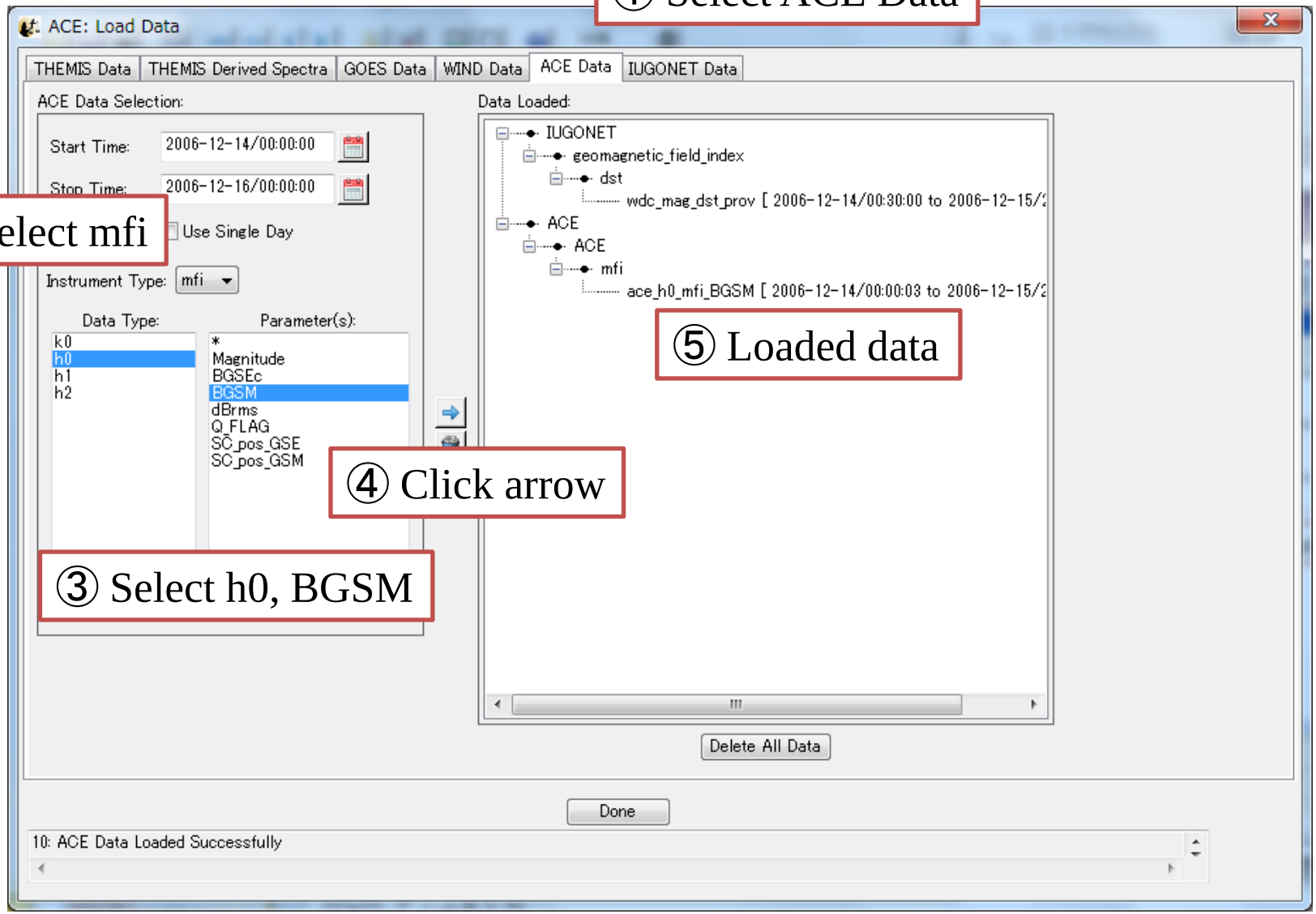
Let's load following data:
ACE satellite
Instrument: SWE
Type: h0
Parameter: V_GSE

Let's load following data:
MAGDAS magnetometer
(in IUGONET tab)
Instrument: magnetometer
Station: ASB



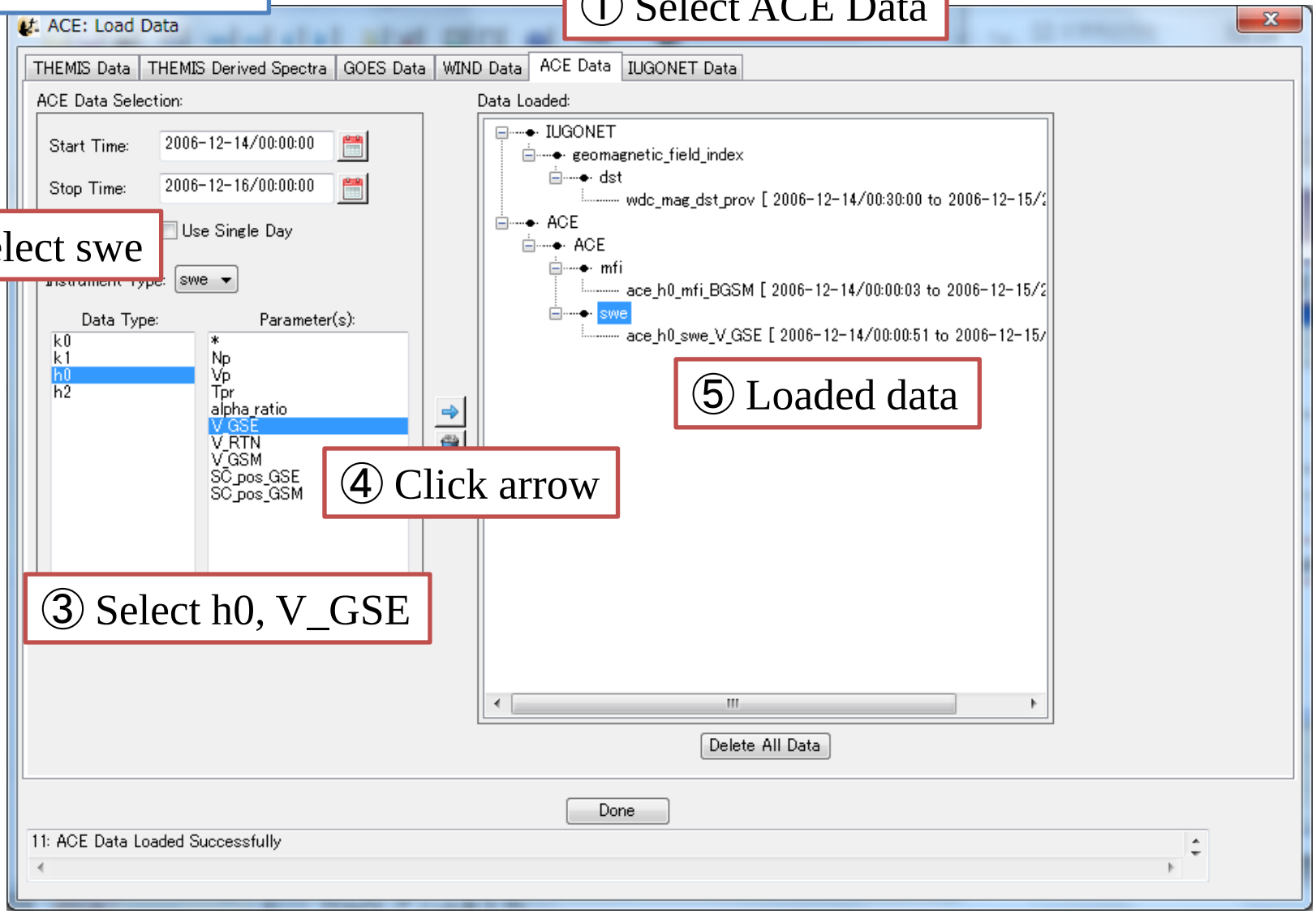
GUI Basic Operation

Load Data Window

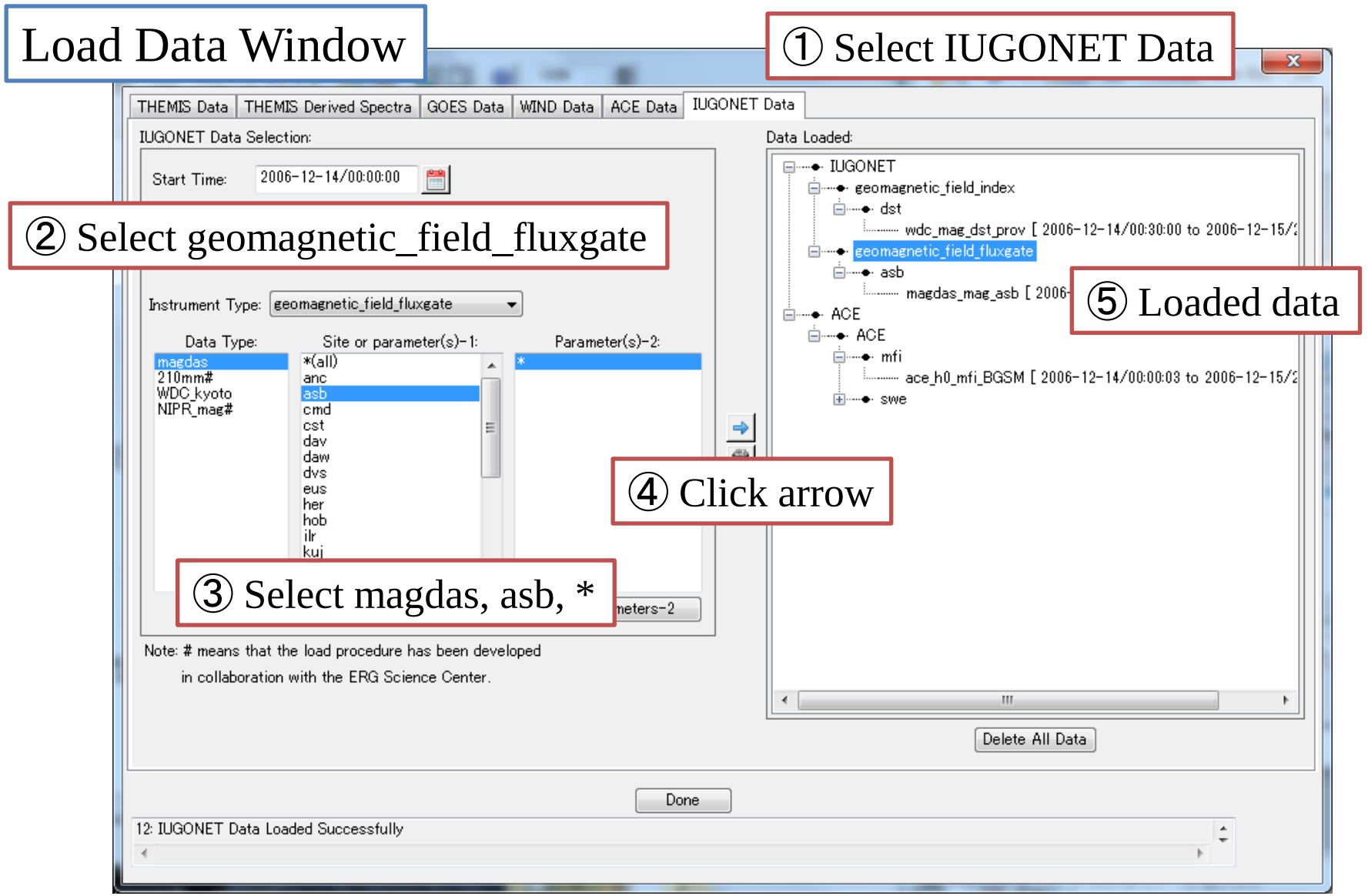


GUI Basic Operation

Load Data Window



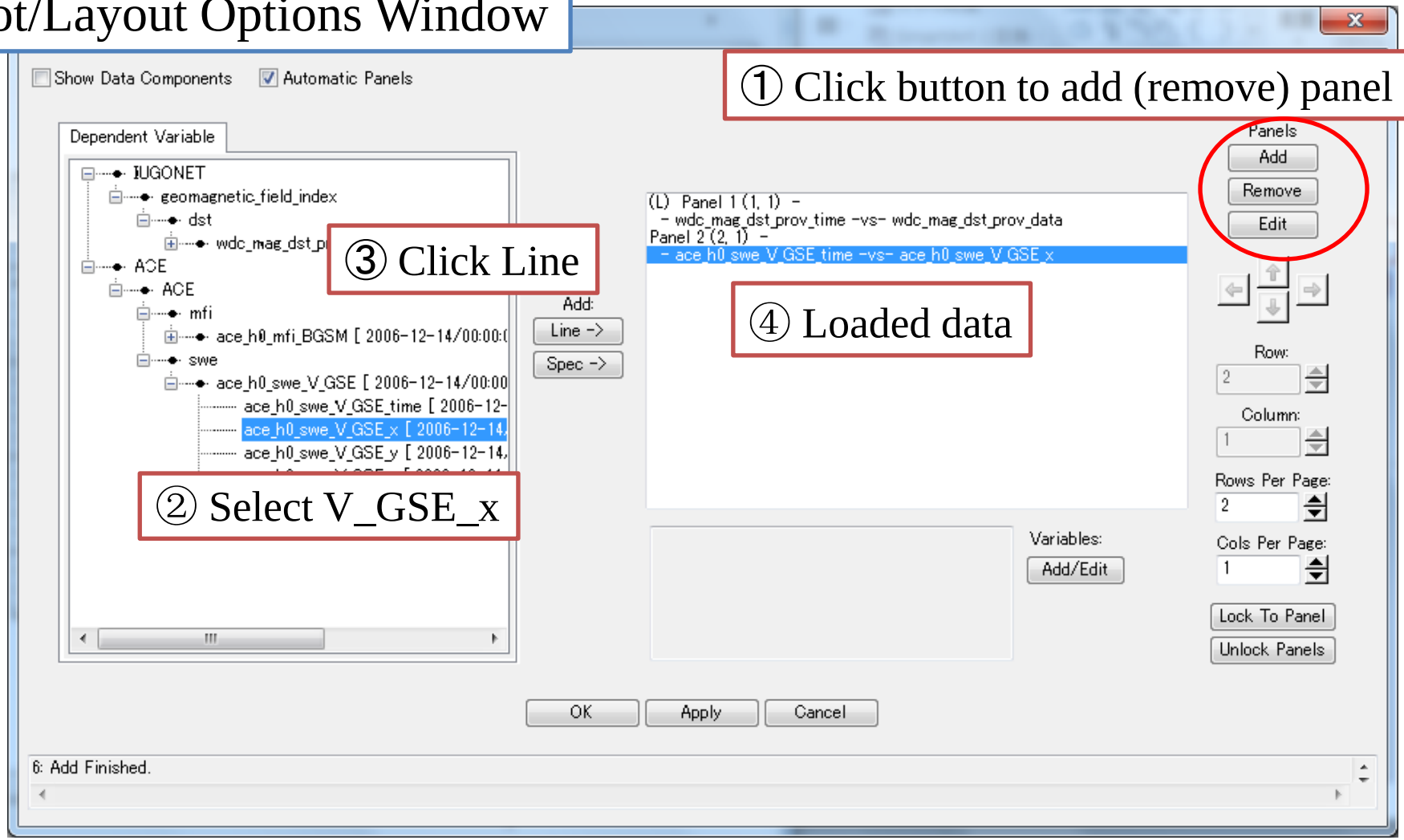
GUI Basic Operation



GUI Basic Operation

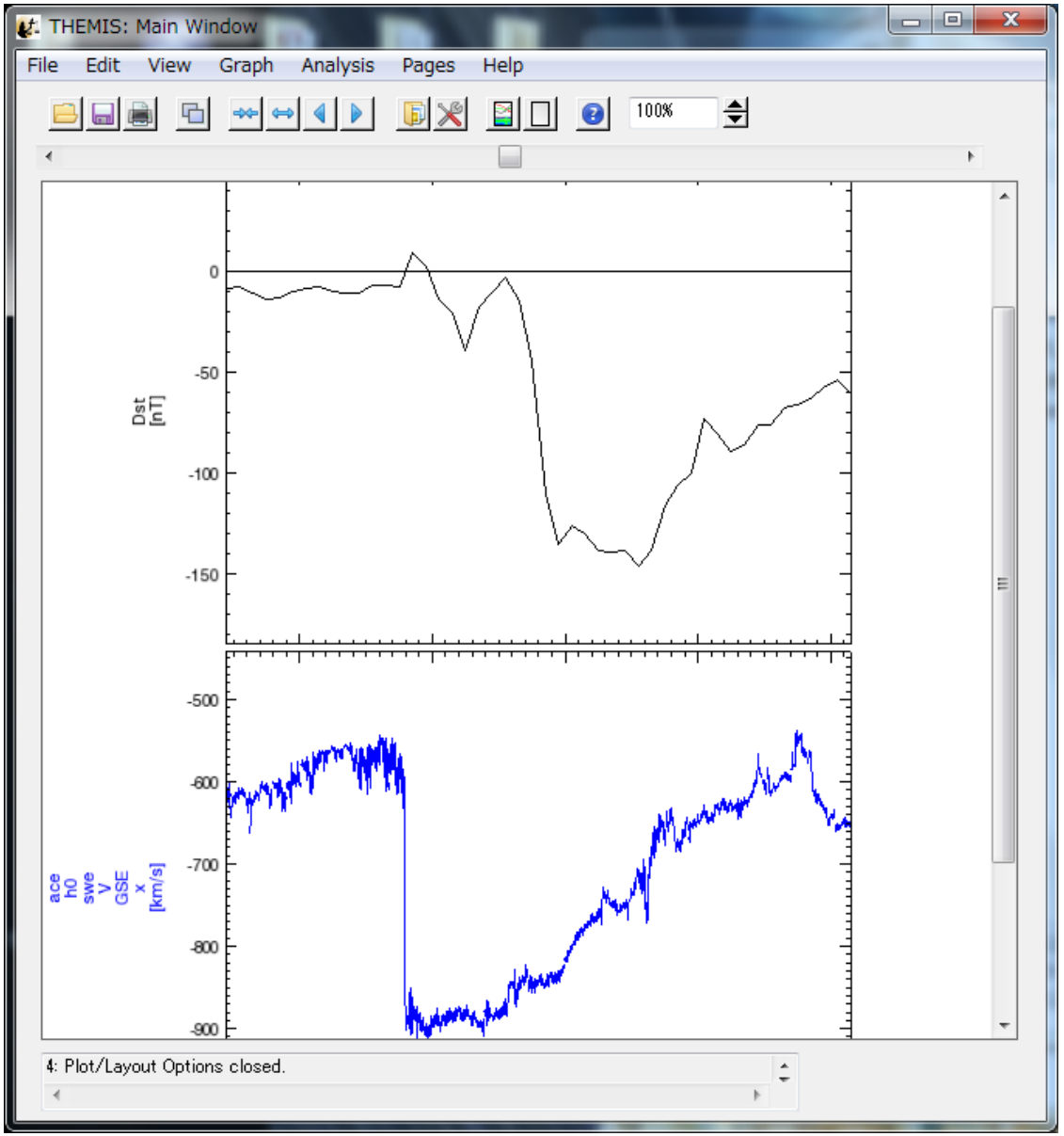
Next: Plot V_GSE_x

Plot/Layout Options Window



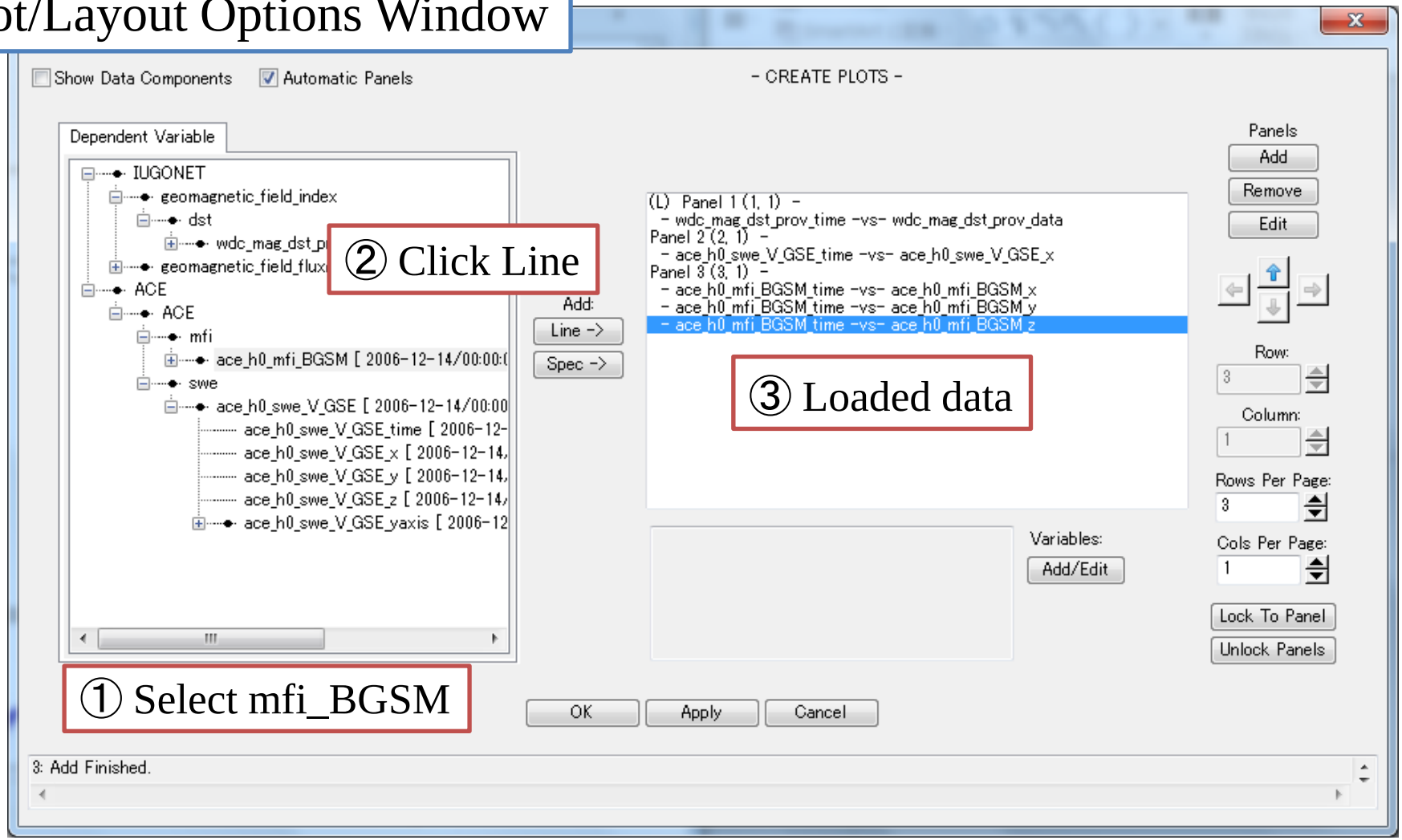
GUI Basic Operation

Next:
plot ACE mfi and ASB geomagnetic data



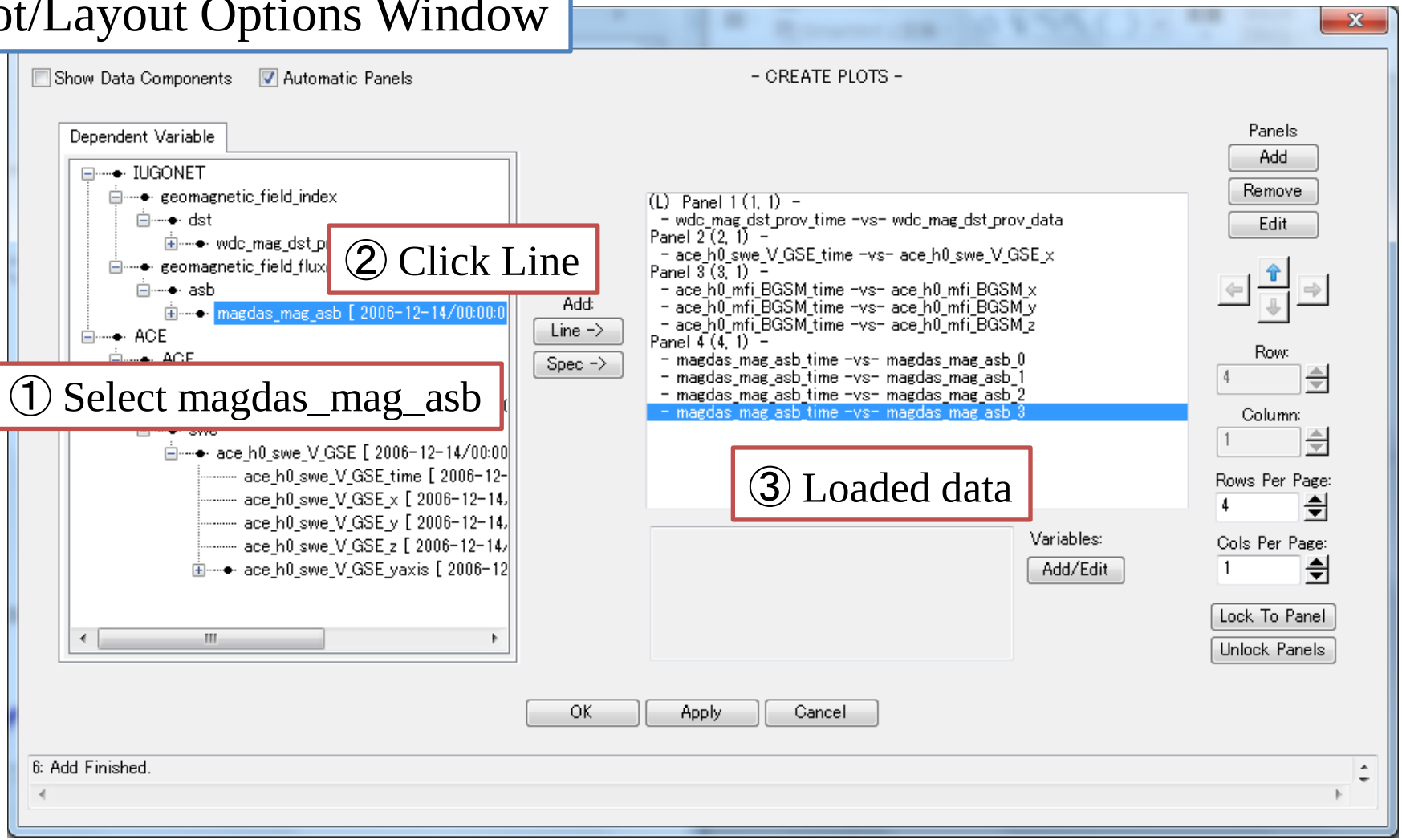
GUI Basic Operation

Plot/Layout Options Window



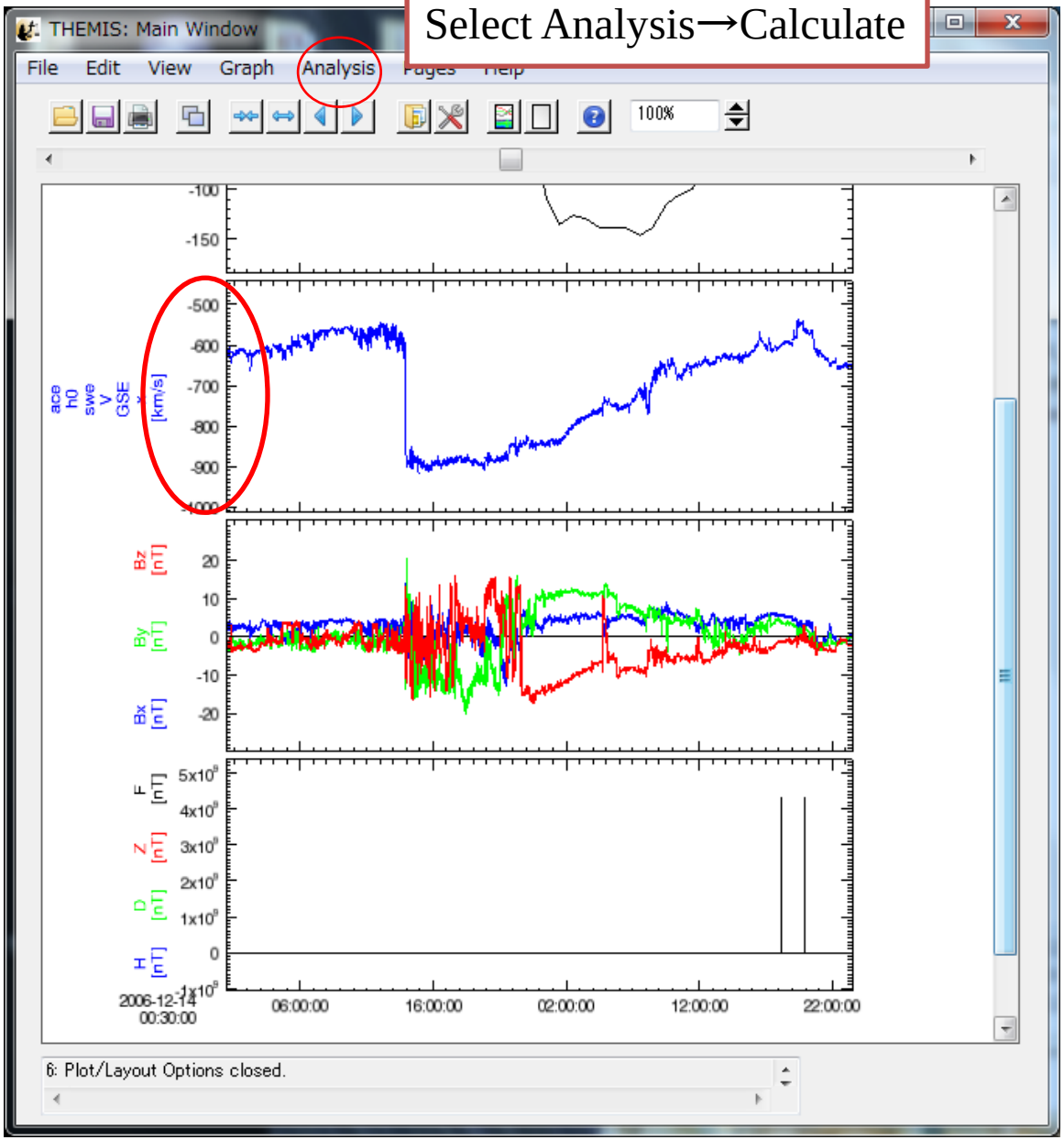
GUI Basic Operation

Plot/Layout Options Window



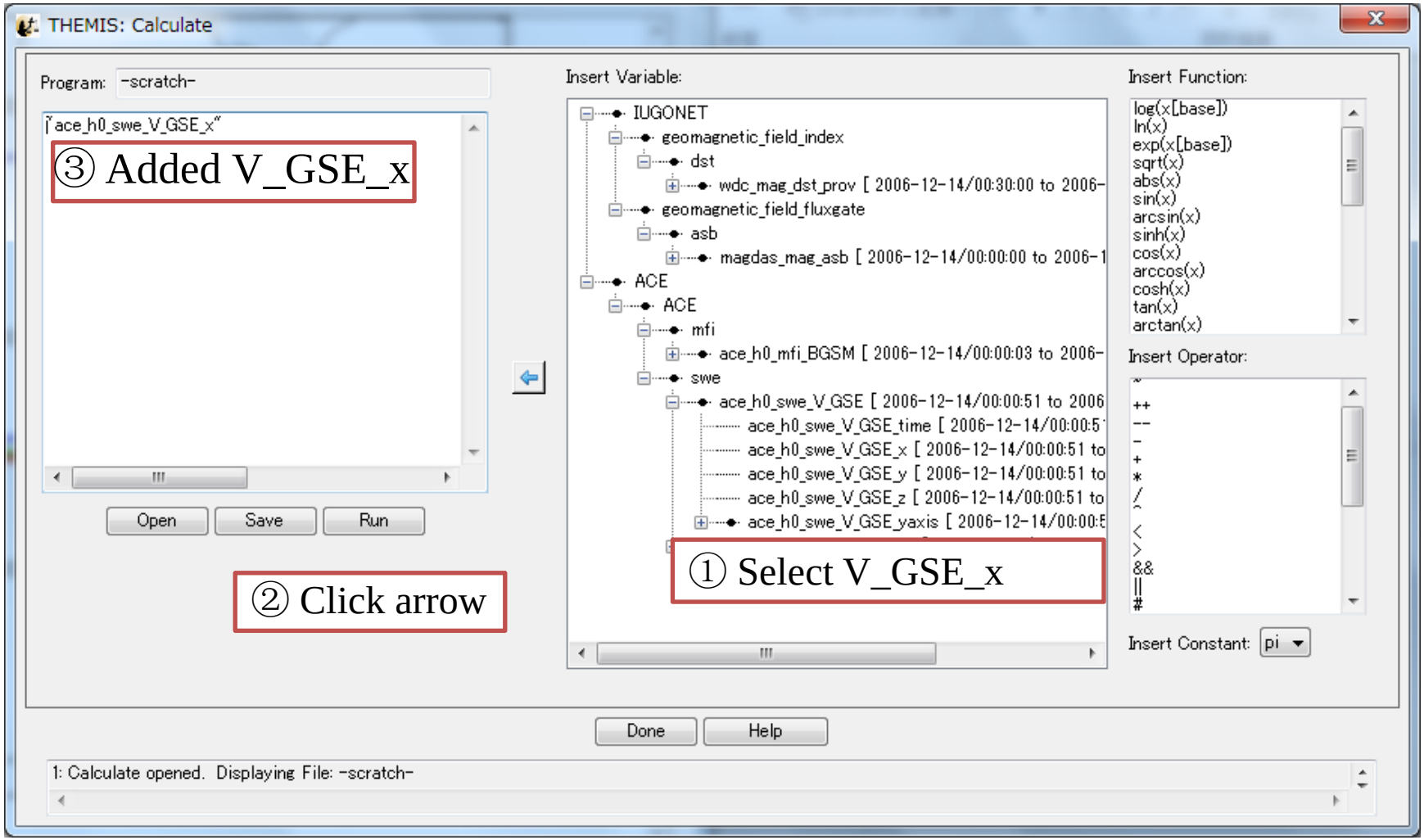
GUI Basic Operation

Next:
Calculation



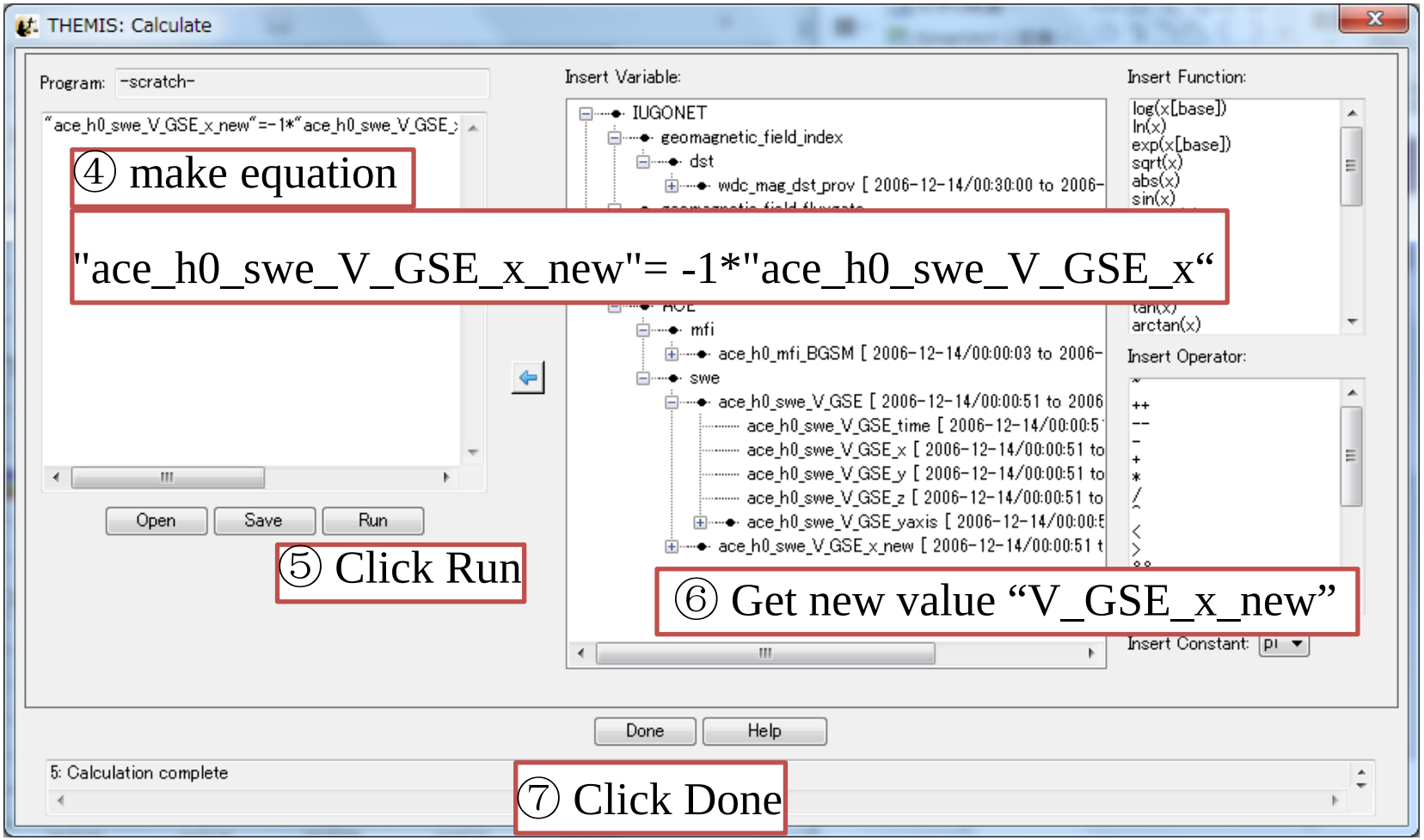
GUI Basic Operation

Calculate Window



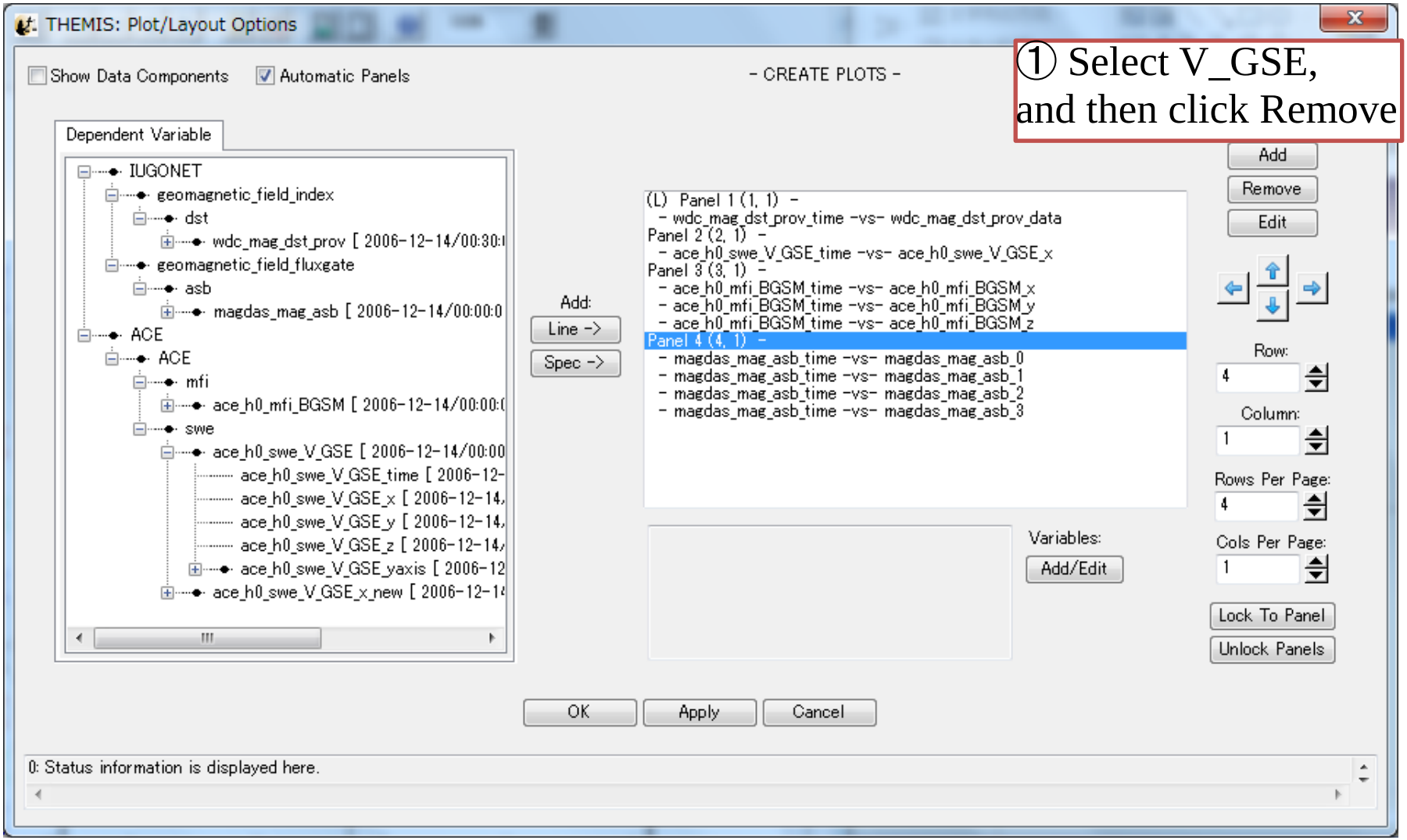
GUI Basic Operation

Calculate Window



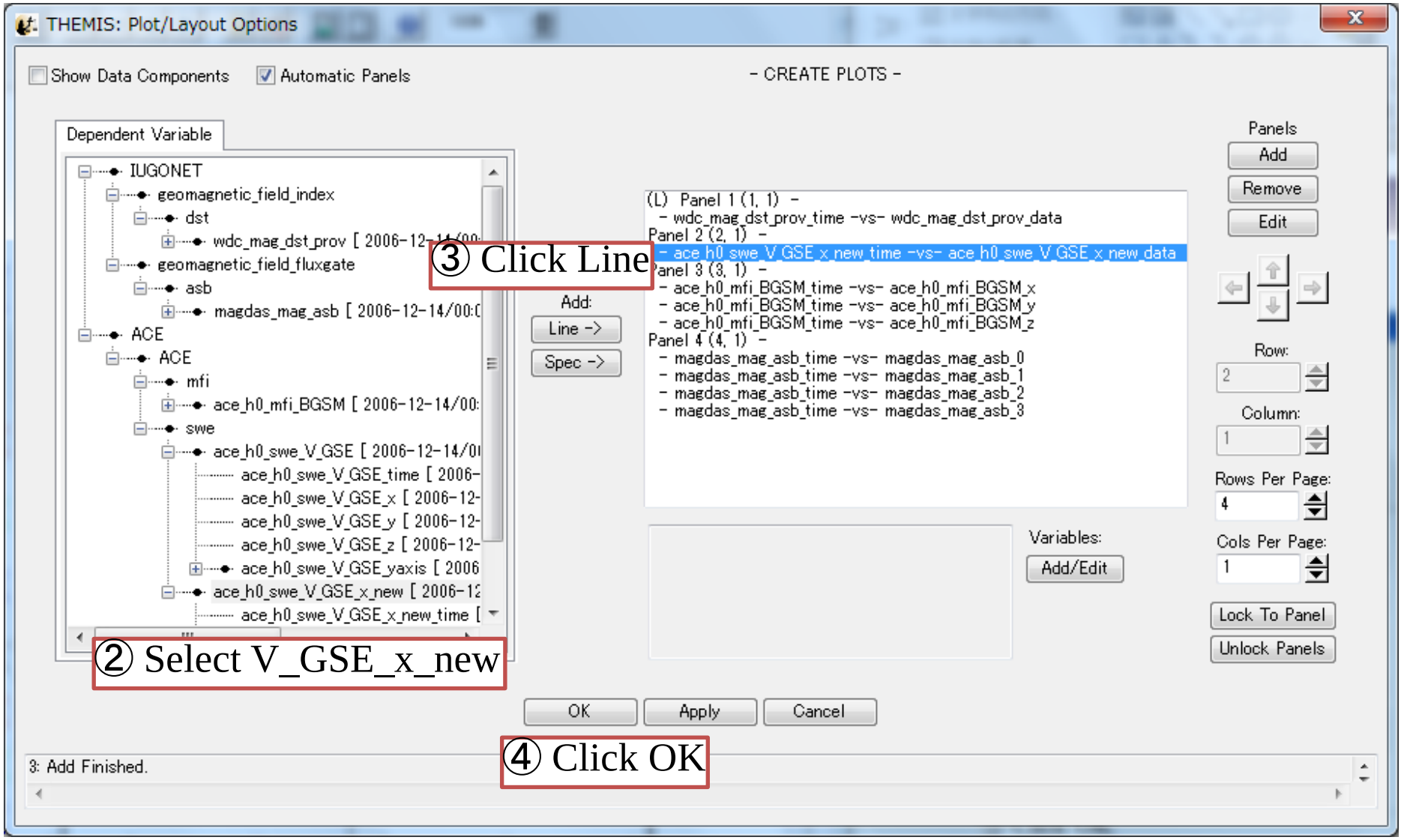
GUI Basic Operation

Plot/Layout Options Window



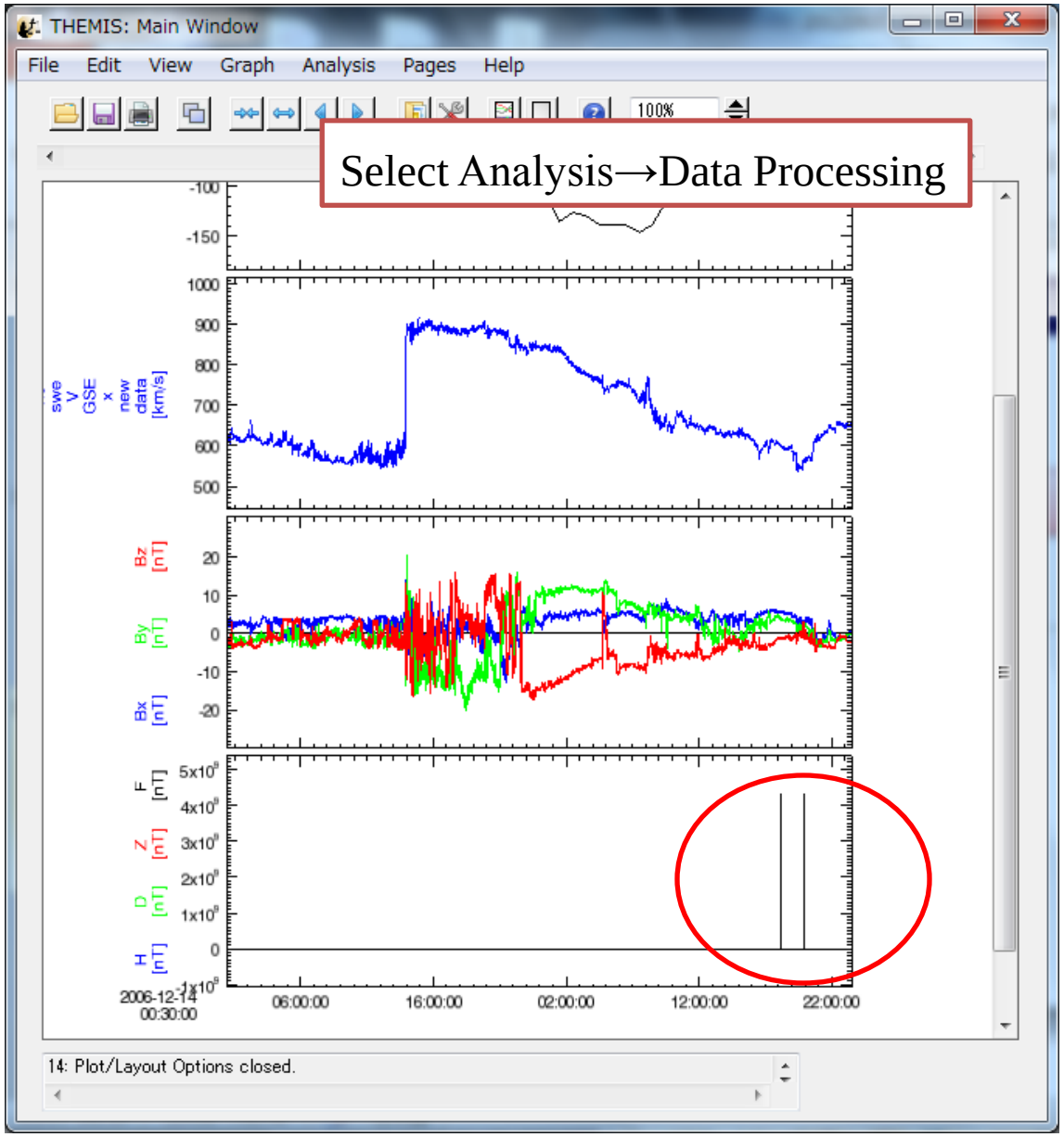
GUI Basic Operation

Plot/Layout Options Window



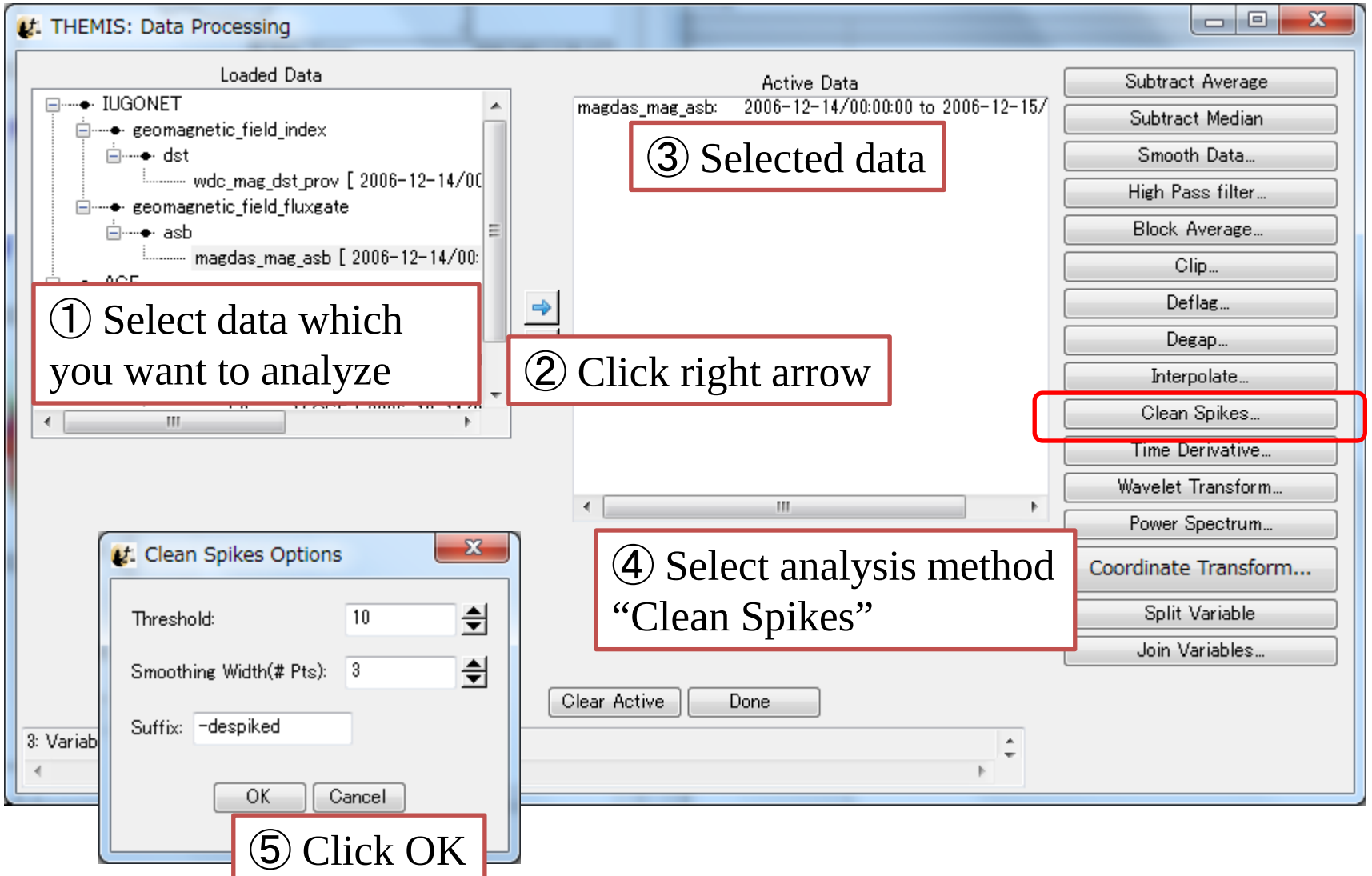
GUI Basic Operation

Next:
Data Processing – reduce spike noise, subtract average



GUI Basic Operation

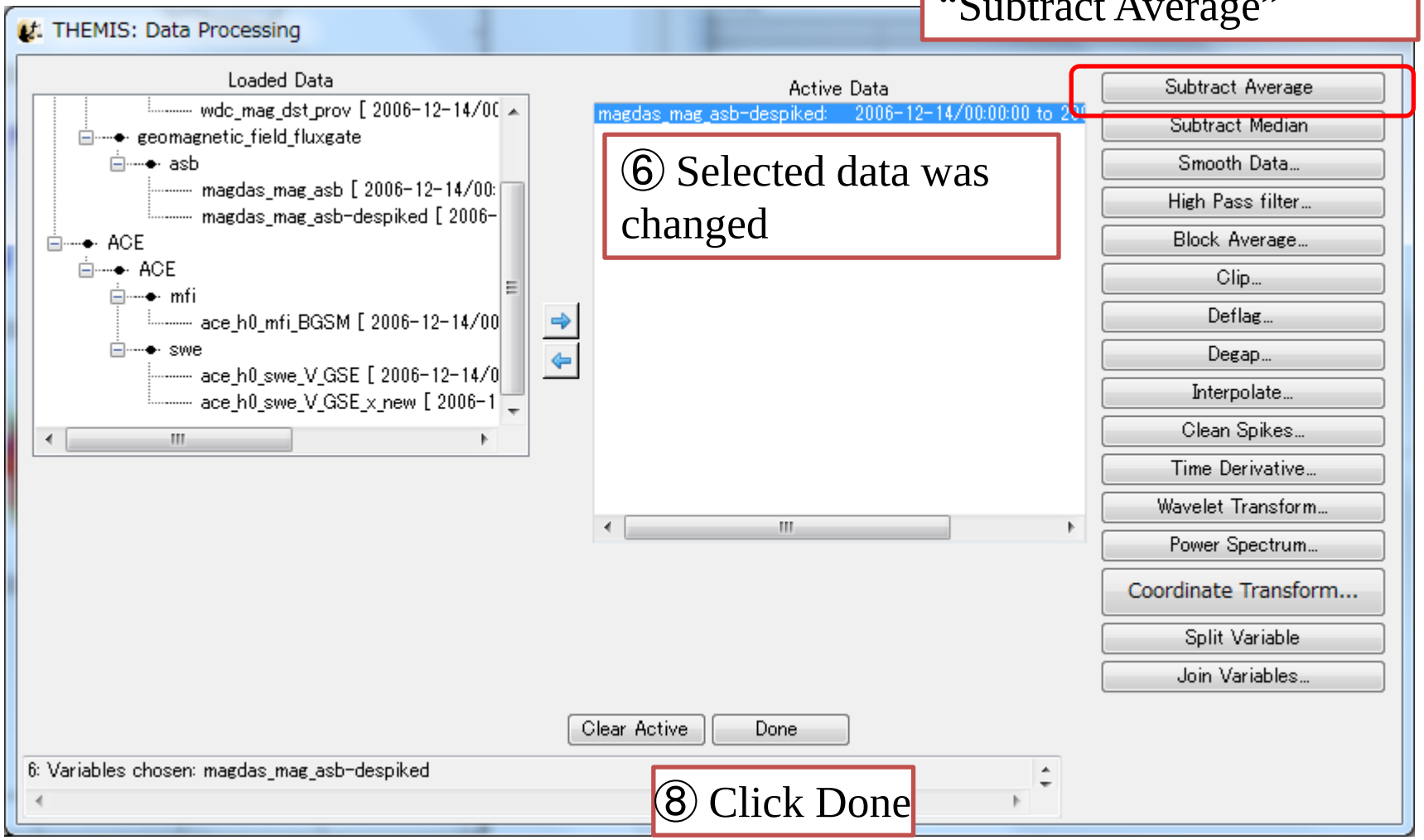
Data Processing Window



GUI Basic Operation

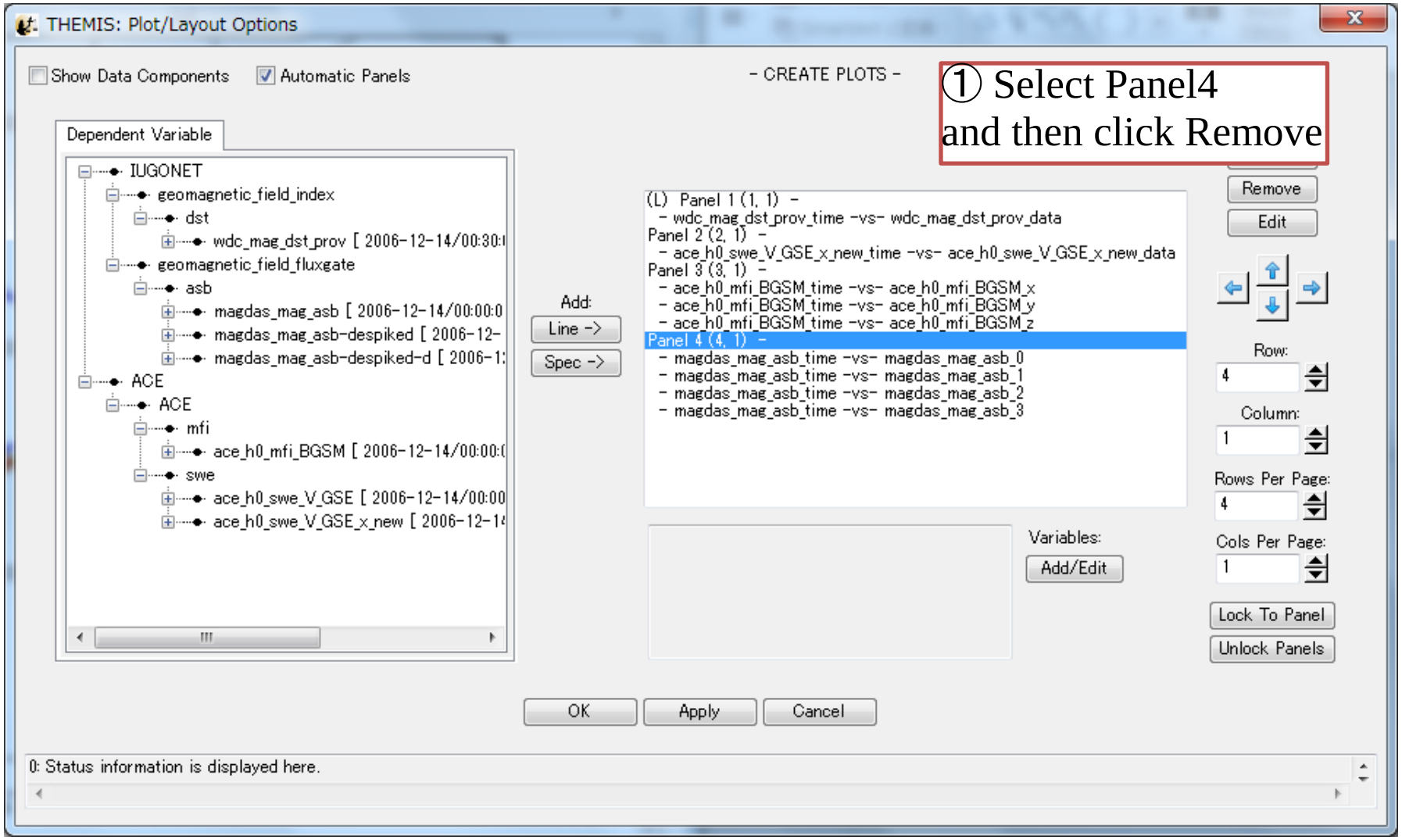
Data Processing Window

⑦ Select analysis method “Subtract Average”



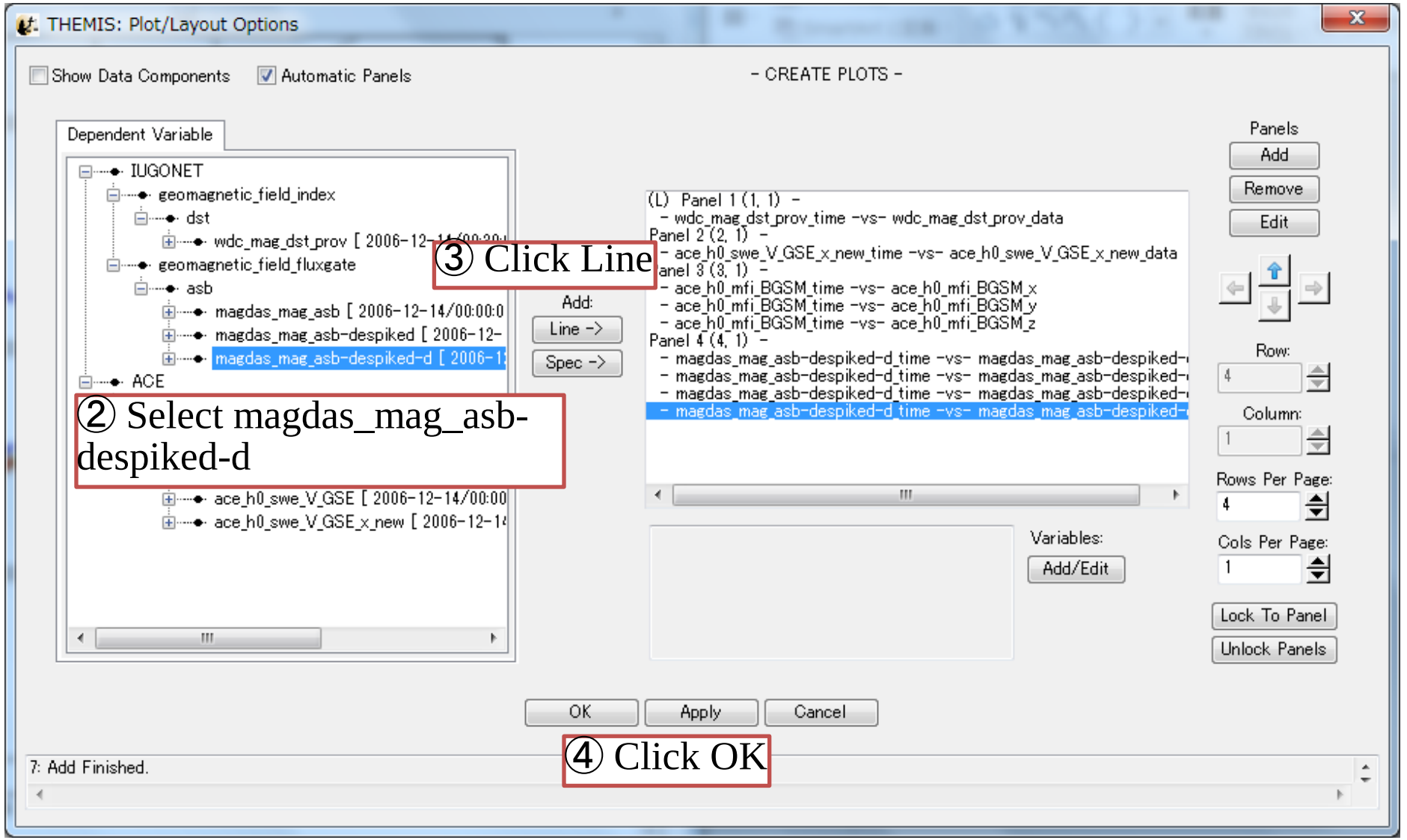
GUI Basic Operation

Plot/Layout Options Window



GUI Basic Operation

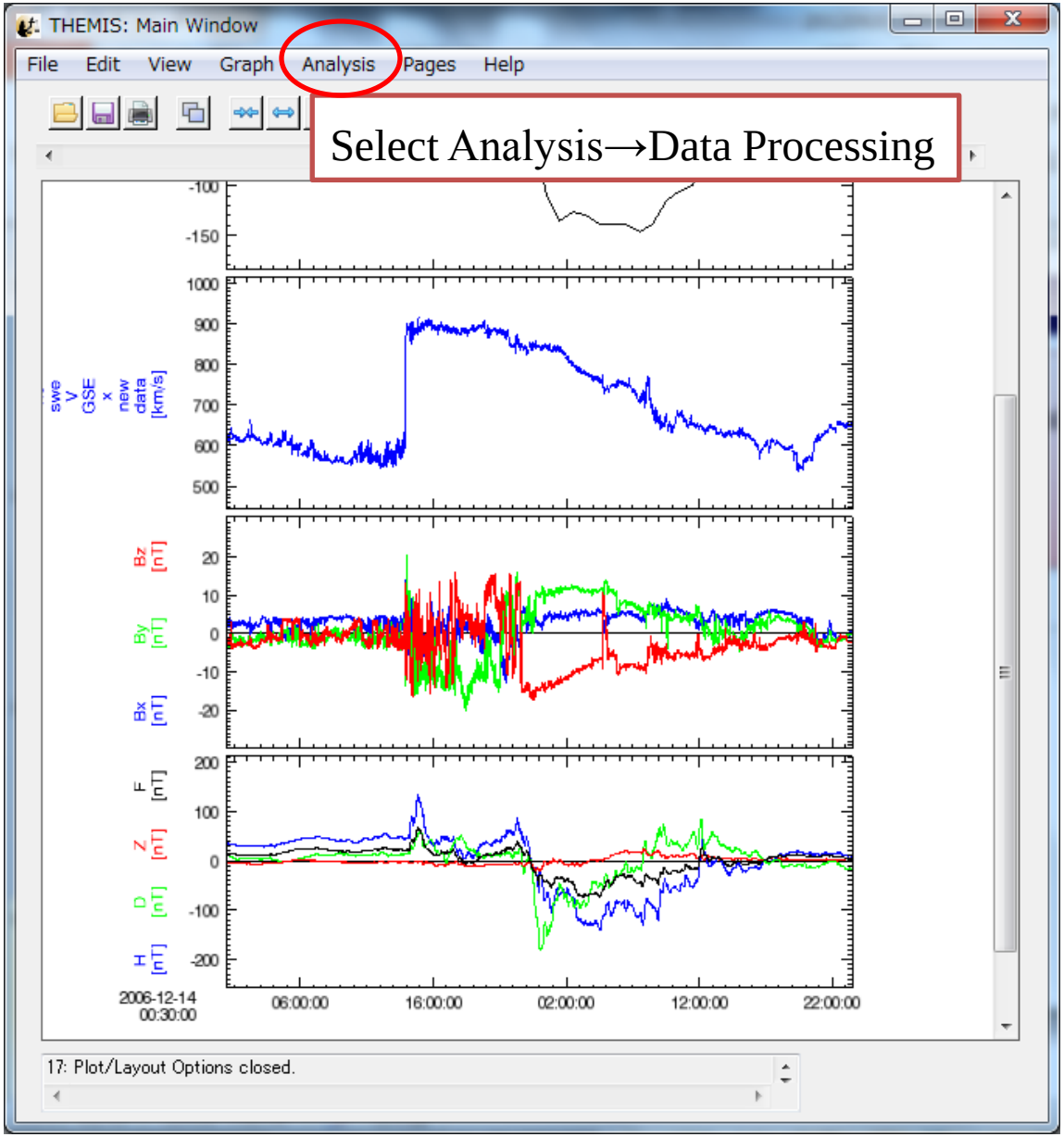
Plot/Layout Options Window



GUI Basic Operation

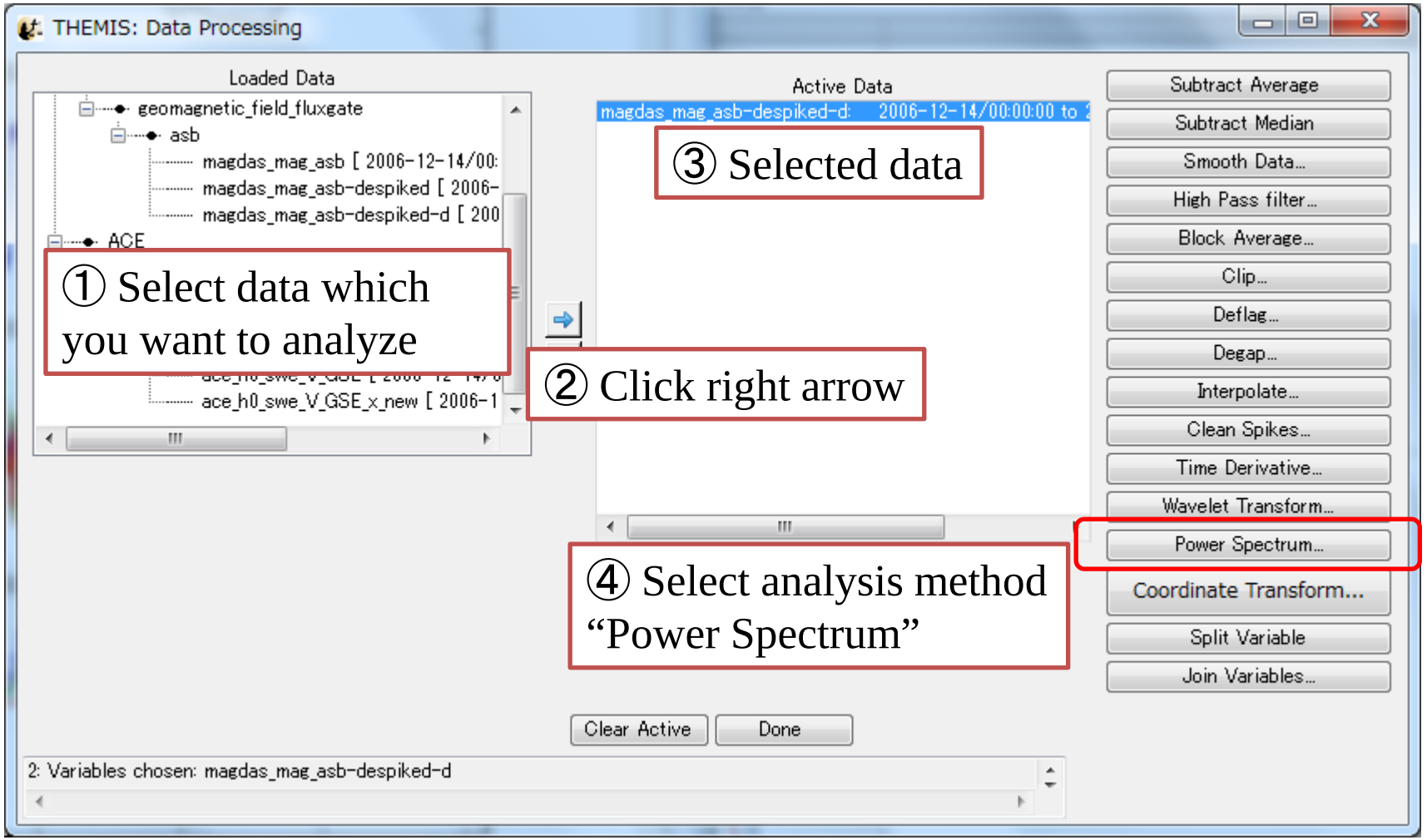
Next:
Calculate Power Spectrum using Data Processing and Spec plot

Component:
magdas_mag_asb-despiked-d
FFT parameter:
Window Size:64
Window Sift: 32



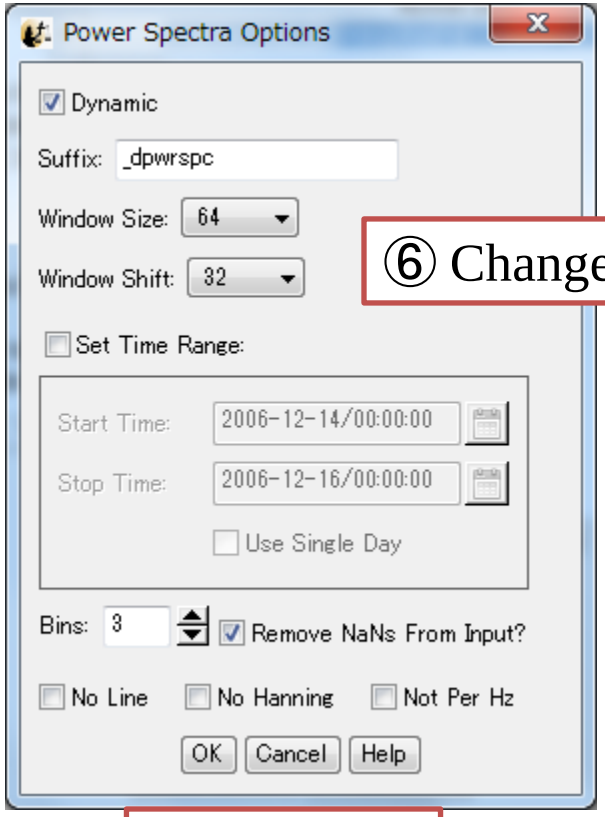
GUI Basic Operation

Data Processing Window



GUI Basic Operation

Power Spectra Options

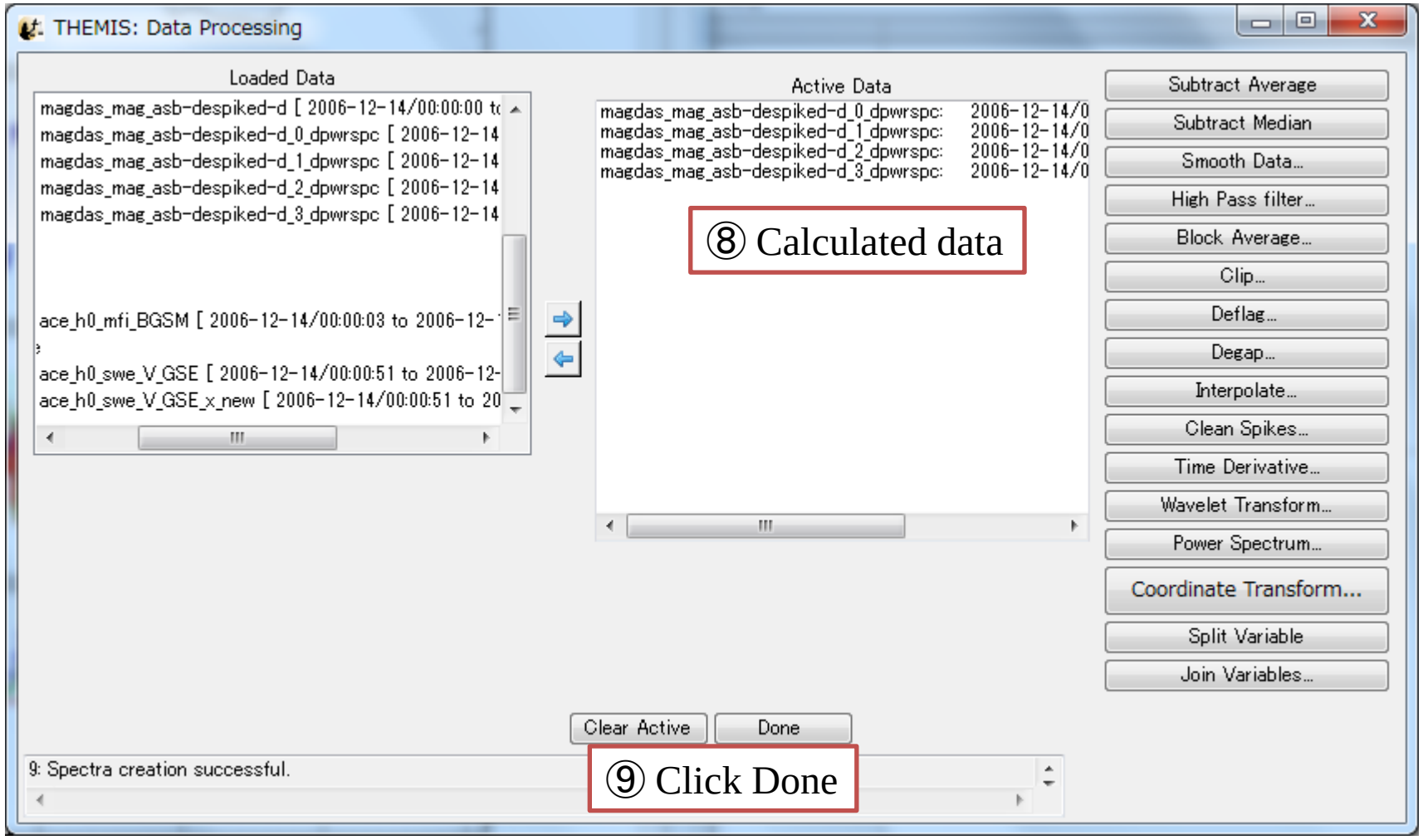


⑥ Change parameters

⑦ Click OK

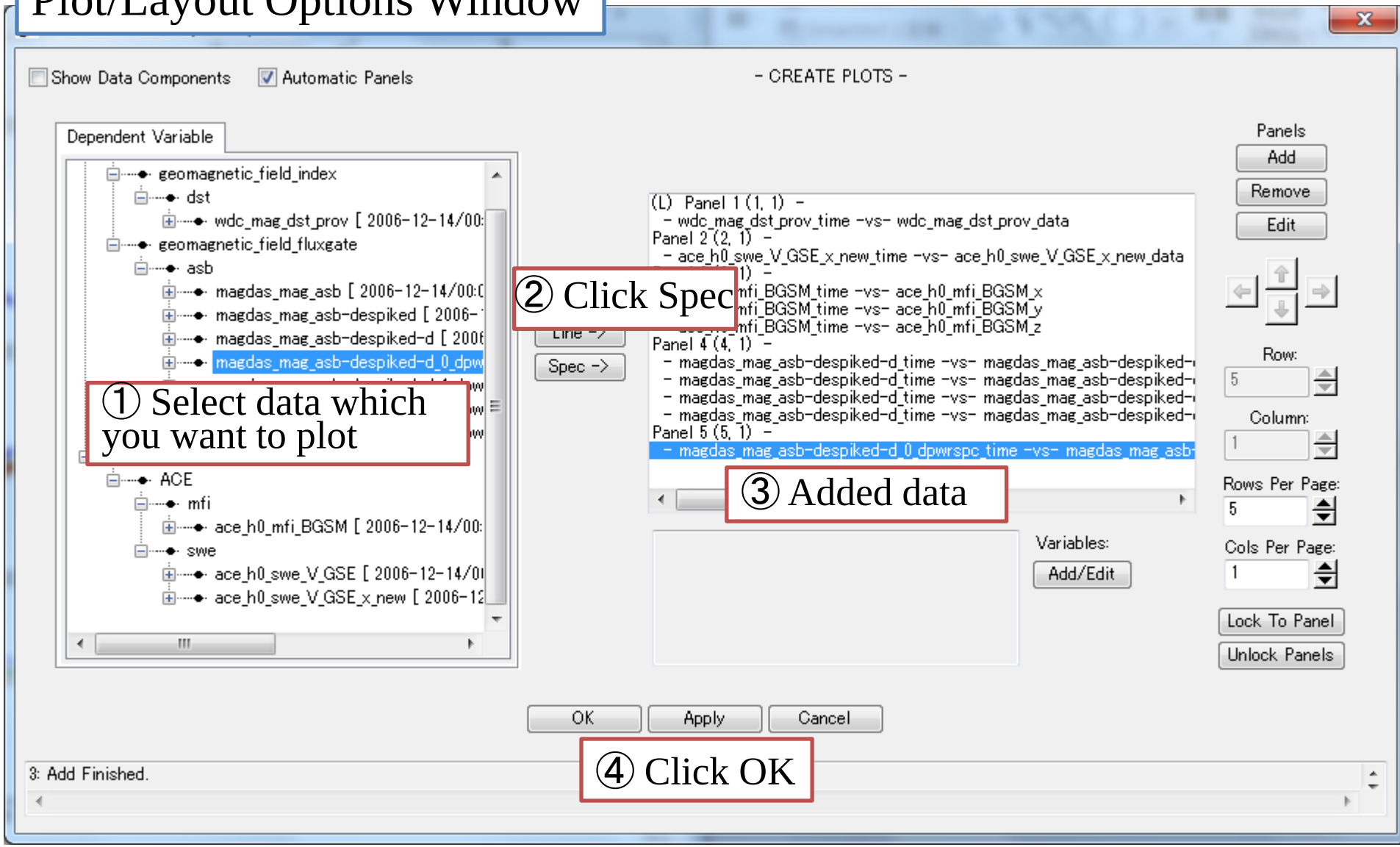
GUI Basic Operation

Data Processing Window



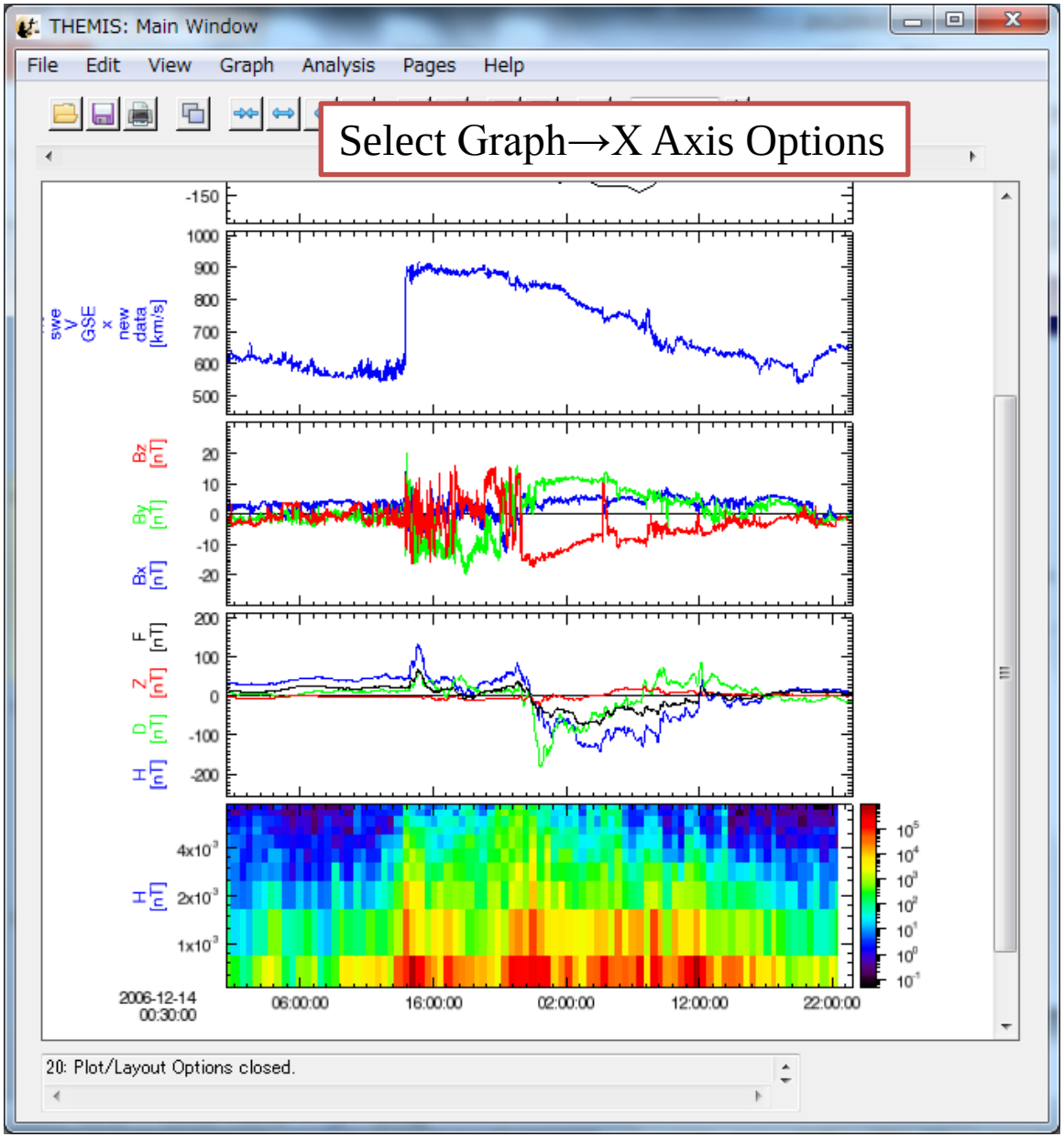
GUI Basic Operation

Plot/Layout Options Window



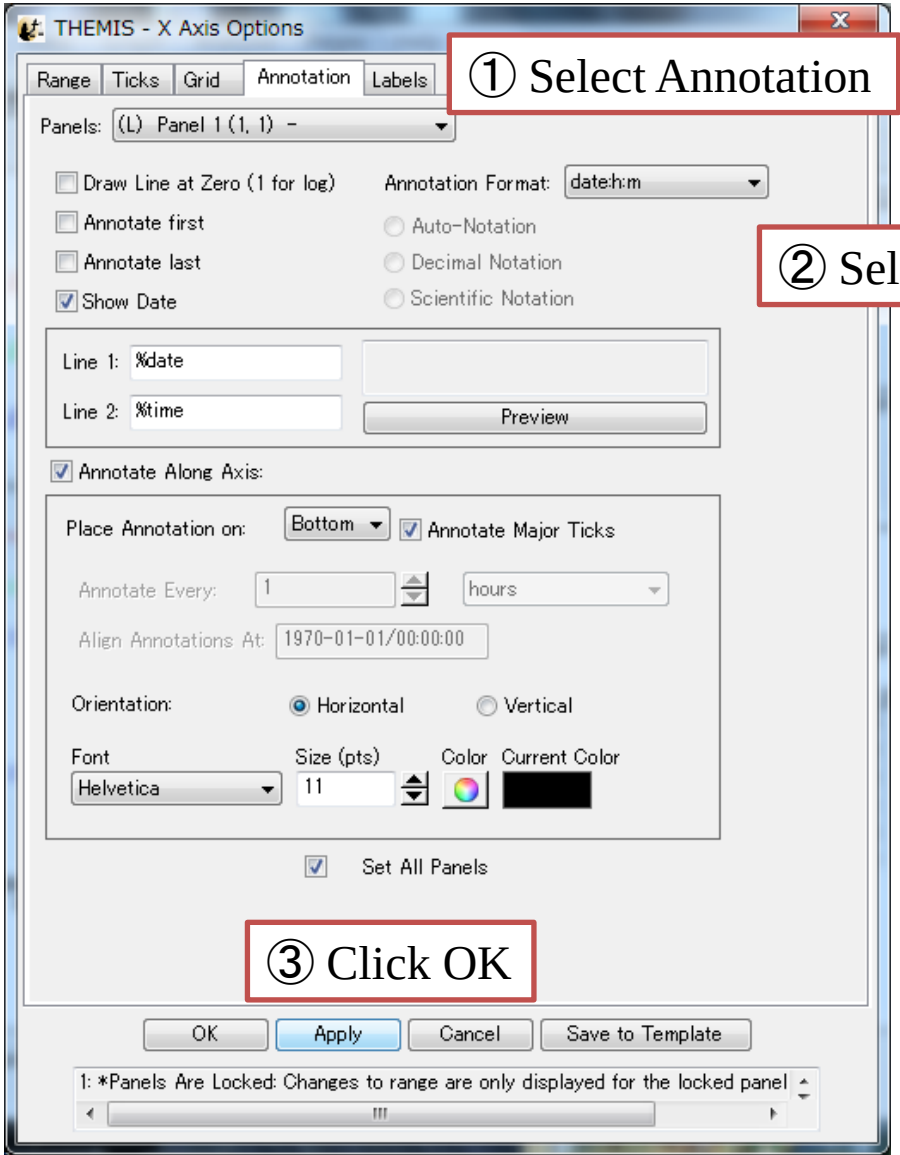
Tips for GUI Operation

Next: Change X axis parameter



Tips for GUI Operation

X Axis Options Window



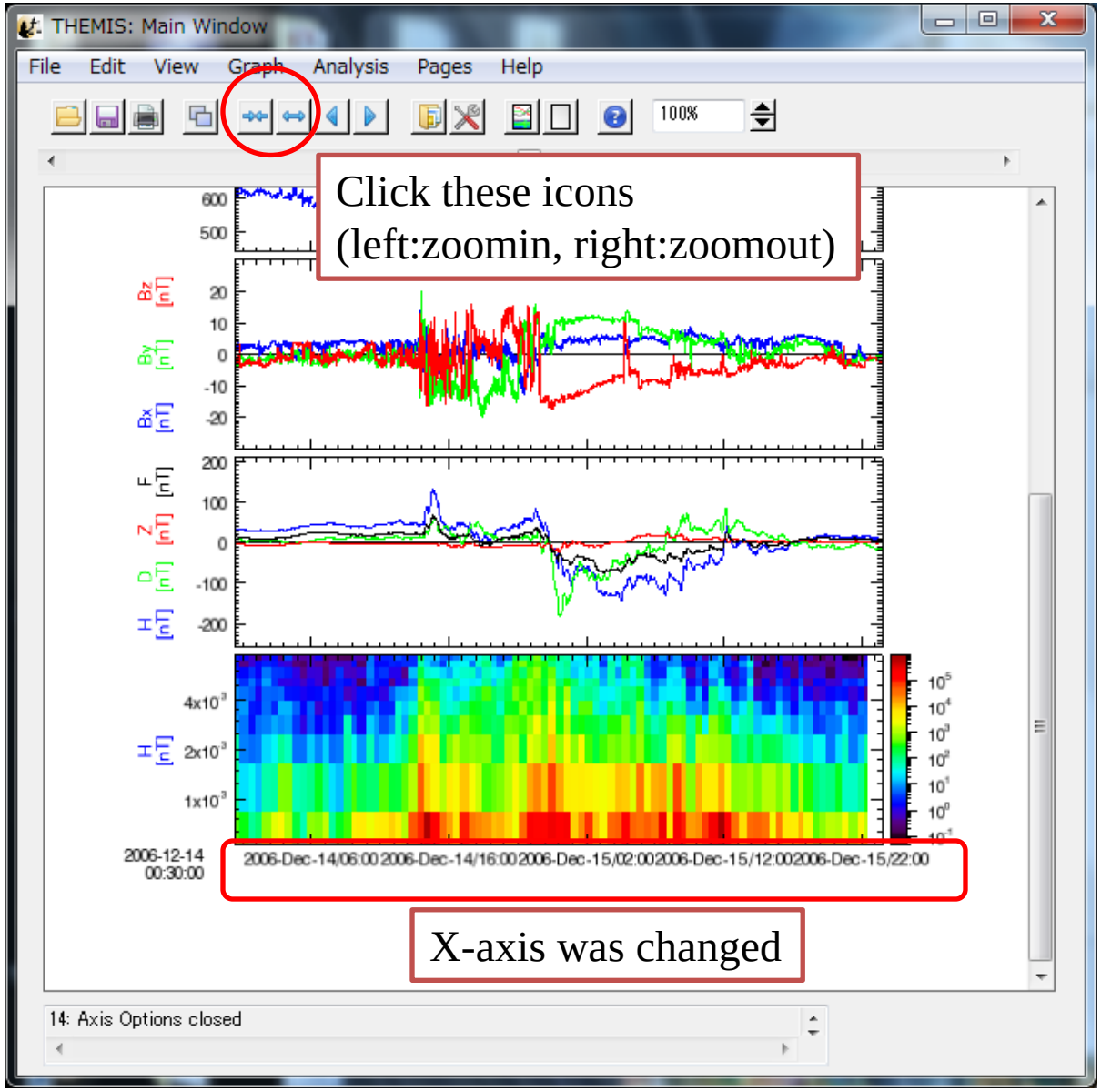
① Select Annotation

② Select date:h:m

③ Click OK

Tips for GUI Operation

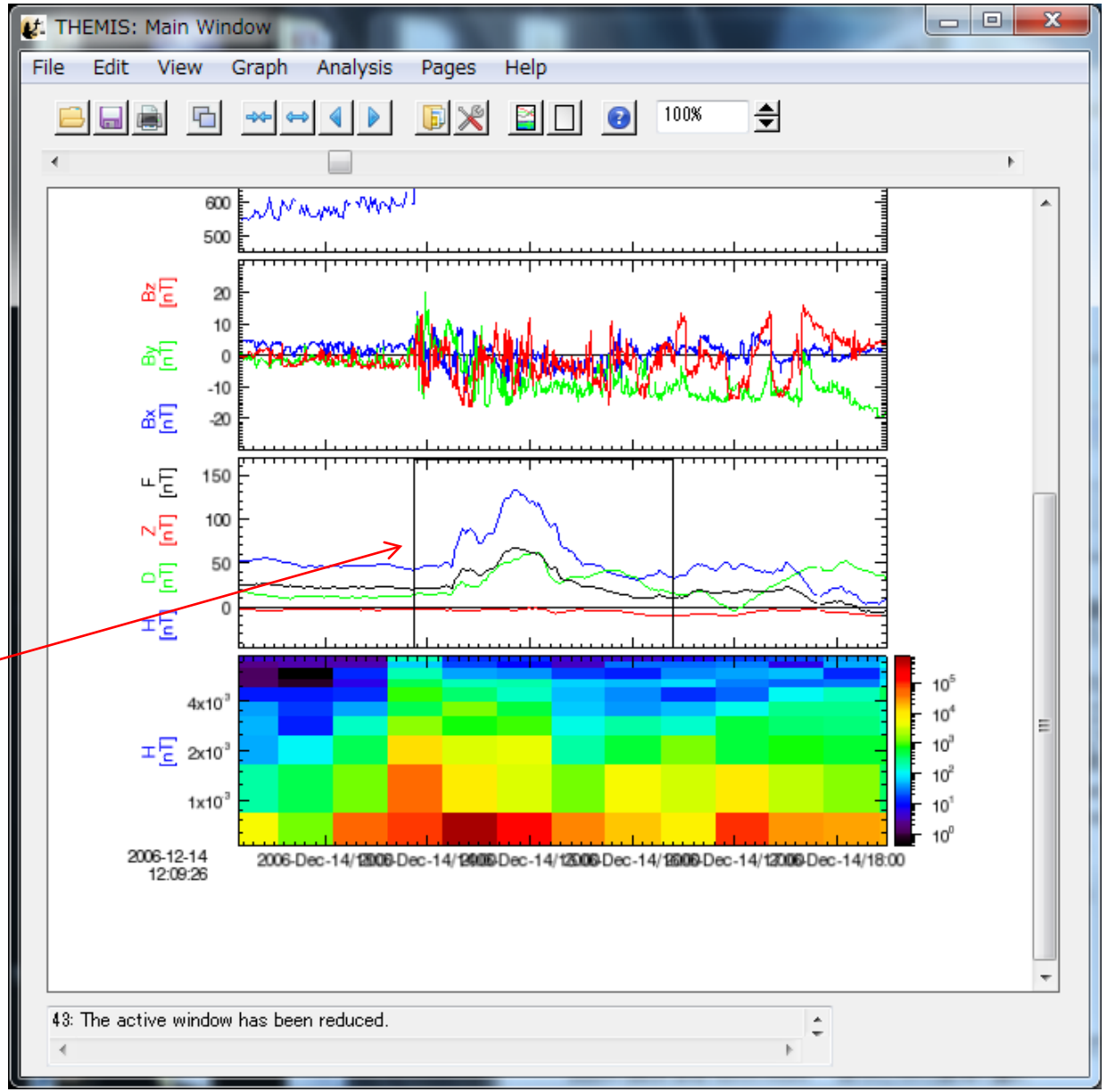
Next: Zoom in and Zoom out



Tips for GUI Operation

Next: Zoom in and Zoom out

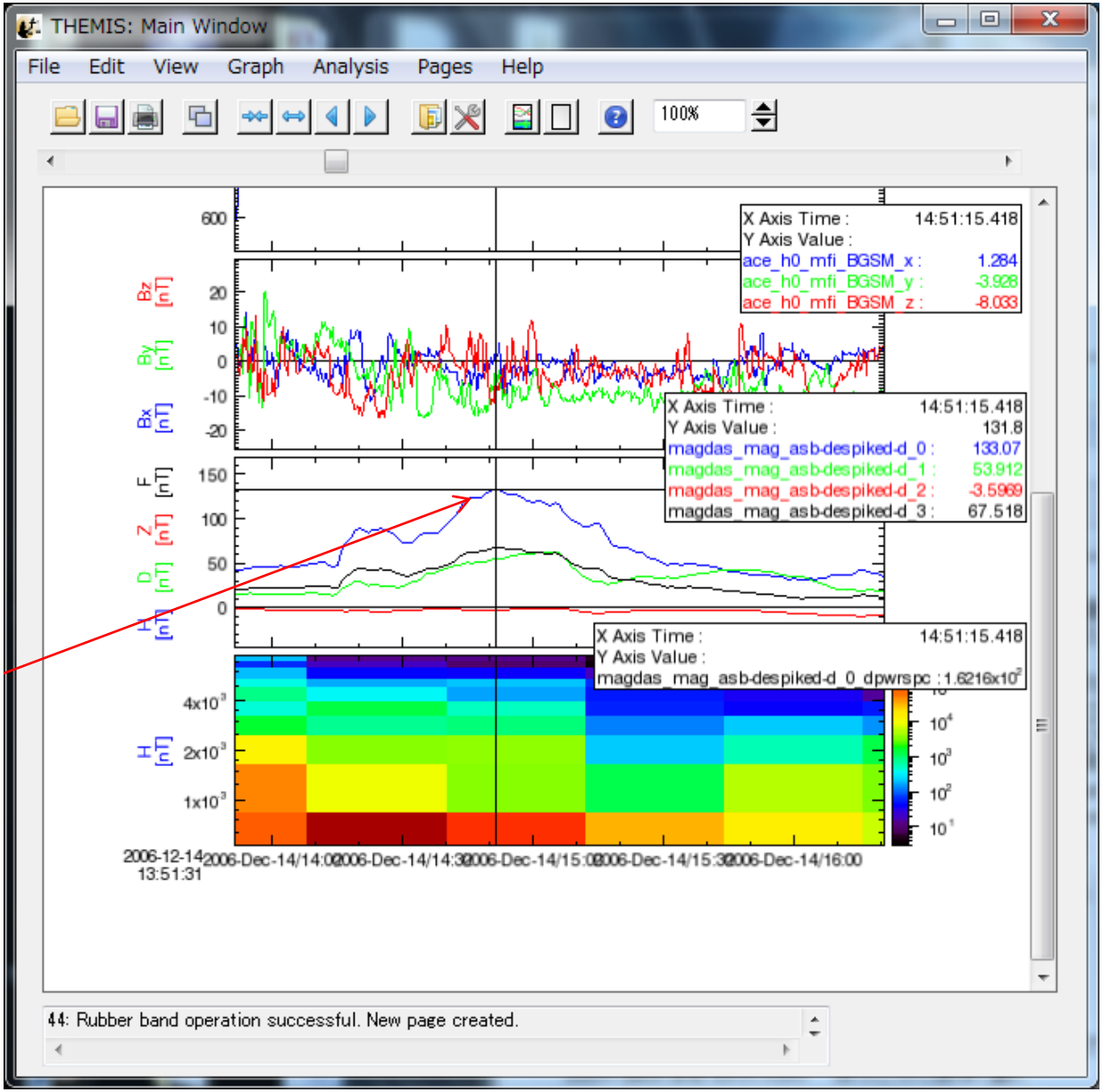
highlight the region by dragging the mouse over it, you will get zoomed in figure!



Tips for GUI Operation

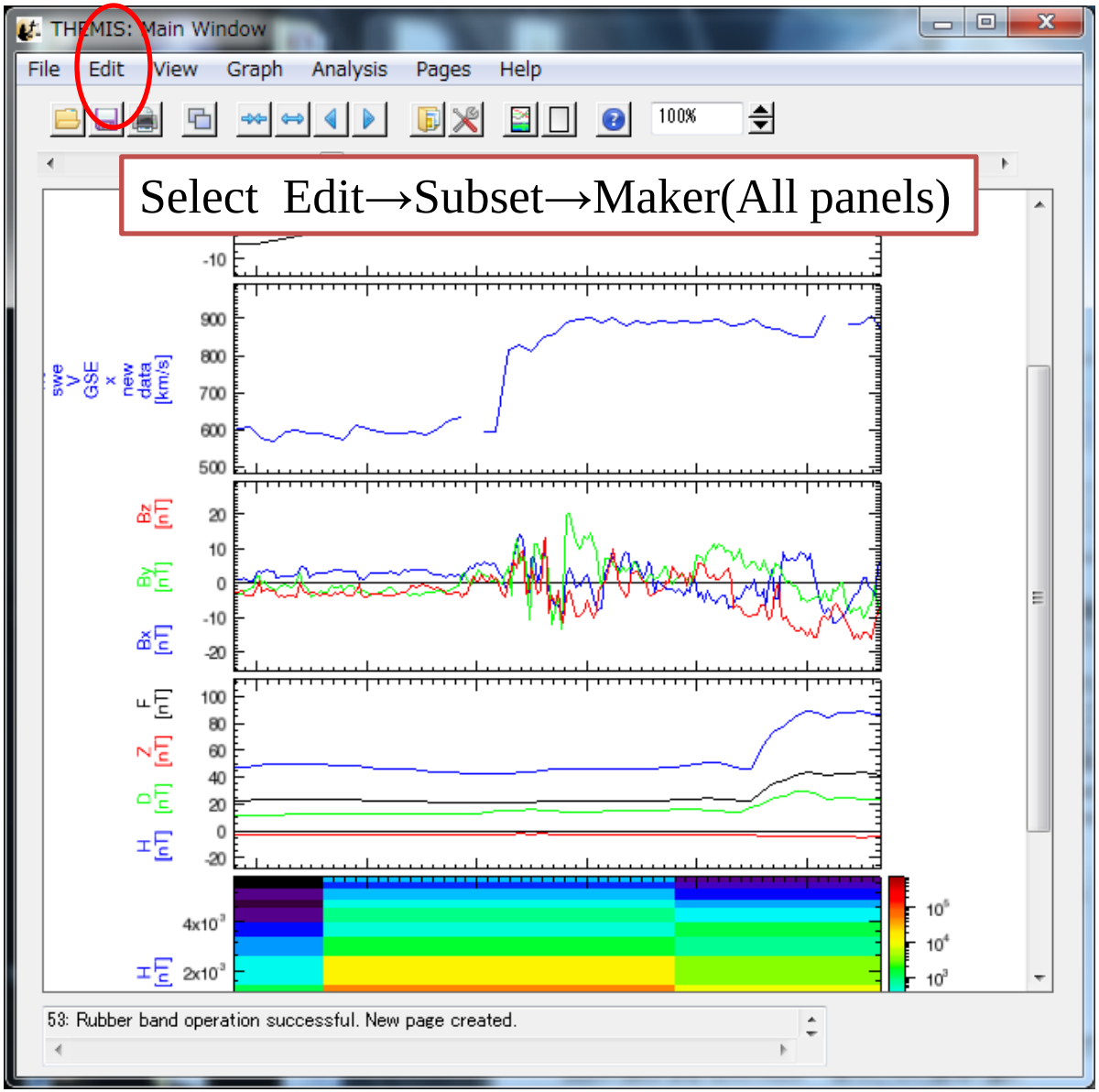
Next: Zoom in and Zoom out

put your mouse pointer over the plot, you will see the value at each plot.



Tips for GUI Operation

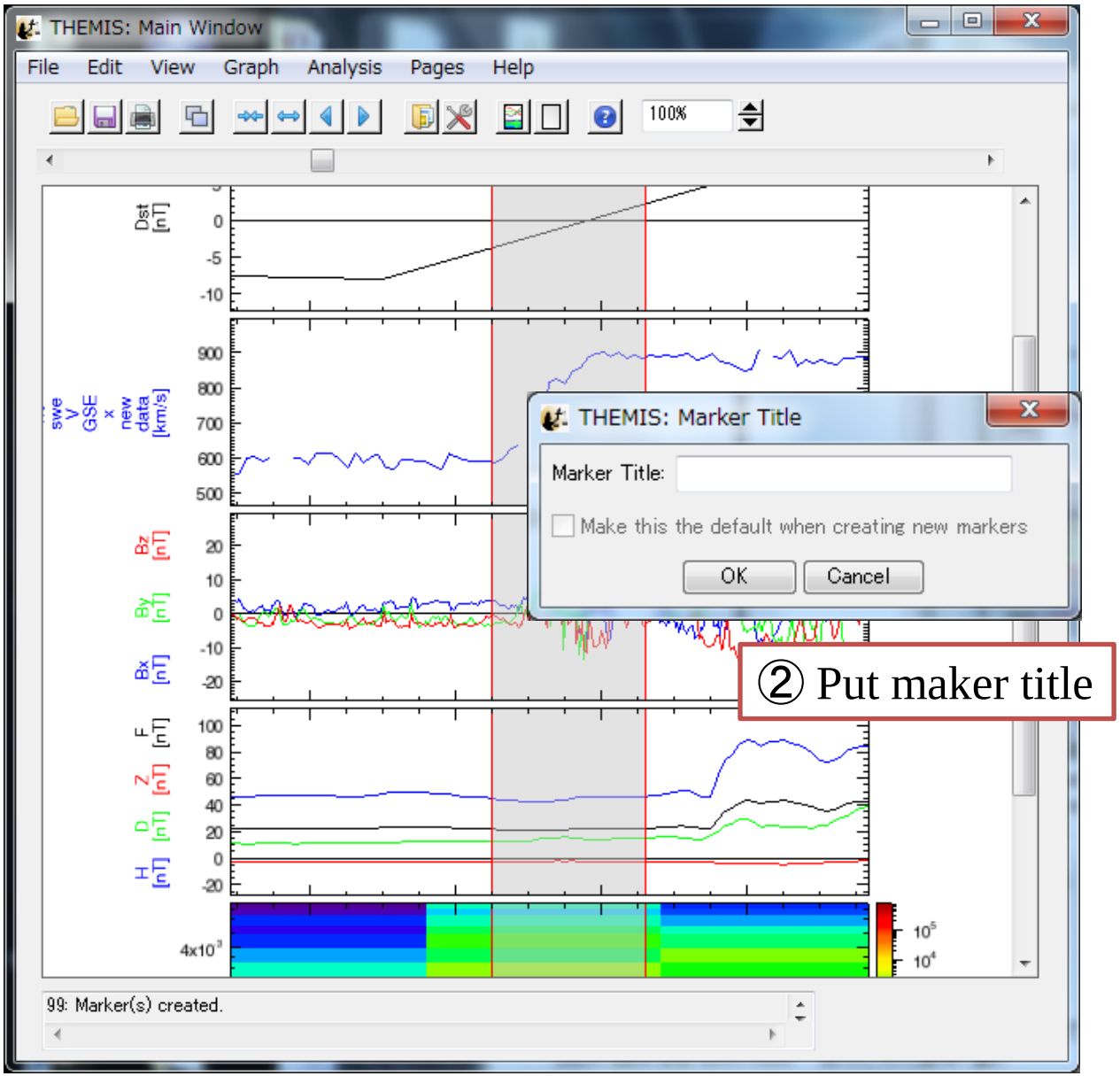
Next: Marking



Tips for GUI Operation

Next: Marking

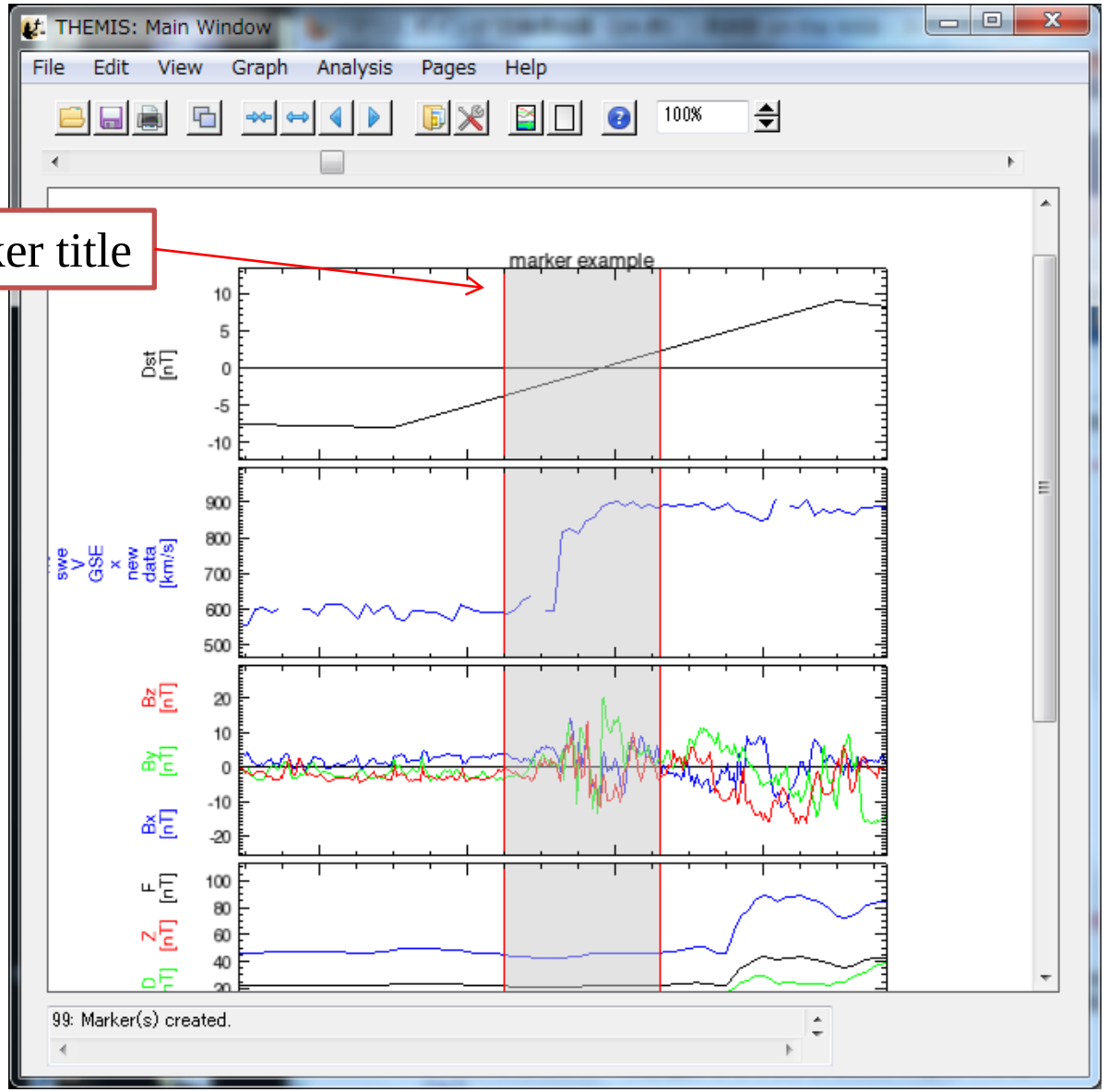
① Hold down the Ctrl key, and then highlight the region by dragging the mouse over it.



Tips for GUI Operation

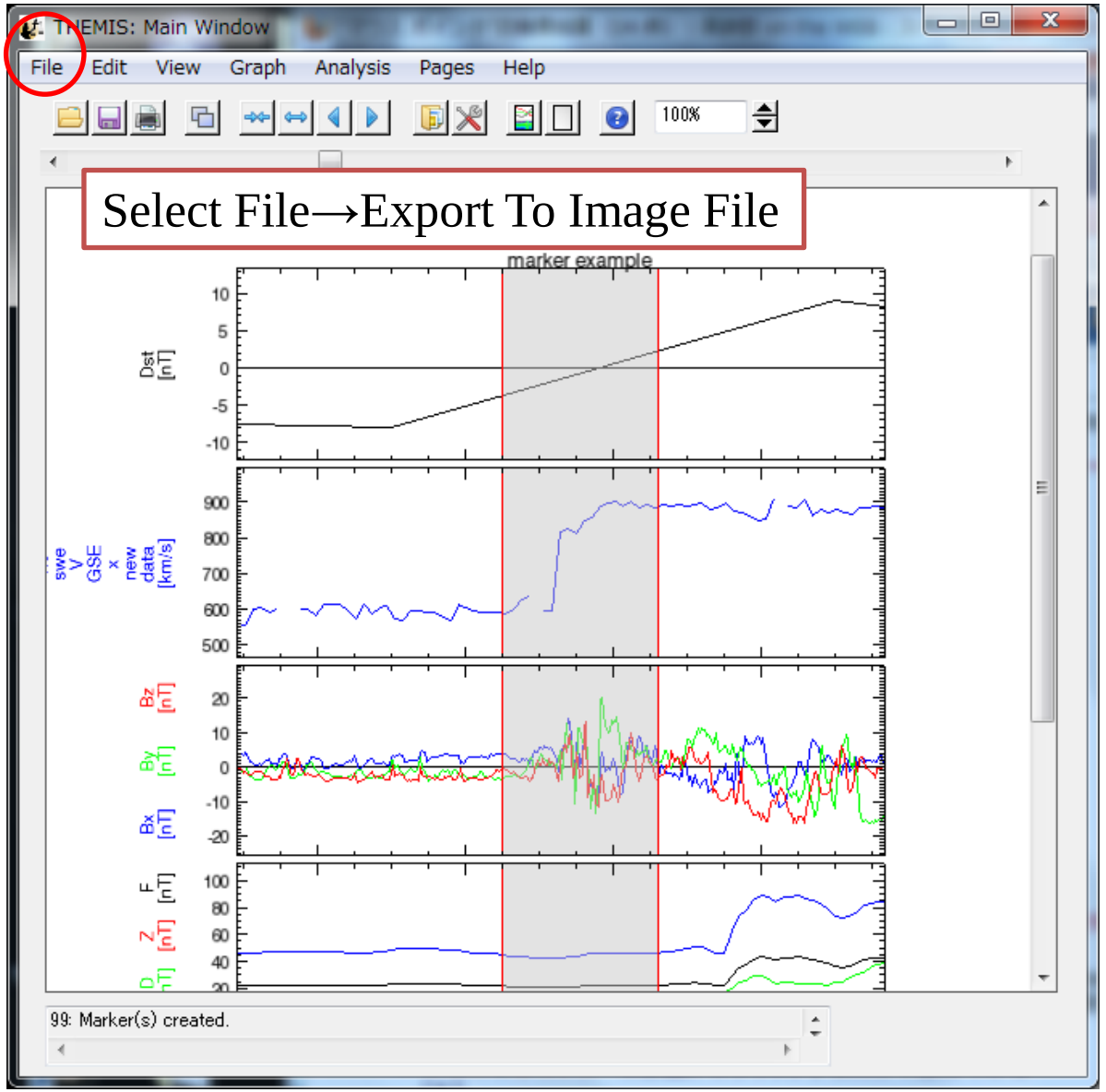
Next: Marking

Marker and maker title



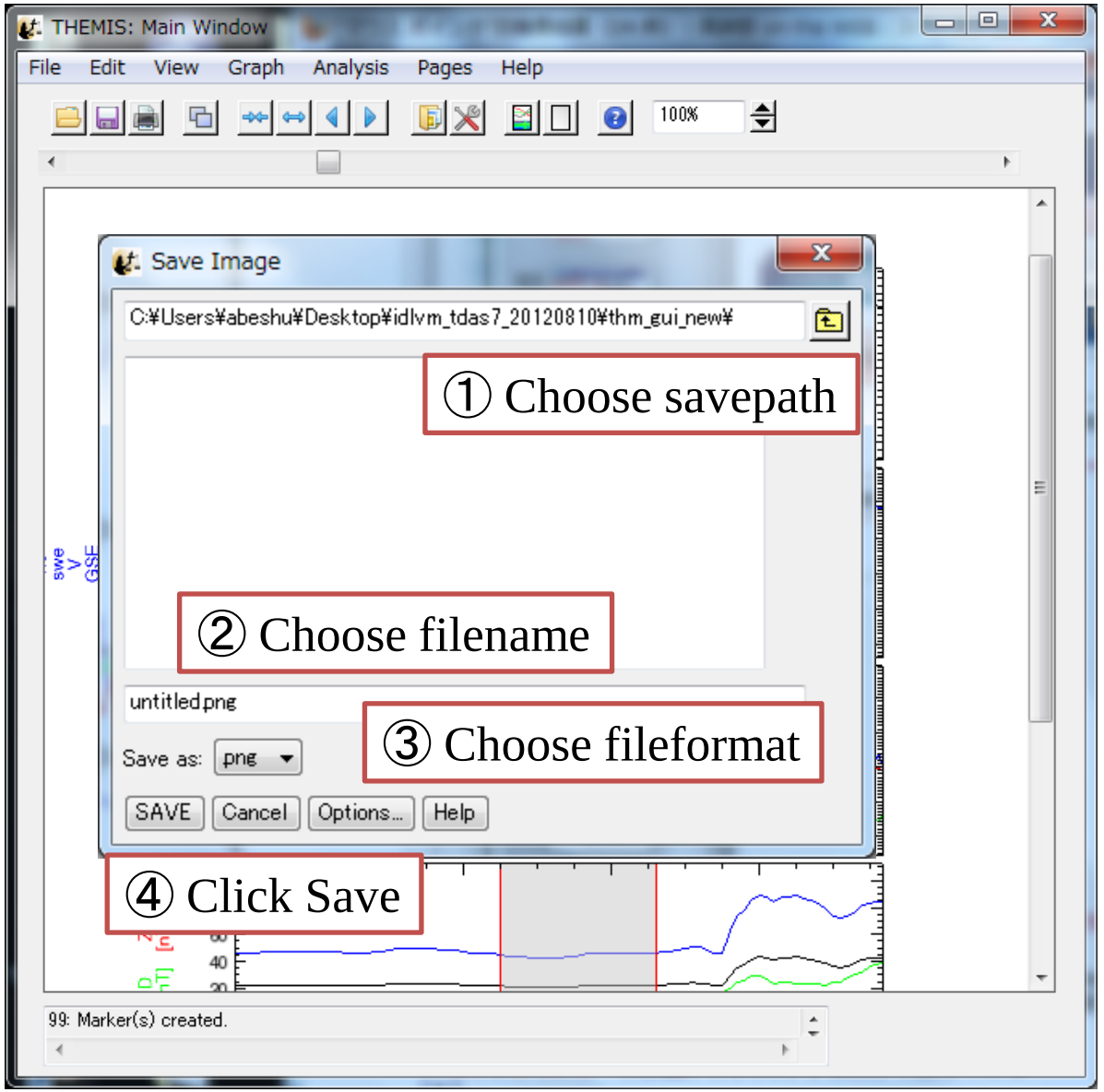
Tips for GUI Operation

Next: Save plot as file



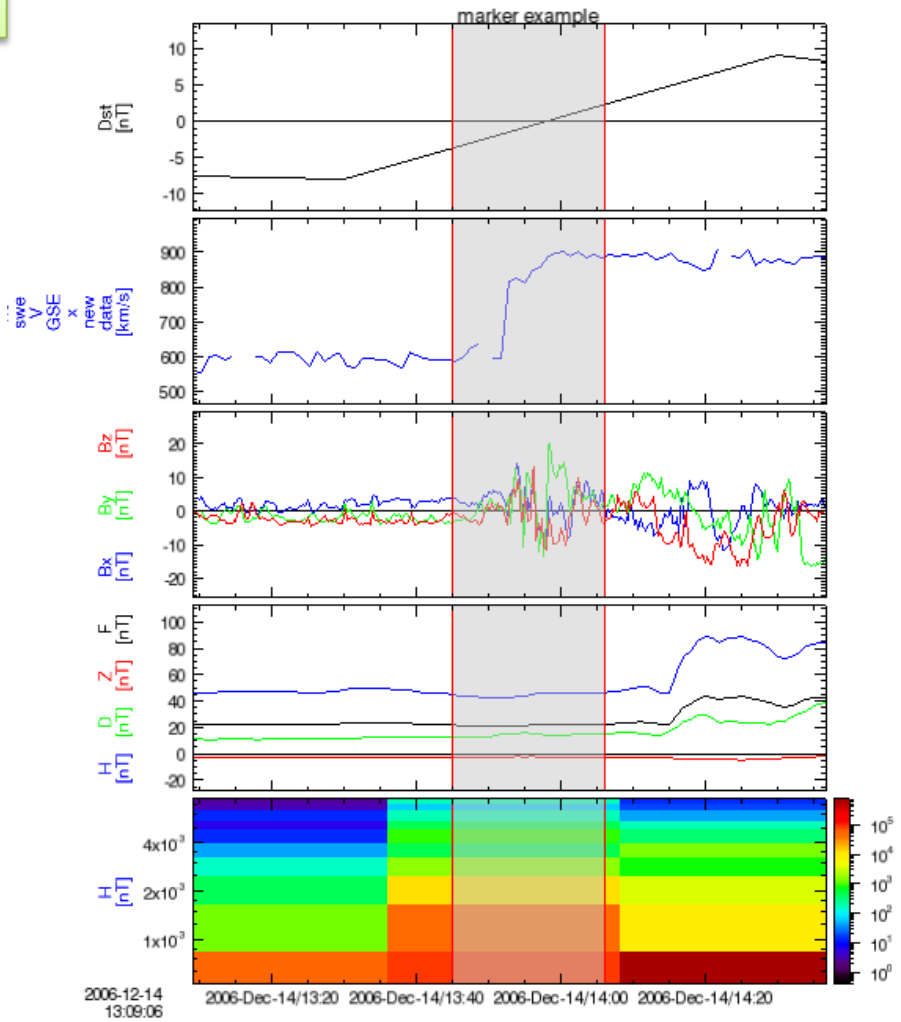
Tips for GUI Operation

Next: Save plot as file



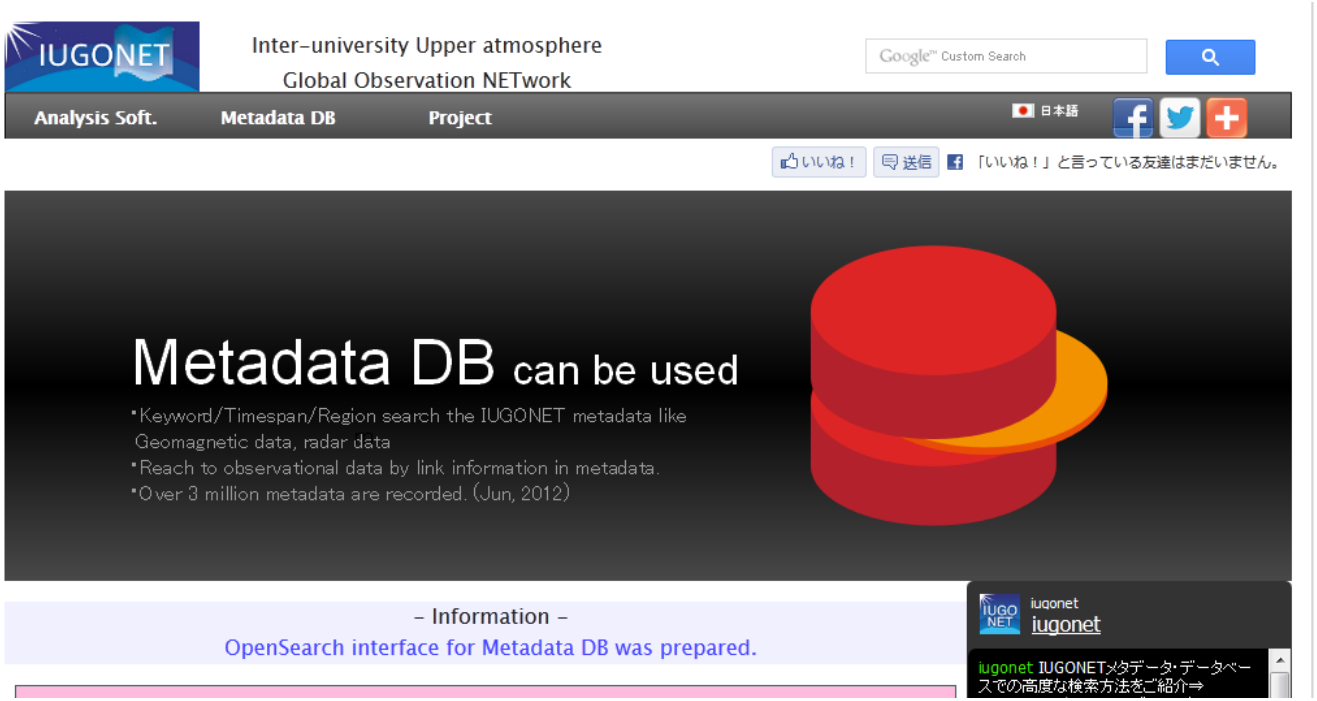
Conclusion

Practice makes perfects!



Website of IUGONET project

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



To know more about this project, please visit this page at regular intervals as we are always posting the latest news.

Thank you for your attention