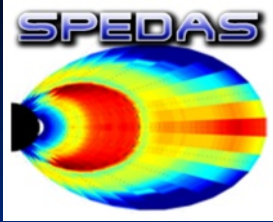


Application of SPEDAS to VarSITI program ~ Introduction of IUGONET and ERG plugins ~

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7. Planetary Plasma and Atmospheric Research Center, Tohoku University
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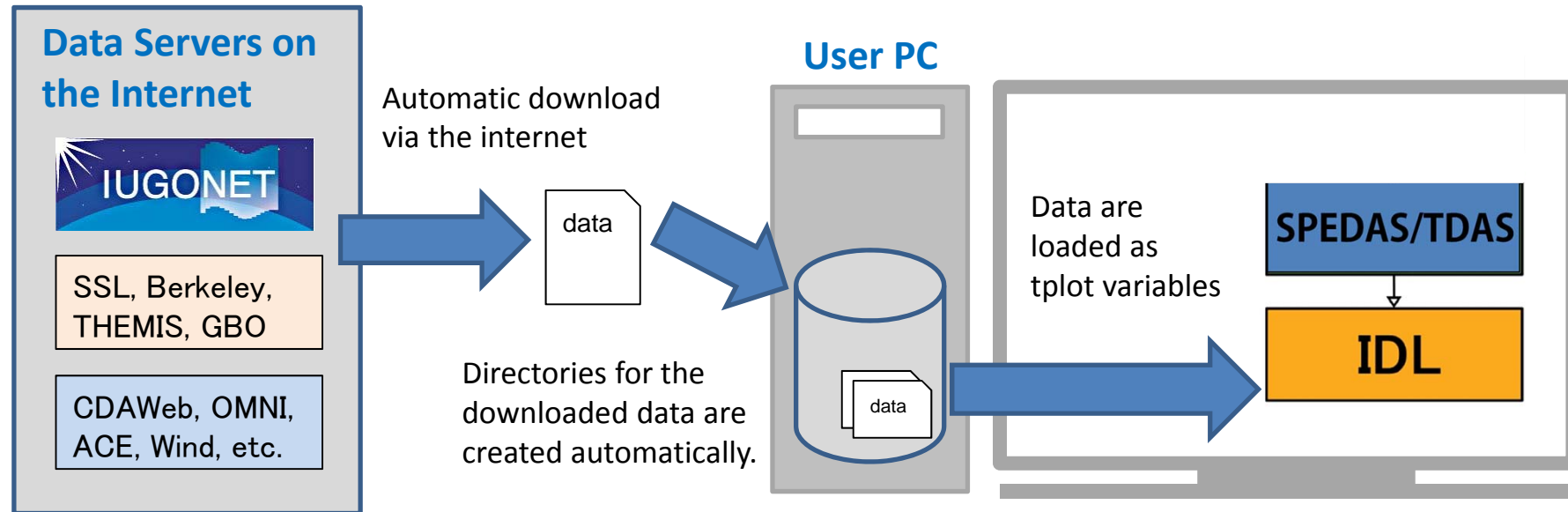


What is SPEDAS

Space Physics Environment Data Analysis Software (SPEDAS)

- Grass-roots data analysis software for Space Physics Community
- Is based on Interactive Data Language (IDL)
- Evolved from software developed for the THEMIS mission, called TDAS (THEMIS Data Analysis Software)
- Was developed by scientists and programmers of the UC Berkeley's Space Sciences Laboratory, UCLA's IGPP and other contributors.
- Contains a Graphical User Interface (GUI) for ease of use
- Works with Windows, Linux and Mac OS X.
- Command Line Interface can be used with an IDL license
- GUI is available through IDL VM freeware without an IDL license

Outline of Loading/Plotting Data Using SPEDAS



Data can be easily plotted, for example, by only three basic commands with the SPEDAS-CUI tool.

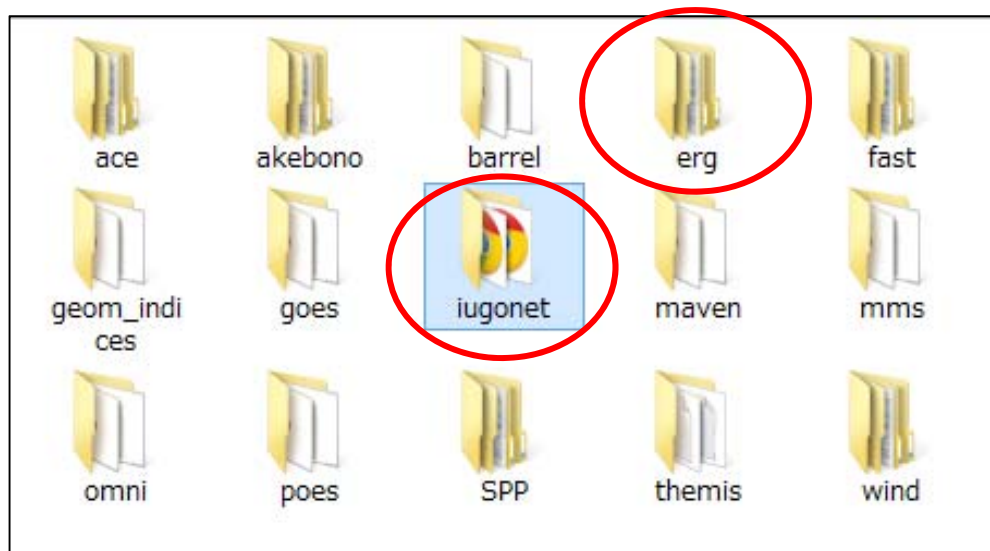
- | | |
|-------------------------|------------------------|
| 1. Set a time period | timespan, 'yyyy-mm-dd' |
| 2. Load *** data | iug_load_*** |
| 3. Plot the loaded data | tplot, +++ |

If using the GUI tool, only a few simple clicks of your mouse are required to procedure the same plot as that created by the above command with the CUI tool.

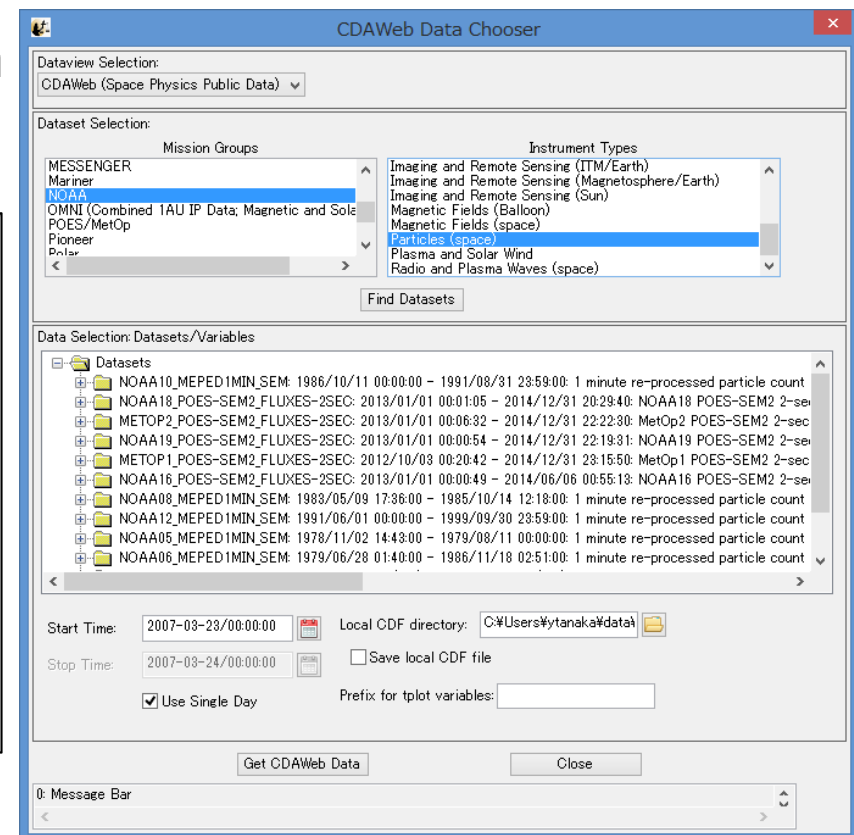
Plugins included in SPEDAS

- ✓ A variety of projects have provided plugins for SPEDAS.
- ✓ SPEDAS has a function of loading various satellite and ground-based observation data from CDAWeb.

Plugins contained in “projects” directory of the bleeding-edge version of SPEDAS (as of August 15, 2015)

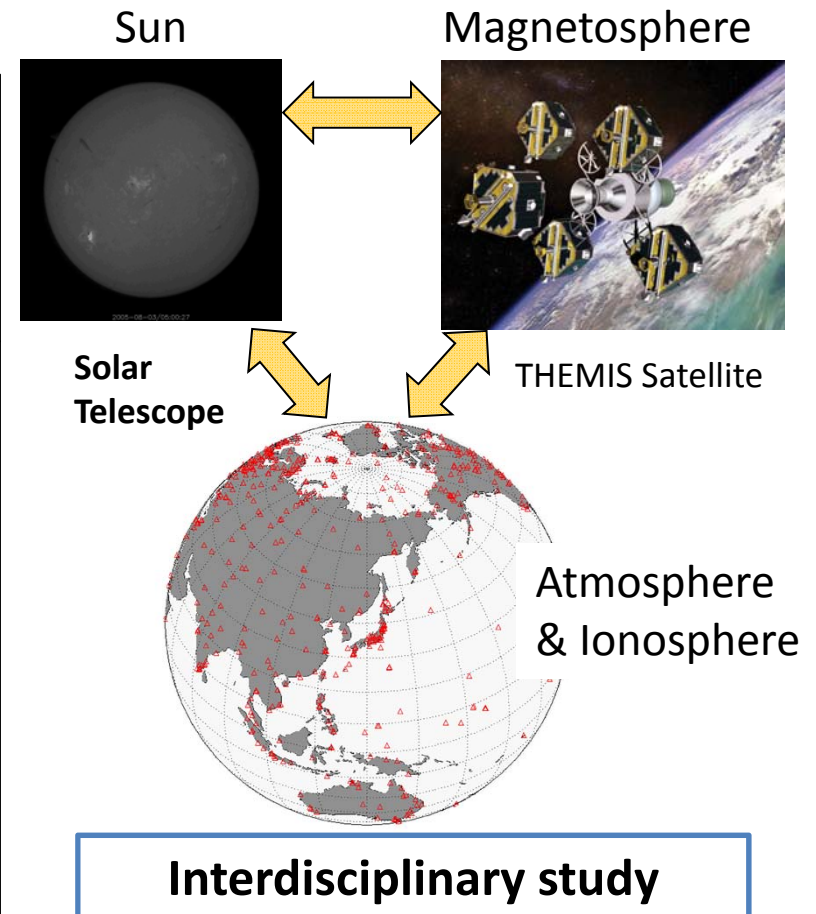
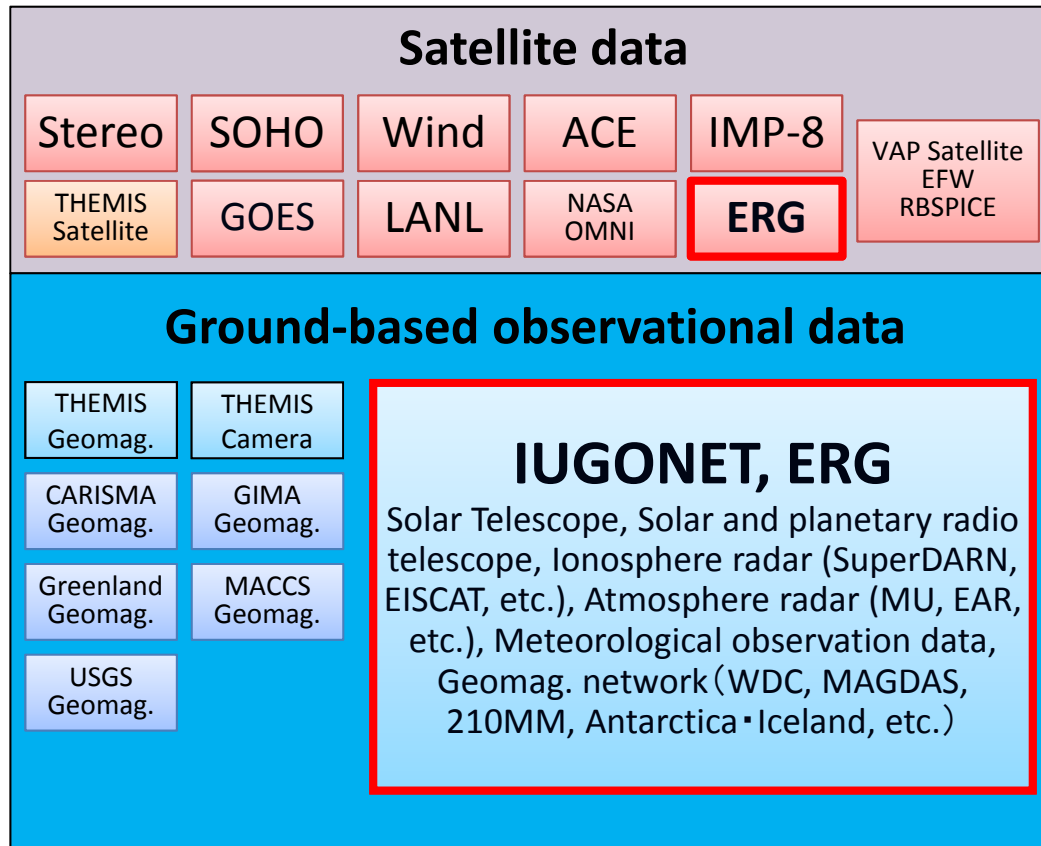


CDAWeb Data Load Window



Contributions of IUGONET and ERG-SC to SPEDAS

Data supported by SPEDAS



- ✓ IUGONET and ERG projects have provided plugins for SPEDAS, which includes many routines for loading various ground-based observation (and in near future satellite observation) data.
- ✓ SPEDAS is suitable for researches in the VarSITI program, in particular, for SPeCIMEN and ROSMIC projects.

An example of data visualization with SPEDAS

(Set time period)

timespan, '2015-3-17', 2

(Load various data)

omni_hro_load

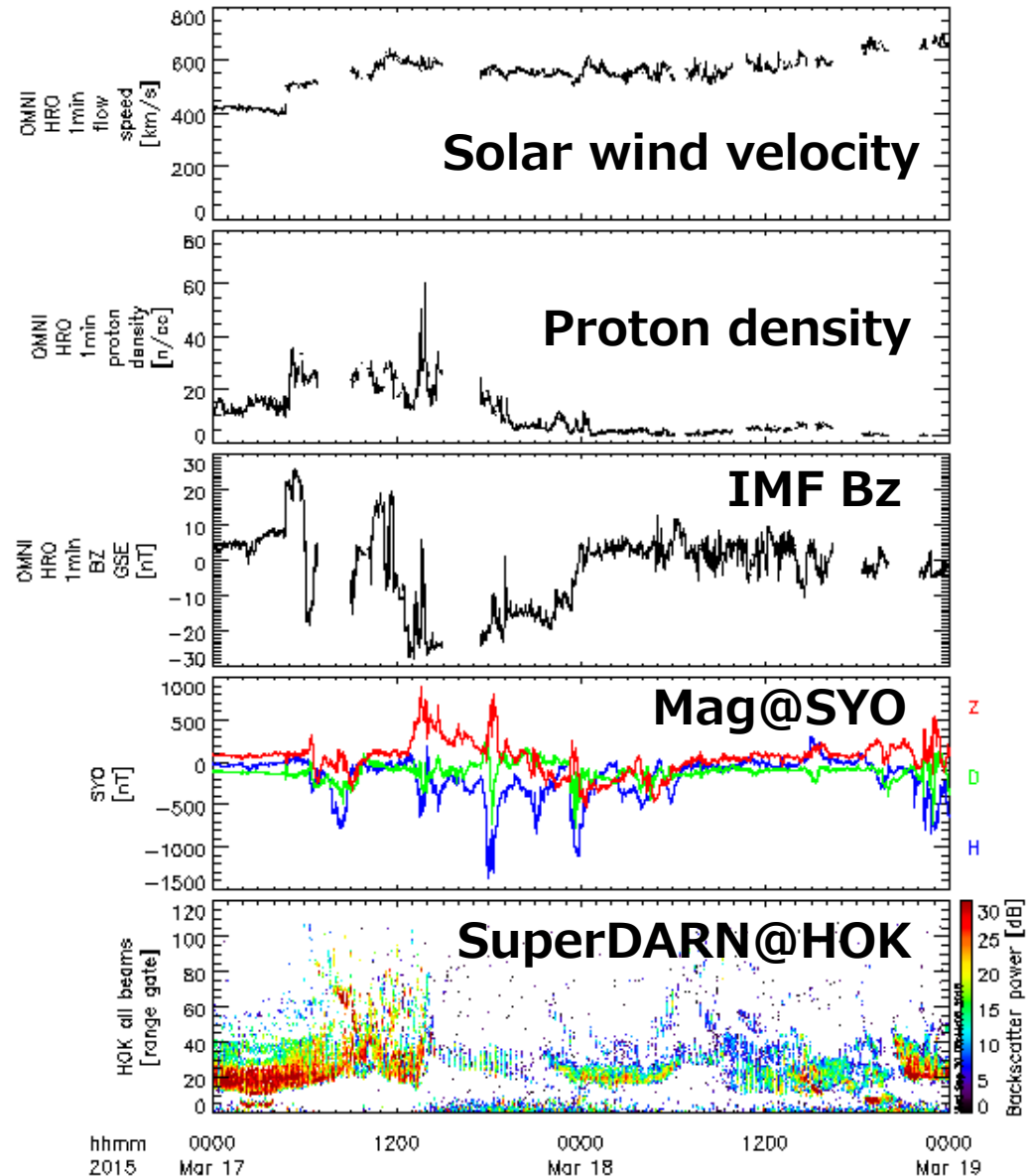
iug_load_gmag_nipr, site='syo'

erg_load_sdfit, site='hok'

(Plot time-series data)

tplot, [18, 22, 13, 43, 45]

Very easy!





Load procedures in IUGONET plugin (1)

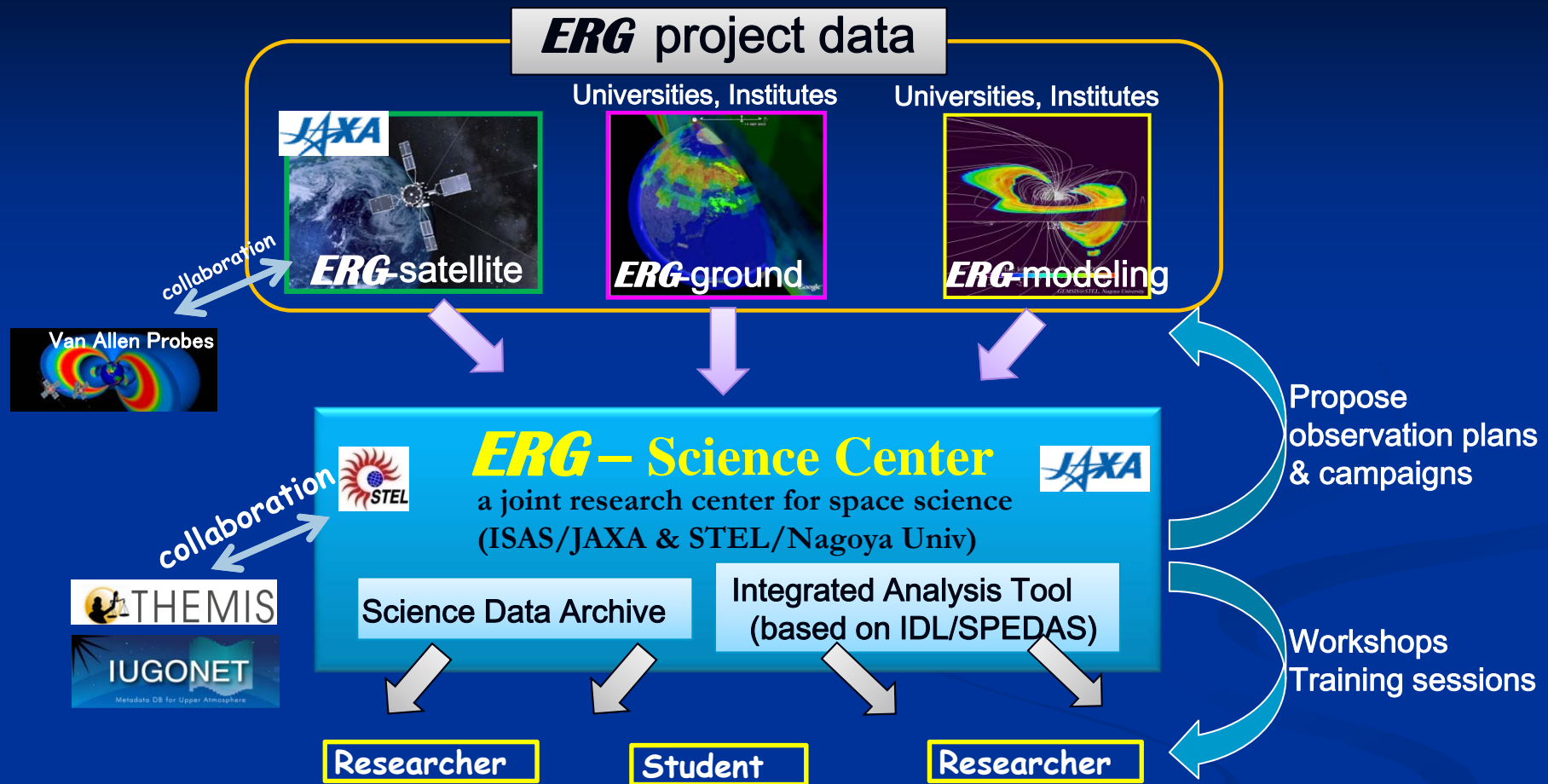
UDAS Load Routines	Observation Data
iug_load_smart	Solar images obtained by the SMART telescope
iug_load_iprt	Solar HF radio spectrum
iug_load_hf_tohokuu	Jupiter's/solar wide band spectral data in HF-band
iug_load_aws_rish	Surface meteorology data taken by the Automatic Weather Station (AWS)
iug_load_blr_rish	Boundary layer radar data
iug_load_ltr_rish	L-band lower troposphere radar data
iug_load_ear	Equatorial Atmosphere Radar (EAR) data
iug_load_mu	MU radar data
iug_load_meteor_rish	Meteor radar data
iug_load_mf_rish	MF radar data
iug_load_wpr_rish	Wind profiler radar data
iug_load_ionosonde_rish	Ionogram data taken by the Ionosonde at Shigaraki
iug_load_radiosonde_rish	Radiosonde data
iug_load_sdfit	SuperDARN radar data
iug_load_eiscat	EISCAT radar data



Load procedures in IUGONET plugin (2)

UDAS Load Routines	Observation Data
iug_load_eiscat_vief	EISCAT radar data (ion velocity and electric field vectors)
iug_load_iriio_nipr	Imaging riometer data at Syowa Station, Antarctica
iug_load_lfrto	Low frequency radio transmitter observation data
iug_load_avon_vlfb	Asia VLF Observation Network (AVON/VLF-B) data
iug_load_camera_omti_asi	Optical Mesosphere Thermosphere Imagers (OMTI) all-sky imager data
iug_load_asi_nipr	All-sky imager data
iug_load_ask_nipr	All-sky imager keogram data
iug_load_gmag_wdc	AE, Dst, ASY/SYM indices, geomagnetic field data at the observatories
iug_load_gmag_nipr	Geomagnetic field data (Syowa, Iceland, and automated magnetometer network near the Syowa Station)
iug_load_gmag_mm210	210° Magnetic Meridian magnetometer network data
iug_load_gmag_magdas_1sec	MAGDAS ground magnetometer data
iug_load_gmag_stel_induction	Induction magnetometer data from STEL, Nagoya Univ.
iug_load_gmag_nipr_induction	Induction magnetometer data from NIPR
iug_load_kyushugcm	Kyushu GCM simulation data

The *ERG* Science Center



- ◆ Data from satellite, ground-based networks, and simulations have been archived in CDF (Common Data Format) by ERG-science center.
- ◆ Plug-in tools for these data has also been developed by ERG-SC.
- ◆ L-2 and higher science data will be opened to the public via ERG-SC.

Developed CDF data



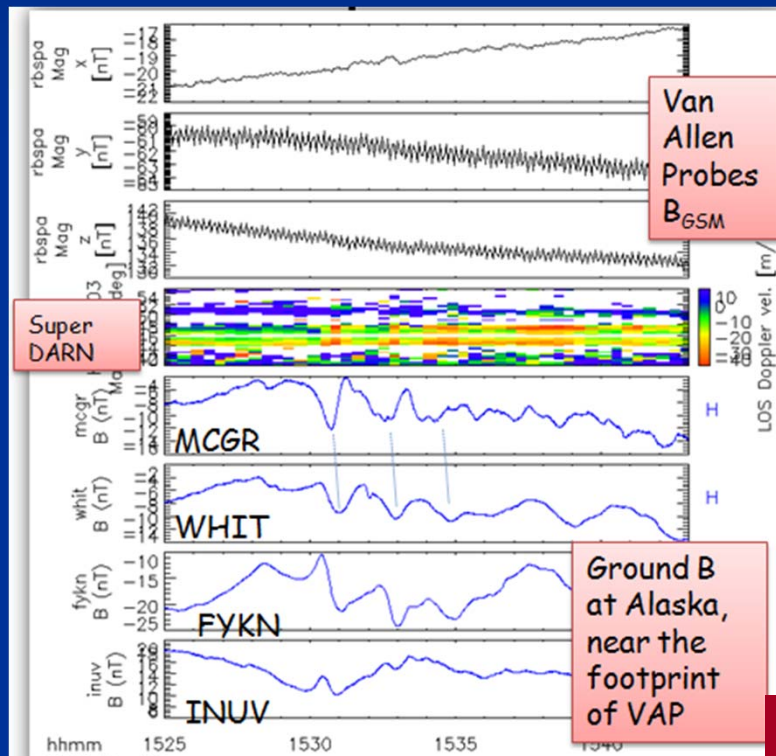
Magnetometer Data: 210 MM (PI: A. Yoshikawa)
 MAGDAS (PI: A. Yoshikawa)
 STEL Flux Gate (PI: K. Shiokawa)
 STEL Search Coil (PI: K. Shiokawa)

Radar Data: SuperDARN
 The data from all SuperDARN radar
 have been archived at the ERG-Science center
 and opened to the public.

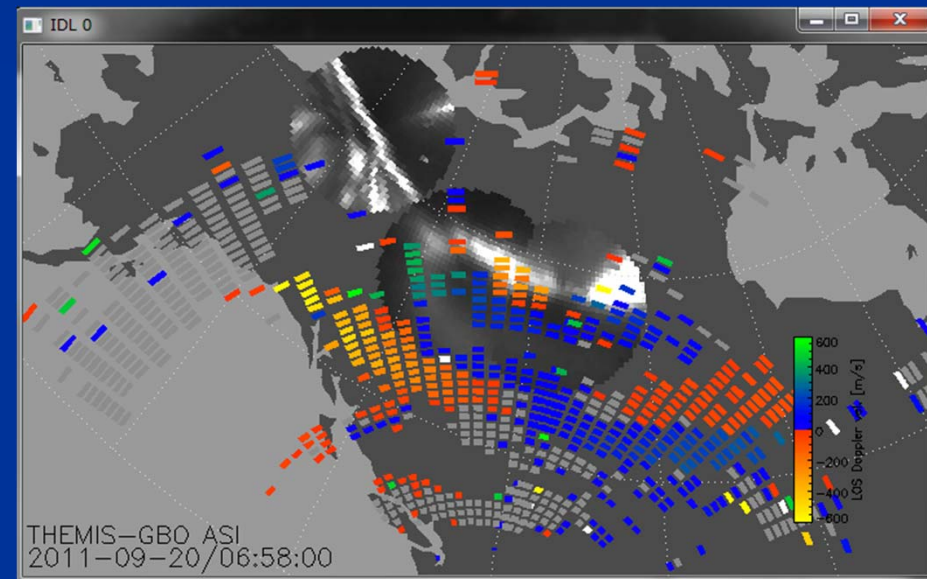
All Sky Imager: OMTI (PI: K. Shiokawa)

Software resources on the ERG project

Stack plot of multiple satellite and ground data by SPEDAS



Various ground data and satellite footprints can be superposed on the world map



Please visit at ERG-Science Center:

Google

ERG Science Center

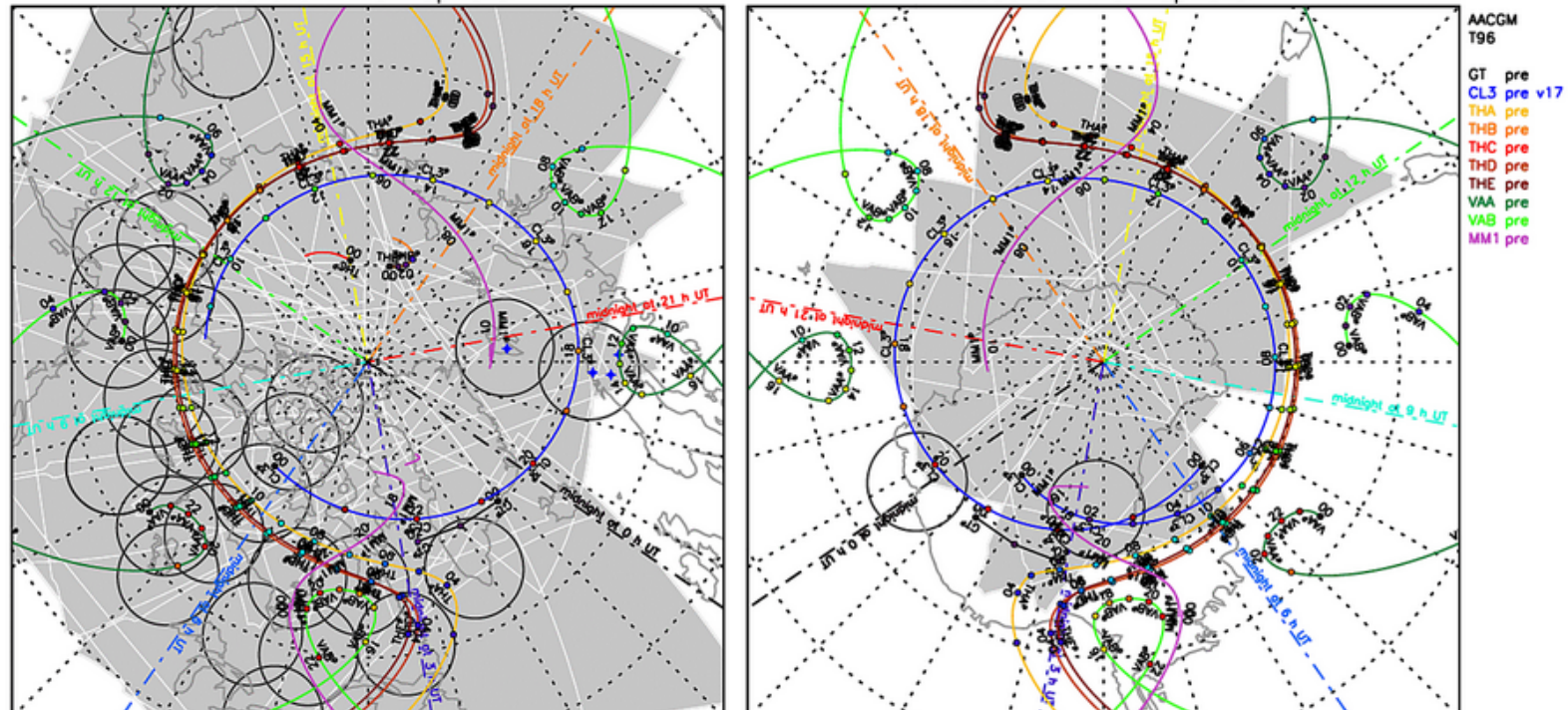
Software resources on the ERG project



Spacecraft Footprints and Ground-Based Instruments for 1989-2018

Submit -1 day Previous 2015 09 30 DOY=273 0000-0200 UT
Interval=1 day Ground=High-Lat Magnetosphere=Mid-Tail Size=100
Next +1 day Submit [Conjunction Event Finder](#)

Spacecraft Footprints and Ground-Based Instruments 20150930 0000-2400 UT
Northern Hemisphere Southern Hemisphere



Conjunction Event Finder (CEF) :
An easy-to-use quick browsing tool for premade ground-s/c conjunction plots as well as various QL plot sites.
Van Allen Probes data are now available.



Conclusions

- SPEDAS is grassroots/open-source data analysis software for Space Physics Community, which can handle various kinds of satellite and ground-based observation data.
- IUGONET and ERG projects have contributed to SPEDAS as developers of plugins.
- SPEDAS is suitable for researches in the VarSITI program, in particular, for SPeCIMEN and ROSMIC.
- It should be a useful tool for the capacity building of solar-terrestrial community.
- SPEDAS can be freely downloaded from

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

