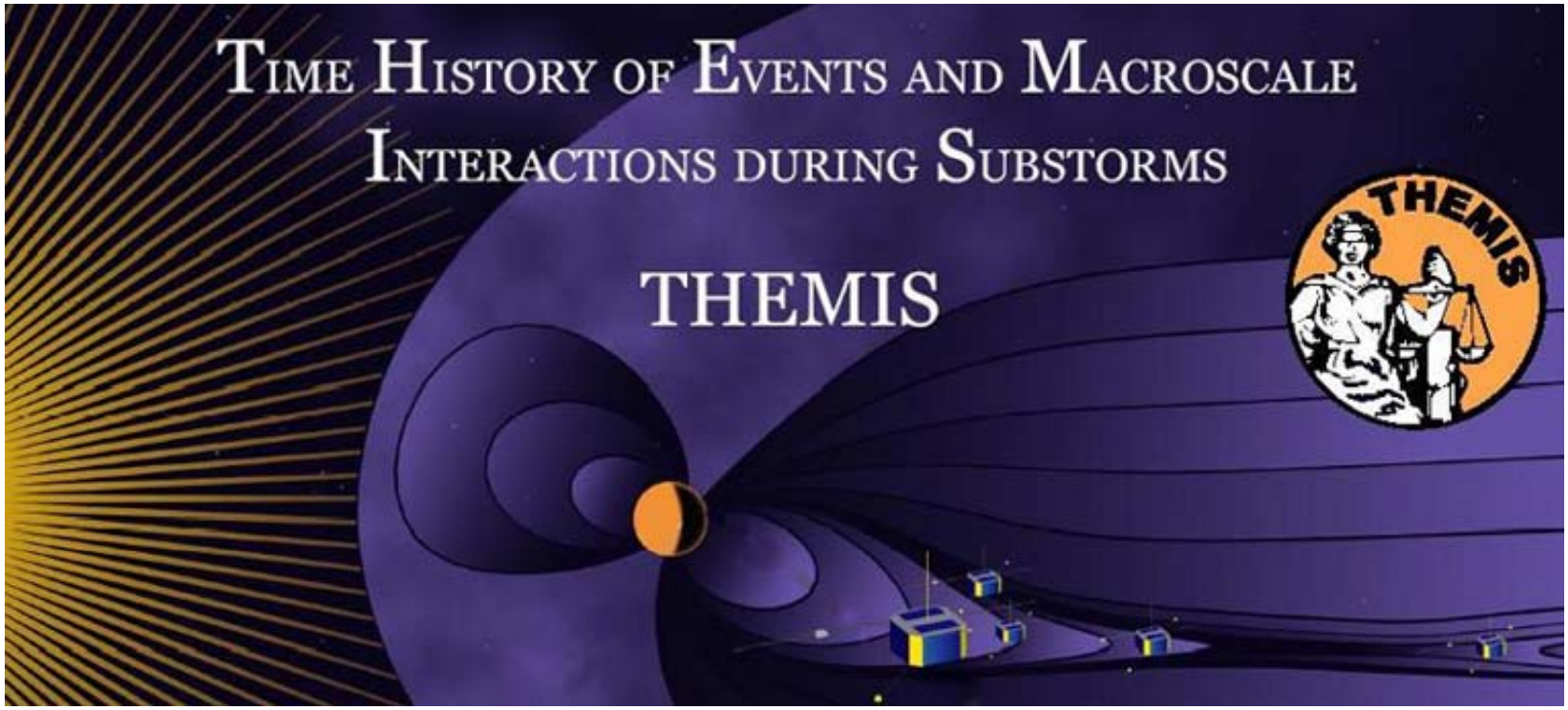


Science Software – v5.00 Training

GEM Mini-Workshop

December, 2008

Agenda

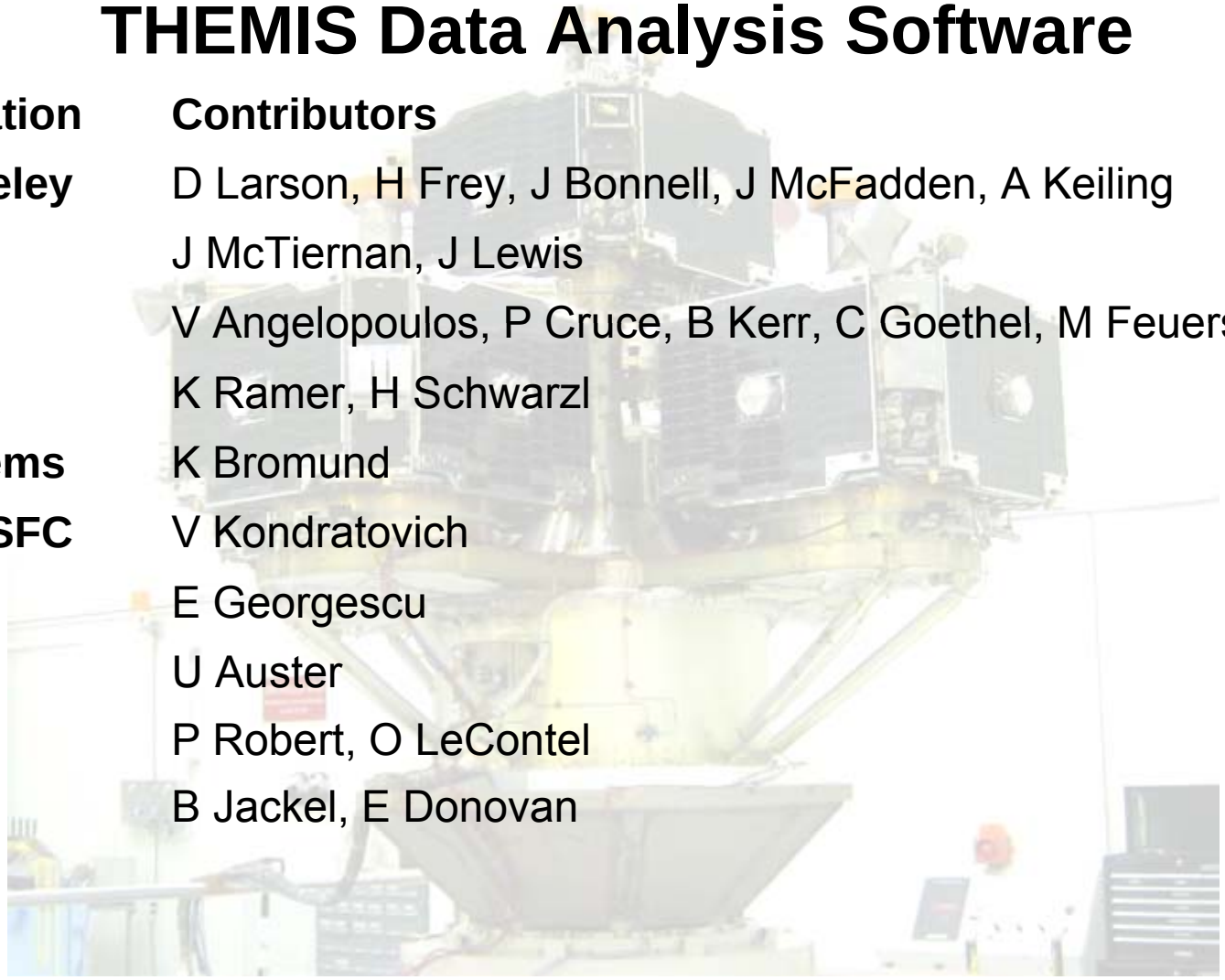
01:00	Introduction	D. King
01:05	THEMIS Web Site	D. King
01:15	V5.00 Science Software/Data Status Report	J. McTiernan, J. Lewis
01:25	THEMIS Science Data Analysis Software	J. McTiernan / B. Kerr
01:50	V5.00 New Themis Software Capabilities	P. Cruce
02:00	V5.00 THEMIS Graphical User Interface (GUI)	C. Goethel
02:30	THEMIS Ground Based Observatories (GBO)	J. McTiernan
02:40	SPDF – CDAWeb	Dieter Bilitza
02:50	Q&A's	All
03:00	Software Clinic	All

V5.00 Science Software/Data Status Report

- General
  - Loads, introduces and calibrates all L1 quantities, all instruments
  - Loads calibrated L2 quantities
- STATE
  - L1 STATE available since launch, L2 STATE in progress
- FGM
  - L1, L2 data available since early March 2007
- FIT / FFT / FBK
  - L1, L2 data available since early March 2007
- SCM
  - L1 data available since early March 2007
  - L2 frequency spectrograms (FBK) available now
- EFI
  - All L1 data available from TH-C since May 2007, TH-D,E since Jun 7
- ESA
  - No L1 data, only L0 data – however, read-in is transparent to user
  - All data available since ESA turn-on, i.e., mid-March
  - L2 omnidirectional energy spectrograms, ground moments available now
- SST
  - L1 data available since SST turn-on, mid-March
  - L2 omnidirectional energy spectrograms available now
- ASI
  - L1 thumbnail images from 21 stations available. L1 full-resolution images available up to late April 2008,
  - Mosaics, movies for full mission
- GMAG
  - L2 cdf files with ground magnetometer data from 41 stations

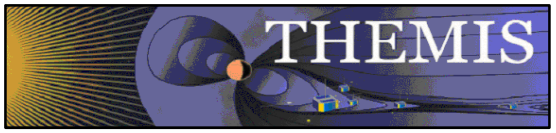
THEMIS Data Analysis Software

Organization	Contributors
UC Berkeley	D Larson, H Frey, J Bonnell, J McFadden, A Keiling
	J McTiernan, J Lewis
UCLA	V Angelopoulos, P Cruce, B Kerr, C Goethel, M Feuerstein,
	K Ramer, H Schwarzl
SP Systems	K Bromund
NASA/GSFC	V Kondratovich
MPE	E Georgescu
TUBS	U Auster
CETP	P Robert, O LeContel
Calgary	B Jackel, E Donovan



Overview

- Software Objectives
  - Powerful, Flexible Command Line Interface
  - GUI to provide Easy Access to Key Features
- Software Installation
- Data Distribution
- Key Routines, crib sheets.
- Examples



Software Objectives

- Code is available to everyone, but not required to analyze data.
- IDL based (library of routines –but no main program!).
- Separates the tasks of:
  - Reading files.
  - Manipulating data
  - Plotting
- Platform independent. Works on:
  - Solaris
  - Linux
  - Windows
  - Mac OS X
- Self-Documenting
  - Auto-generated html help: idl/_tdas_doc.html
  - `IDL> DOC_LIBRARY, 'routine_name'`

THEMIS-specific routines (idl/themis)

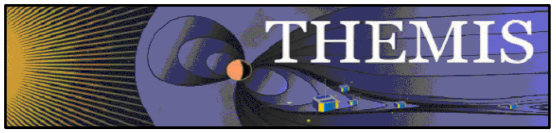
- Instrument-specific routines organized according to ground/spacecraft/state, fields/particles, instrument name.
  - Loading data
  - Calibrating data
- Transforming data
- Examples – crib sheets
- GUI – built on top of the command-line routines

General routines (idl/ssl_general)

- Library of generic routines useful for building mission-specific load routines
  - CDF reading/writing routines
  - File retrieval routines
  - Miscellaneous routines
- Plotting routines
  - Uses “tplot variables”: strings that associate data together with metadata and plotting parameters.
  - Routines to manipulate/plot tplot variables
- Data Export routines
- Data Processing routines

External Libraries (idl/external)

- CDAWlib – from NASA SPDF, reads/plots CDF data
- IDL_GEOPACK – Magnetic field modelling kit



System Requirements

Windows, Solaris, LINUX, PPC Mac or Intel Mac.

IDL 6.2 or higher required

IDL Patch Recommended

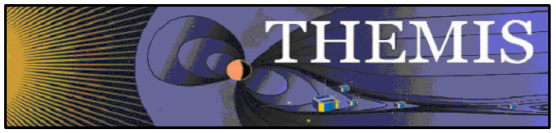
- http://cdf.gsfc.nasa.gov/html/cdf_patch_for_idl6x_new.html
- Required for IDL 6.2, (Strongly recommended for IDL 6.4 and 7.0)
- Required for Intel Mac, regardless of IDL version

For Mac, system configurations are required to run IDL

- X11 – may need to be installed.
- mouse click-through
  - one-time X11 configuration necessary for proper operation:

```
defaults write com.apple.x11 wm_click_through -bool true
```

See THEMIS User's Guide for full information, available at:
ftp://apollo.ssl.berkeley.edu/pub/THEMIS/



Installing/Configuring TDAS

For a new installation:

- Download and expand the latest TDAS release .zip file. The latest version is 4.01. http://themis.ssl.berkeley.edu/socware/tdas_4_01/tdas_4_01.zip
- Create a directory called TDAS into which you will copy the latest software.
- Move the tdas_4_01 folder into the TDAS directory you created.
- Configure IDL to search the TDAS directory for IDL programs. Details on next slide.

For an upgrade of an existing installation of TDAS, installed as per the above 4 steps:

- Remove old tdas_x_xx from the TDAS directory.
- Download and expand the latest TDAS release .zip file.
- Copy the new tdas_x_xx directory into the pre-existing TDAS directory.
- Re-start IDL.

Path Setup

Set up the IDL path

- Windows and IDLDE on any platform:
  File->Preferences
  Path Tab
  Press Insert
  Browse to find the TDAS folder you created.
  Check the box preceding the path to 'search subdirectories'

- UNIX-like systems (Mac OS X, Linux, Solaris)

```
In .cshrc:
setenv IDL_PATH '<IDL_DEFAULT>:+/path/to/tdas'
 -Or-
In .bashrc or .bash profile:
export IDL_PATH='<IDL_DEFAULT>:+/path/to/tdas'
```

Path to Data Directory

- Data directory will be created automatically at
  - C:/data/themis (Windows)
  - ~/data/themis (UNIX/LINUX/Max OS X)
- Run thm_ui_config from command line or THEMIS GUI if you need to change this.

Data Definitions

The software operates on Level 1 and Level 2 data.

Data Level Definitions:

Level 0 Data –

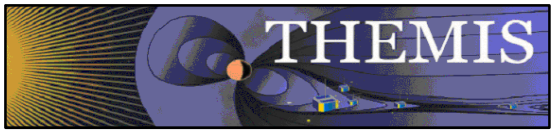
- Raw files (*.pkt) one per APID.
- Only used for loading ESA data.

Level 1 Data -

- CDF (Common Data Files) files (*.cdf)
- Files contain raw, uncalibrated data. i.e. counts, DAC units.
- Requires TDAS software to interpret. Calibration is done by default when Level 1 data is input.

Level 2 Data -

- CDF files – contain physical quantities – TDAS software is not needed for interpretation.
- Files available for ESA, FBK, FIT, FGM, MOM*, SST – can be downloaded from SPDF. *(except for MOM)



Data / Directory structure

- Data Directory structure is large!
  - Scores of files per day
  - ~3GB/day for all probes (L1 data)
- Directory hierarchy keeps directory sizes manageable
  - Software performs automatic file retrieval.
  - Software maintains directory hierarchy.
- Behaviour of Automatic File Retrieval is configurable
  - 'No Download' mode for stand-alone operation.
  - 'No Update' mode to preserve local modifications.
  - Root directory of local copy of hierarchy is determined automatically, but configurable.
  - Available configuration methods:
    - thm_ui_config IDL widget
    - Button on THEMS GUI widget
    - Environment variables

Load Routine Summary

Name	Description	L0	L1		L2
			raw	calibrated	
thm_load_asi	All-Sky Imager.		*	-	
thm_load_ask	All Sky Keogram		*	-	
thm_load_efi	Electric Fields Instrument waveforms		*	(*)	
thm_load_esa	ElectroStatic Analyzer				*
thm_load_esa_pkt	ElectroStatic Analyzer	*			
thm_load_fbk	Fields Filter Bank		*	*	*
thm_load_fft	On-board Fields Fast Fourier Transform.		*	*	
thm_load_fgm	Flux Gate Magnetometer waveforms		*	*	*
thm_load_fit	On-Board Fields Spin-Fit		*	*	-
thm_load_gmag	Ground Magnetometer				*
thm_load_hsk	Housekeeping		*		
thm_load_mom	On-board Particle Moments		*	(*)	
thm_load_scm	Search Coil Magnetometer waveform		*	(*)	
thm_load_sst	Solid State Telescope		*	-	*
thm_load_state	Orbit and Attitude		v2		

Notes:
(*) calibration routine available but still under development
- data reduction and analysis routines available: see crib sheet

Usage Conventions:

Use keywords to determine functionality

level - Calibrated Level 1 data is the default (Except for SST and ESA data, which is handled differently).

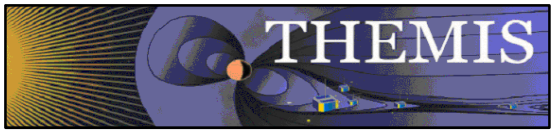
datatype and probe keywords determine which data is loaded and/or created through calibration process

/get_support_data keyword is needed in thm_load_state to load data required by thm_cal* and thm_cotrans routines.

To load uncalibrated data, set type = ‘raw’ (For all but SST, ESA)

Example from IDL Command Line:

```
timespan,’2007-07-07’,1    ;choose a time range
thm_load_state, probe = 'a', /get_support_data
thm_load_fgm, probe='a', coord='gsm', datatype='fgl', level=1
```



Variable Names

Probe specification. Example: tha

- a – can be one of [a-e] specifies probe

Particle data. Example: tha_peif

- p – particles
- e – ESA, s – SST
- i – ions, e – electrons
- f – full, r – reduced, m – moments, b – burst

FGM data. Example: tha_fgl

- l – low telemetry rate, h – high telemetry rate, e – engineering decimated high rate, s – spin fit.

Electric Fields and SCM. Example: tha_efs

- ef - efi, sc – scm, fb – fbk, ff – fft
- s – spin fit, f – full orbit or fast survey, p – particle burst, w – waves burst.

Wildcards are accepted in names when plotting and data processing:

- th?_fg?
- th[ab]_fg[lh]
- th?_state*

Crib Sheets for Loading, Processing and Plotting

thm_crib_asi
thm_crib_dproc
thm_crib_efi
thm_crib_esa_da
thm_crib_esa_moments
thm_crib_export
thm_crib_fac
thm_crib_fbk
thm_crib_fft
thm_crib_fgm
thm_crib_fit
thm_crib_gmag
thm_crib_mom
thm_crib_mva
thm_crib_overplot
thm_crib_part_getspec
thm_crib_scm
thm_crib_sst
thm_crib_state
thm_crib_tplot
thm_crib_tplotxy
thm_crib_twavpol
thm_map_examples

IDL>.run thm_crib_asi

or cut and paste, or copy and modify

Coordinate Transformations

- thm_cotrans
  - transforms to/from any of the following coordinate systems in a single call
  - updates metadata in output.
  - knows coordinate system of input from metadata
- Currently Supported Geophysical Coordinate Systems
  - SPG Spinning Probe Geometric
  - SSL Spinning SunSensor L-vectorZ
  - DSL Despun SunSensor L-vectorZ
  - GEI Geocentric Equatorial Inertial
  - GSE Geocentric Solar Ecliptic
  - GSM Geocentric Solar Magnetospheric
  - SM Solar Magnetic
  - GEO Geographic Coordinate System
- Example (using previously loaded FGM and STATE data)
  - thm_cotrans, 'th?_fg?', out_coord='geo‘, ouf_suffix = ‘geo’

Plotting & Analysis Routines

Plotting

- tplot
- tplotxy
- plotxy
- plotxyz
- tplot_names
- tlimit
- get_data
- store_data

Example:

```
tt89,'thc_state_pos',newname='model_field'
fac_matrix_make,'model_field' ,other_dim=
 'xgse', newname = 'fac_mat'
tvector_rotate, 'fac_mat', 'thc_peir_velocity',
 newname = 'ion_velocity_model_fa'
```

Analytic Coordinate Transformations

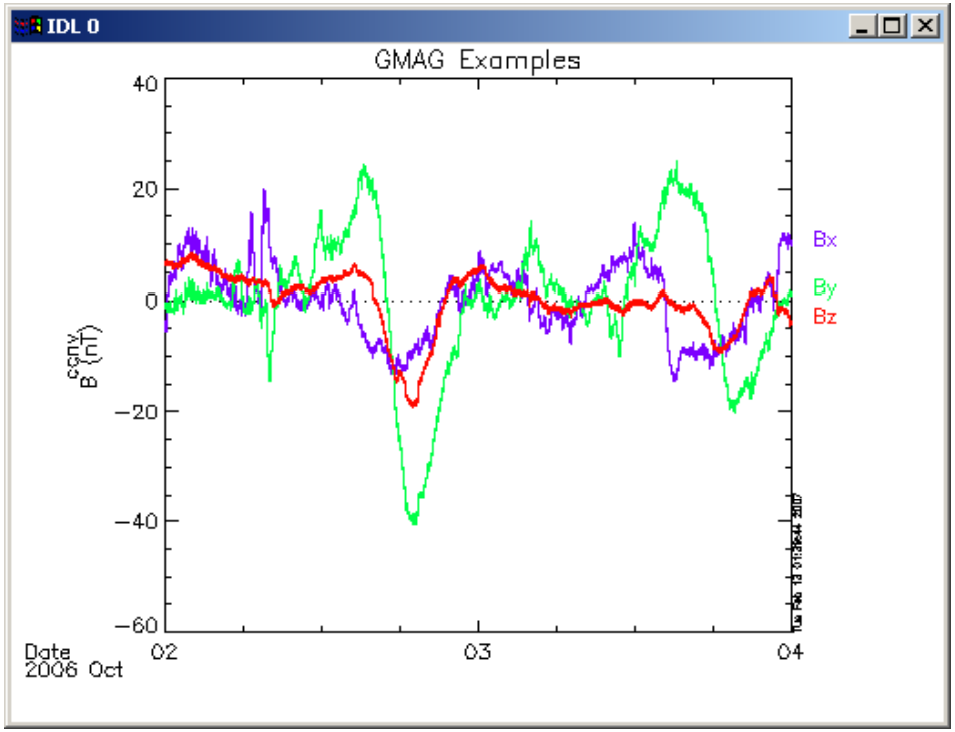
- tvector_rotate
- fac_matrix_make
- thm_fac_matrix_make
- minvar_matrix_make

Tsyganenko Model

- (t)trace2iono
- (t)trace2equator
- (t)t89
- (t)t96
- (t)t01
- (t)t04s

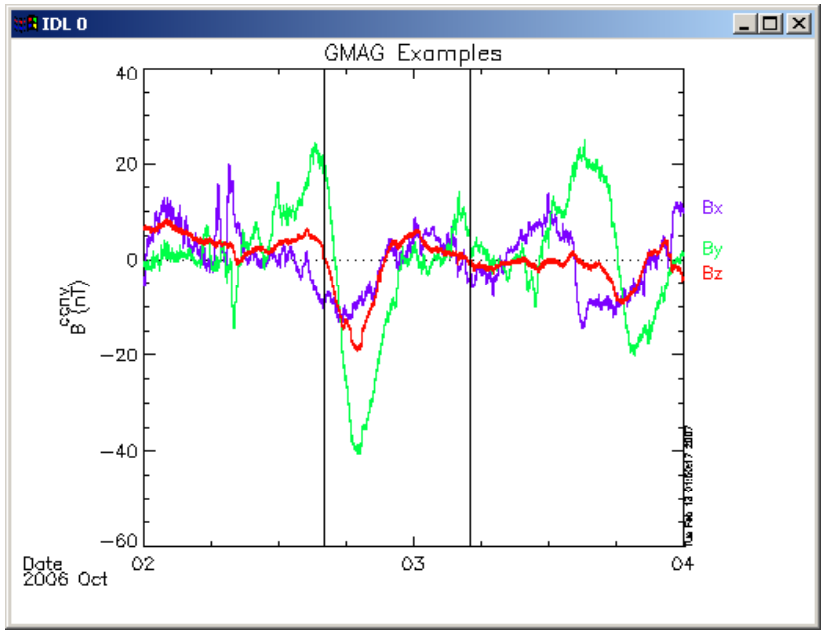
Command Line Example 1

- To load data:
  - » timespan,'6-10-2',2,/days
  - » thm_load_gmag,site='ccnv',$ /subtract_average
- To plot data:
  - » options,'thg_mag_ccnv',$ labels=['Bx','By','Bz']
  - » tplot_options, 'title', $ 'GMAG Examples'
  - » tplot,'thg_mag_ccnv'

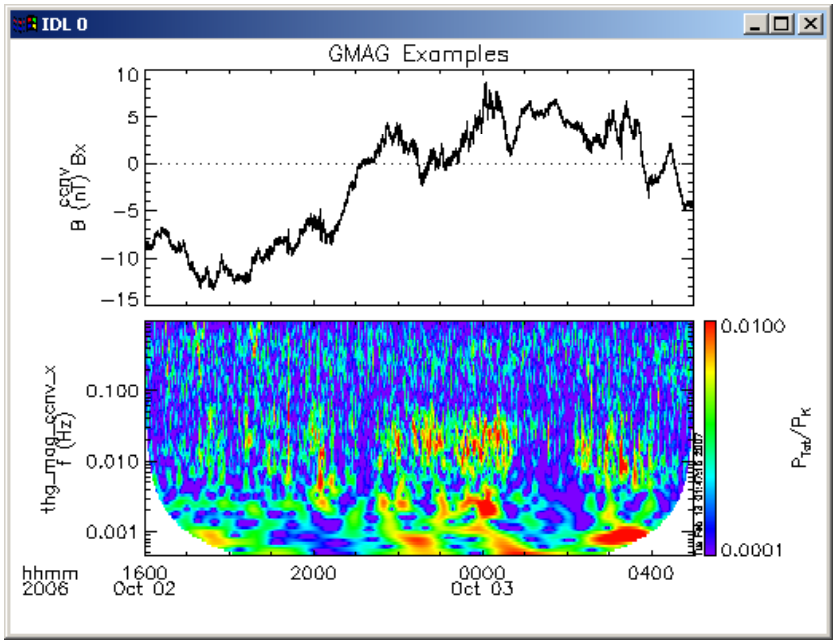


Command Line Example 2

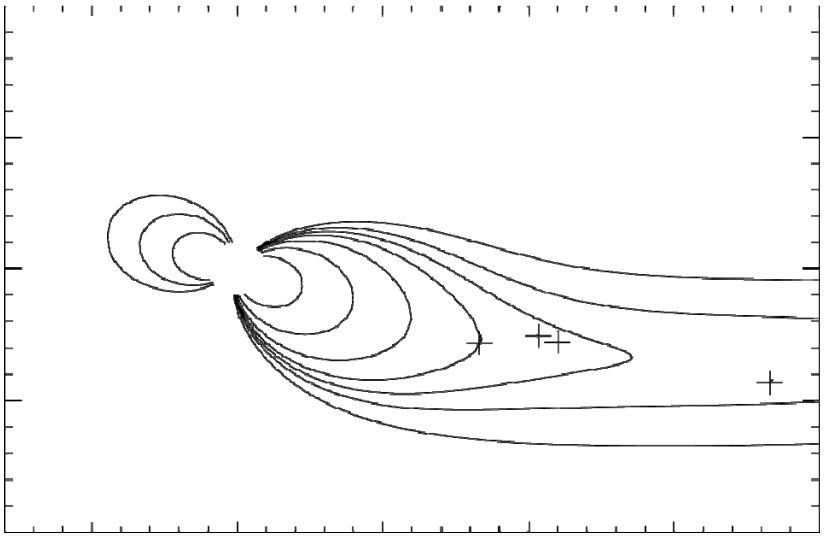
- Wavelet transform on an interval of interest
  - Define and display the interval
    - » Tr = ['2006-10-2/16:00','2006-10-3/05']
    - » timebar,tr



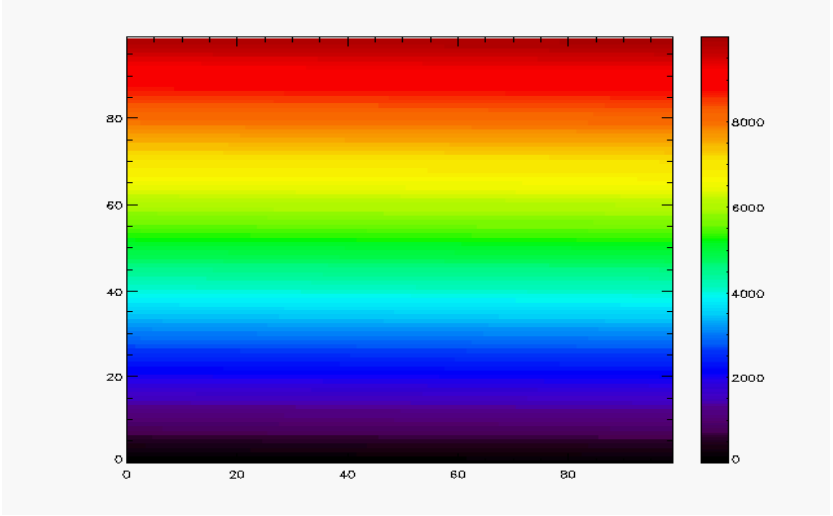
- Split the 3-vector into components:
  - » split_vec,'thg_mag_ccnv'
- Compute transform of one component
  - » wav_data,'thg_mag_ccnv_x',/kol $,trange=tr ,maxpoints=24l*3600*2
- Set color limits (log scale)
  - » zlim,'*pow', .0001,.01,1
- Plot it.
  - » tplot,'*ccnv_x*',trange=tr



Plotting Examples

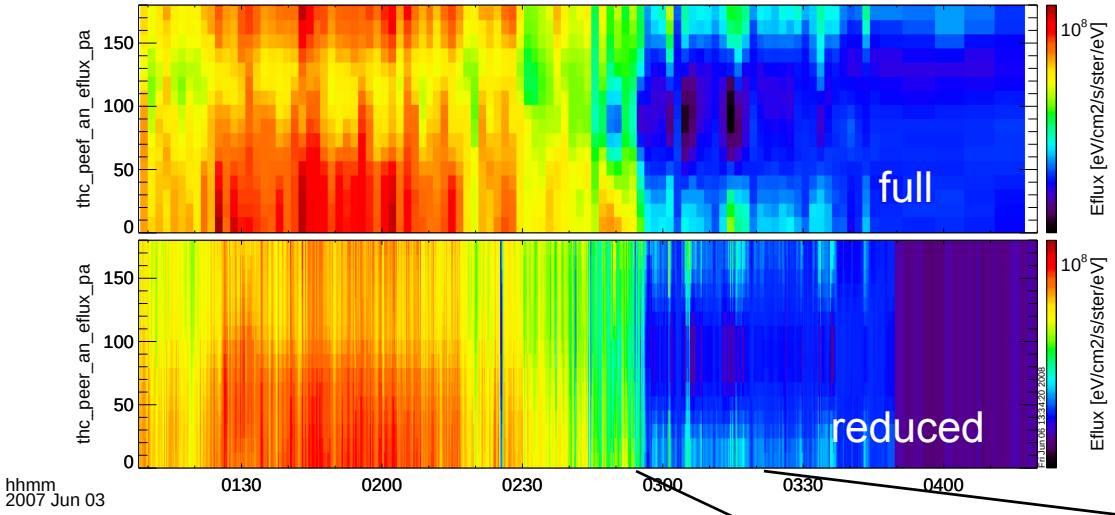


tplotxy can be used to plot isotropic position plots. Like plots of magnetic field models and spacecraft position



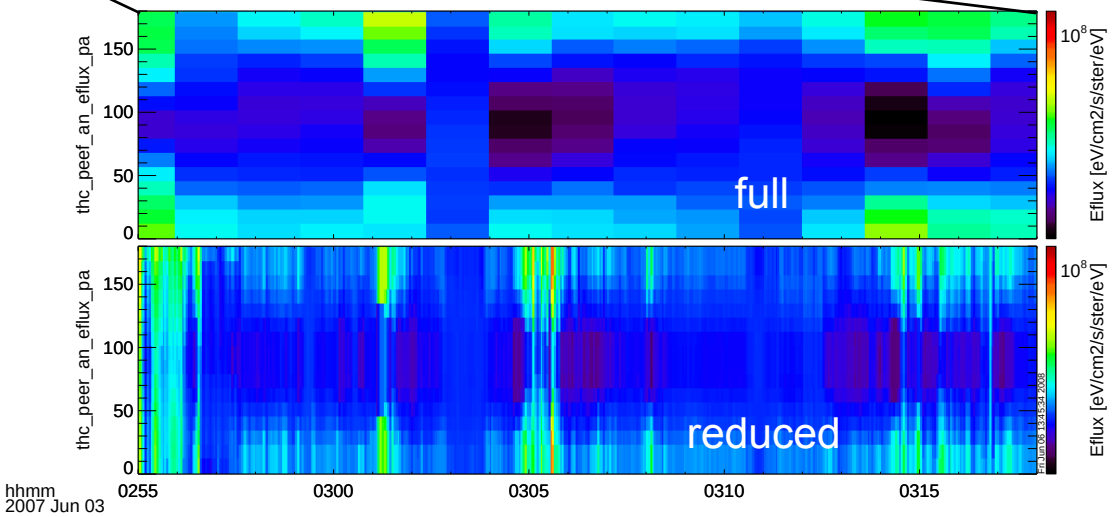
Plotxyz can be used to plot 3 dimensional isotropic data, with any axis.(Not restricted to time-series.)

Plotting Angular Spectra



Pitch angle spectra for full and reduced mode electron ESA data. Plotted using tplot.

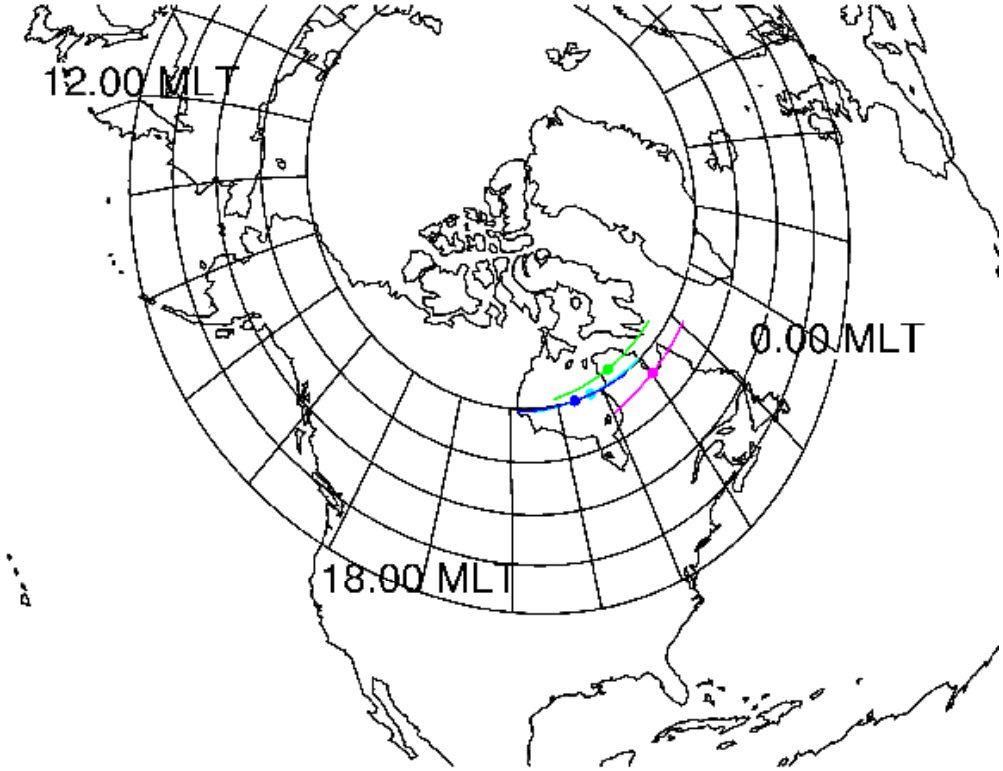
```
thm_part_getspec, $
probe=['c'], $ ;select probe
trange=['07-06-03/01:08', $  ;select timerange
        '07-06-03/04:20'], $
data_type=['peef','peer'], $ ;select data type
angle='pa', $ ;select pitch angle spectra
regrid=[32,16] ;set resolution of pitch/gyro
spectra
```



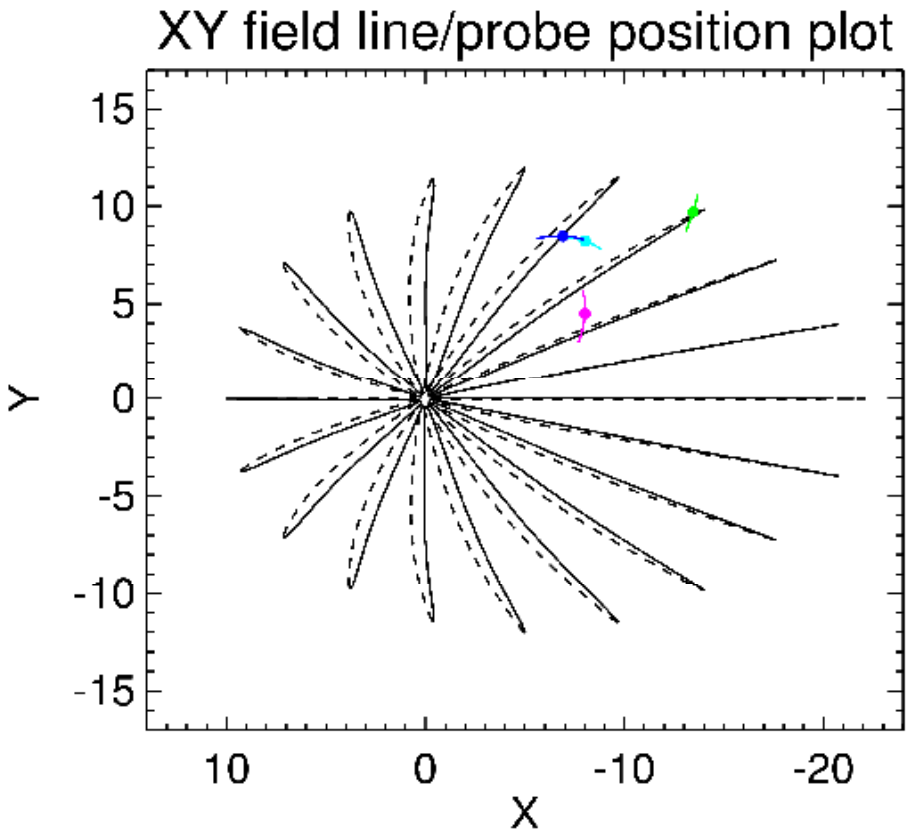
Trace / Orbit Plots

- New routines have been added to perform different 2d projections of 3d data. This particularly useful for plotting orbits and field lines.
- A Tsyganenko interface has been added to TDAS that allows us to calculate model field lines for T89,T96,T01,&T04 models. Field lines can also be Traced.
- Examples of these routines can be found in themis/examples/thm_crib_trace.pro, themis/examples/thm_crib_plotxy.pro and themis/examples/thm_crib_tplotxy
- The graphics in this slide were generated with thm_crib_trace.pro
  Example: .run thm_crib_trace.pro
- A routine was added to plot an arbitrarily sized and spaced AACGM coordinate grid on a world map.

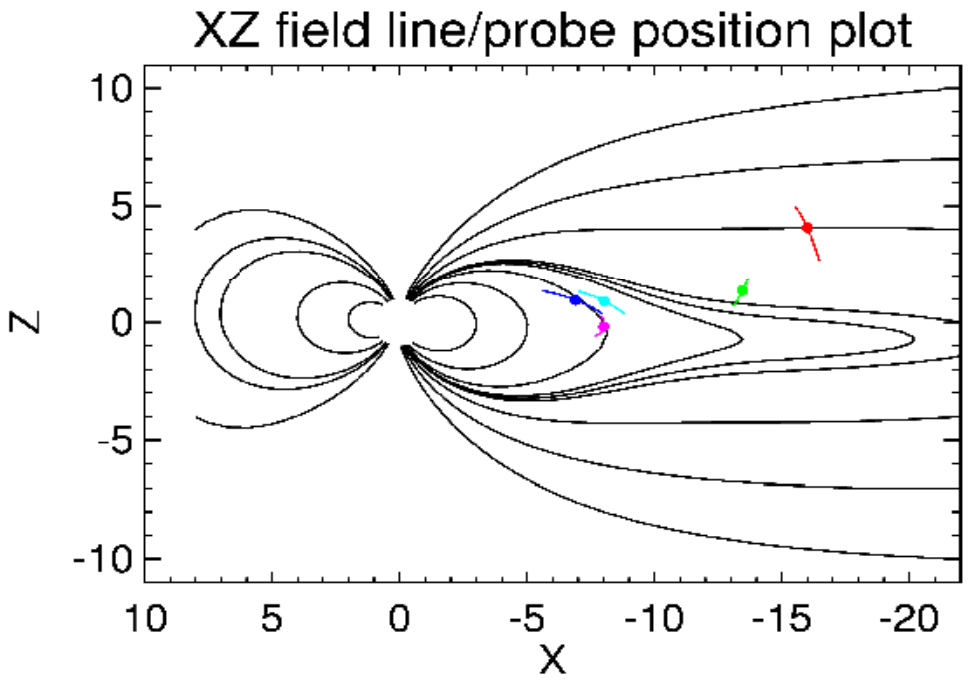
Trace/Orbit Plots - AACGM/Iono Trace Plot



Trace / Orbit Plots – XY Plot



Trace / Orbit Plots – XZ Plot



THEMIS – Mini Language

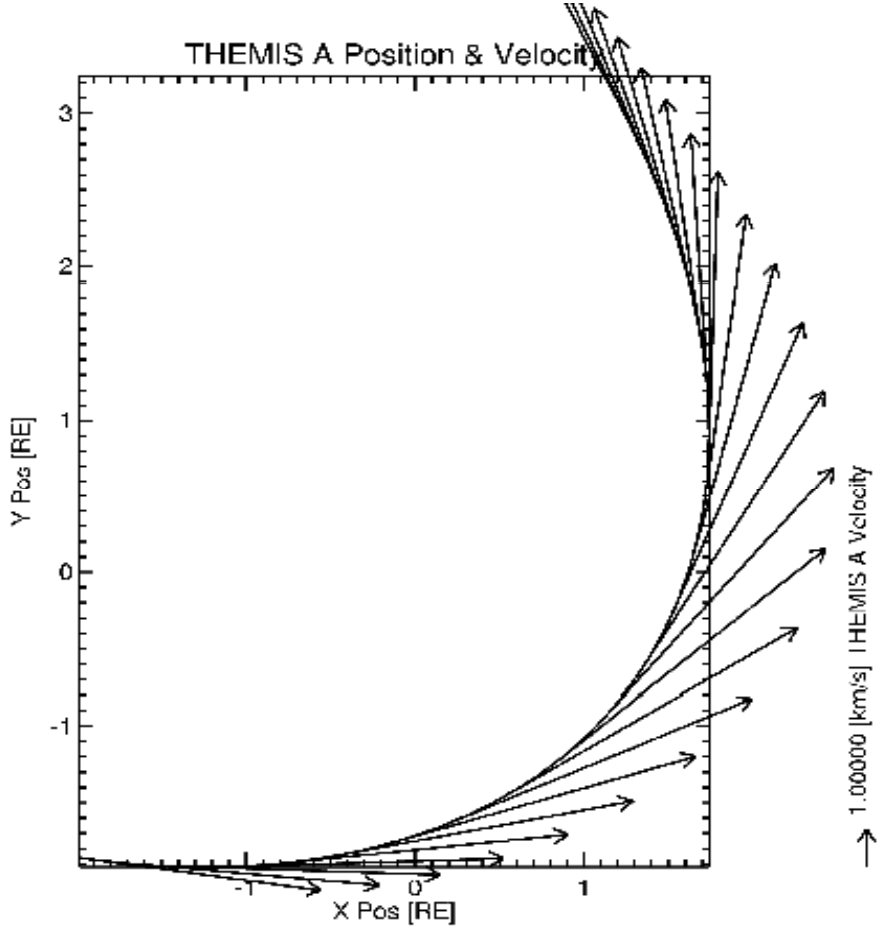
- Simple scripting language has been written in IDL.
- This language allows access to some data analysis functionality in the IDL virtual machine and eases manipulations of time series data.(tplot)
- This language allows composition of statements and functions with order of operations to give significant flexibility in statement construction.
- Examples:
  1: Position to RE: calc,'"tha_pos_re" = "tha_state_pos"/6374.4'
  2: Natural log of total esa density:
  calc,'"tha_density_log" = ln("tha_peir_density"+"tha_peer_density")
  3: Store tplot data in non-tplot idl variable: calc,'var_data = "tha_efs"'
  4: Average Magnetic Pressure:
  calc,'Pb_avg = mean(0.01*total("tha_fgs_dsl"^2,2)/25.132741)'

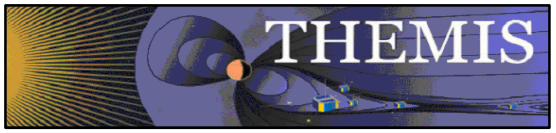
  Additional examples can be found in themis/examples/thm_crib_calc.pro

THEMIS – Additional New Features

- Solar Wind Code - The solar wind code serves SW data propagated to the bow-shock nose, which can be used, potentially, by various applications (currently, they are used in dynamic magnetopause model). The code takes WIND SWE and MFI data, served by SPDF, and propagates them to the bow-shock nose using OMNI methodology. There is also the option of use of already-propagated OMNI HRO and OMNI-2 data. Recently-appeared opportunity to test directly the propagated data by comparison with THEMIS B data shows a good agreement and potential for improvement.
- Outlier Removal Code - Quadratic trend is determined in a hollow vicinity of each point. The data value is compared with the trend value. If the deviation is statistically improbable, the value is repaired. There are 6 options for repair to chose.
- We have now six new routines which allow downloading/creating all A-indices from Kyoto, the Dst index from Kyoto, and the pseudo A-indices using THEMIS data plus crib sheets for each routine. All routines are fully "automatic", i.e., they don't require any manual download of data.
- Program developed to read ACE ascii data. Example: idl> noaa_ace_nrt_load
- A new plotting routine (plotxyvec.pro) has been added for plotting arrows on top of plotxy and plotxyz plots. In addition a new routine grad.pro has been developed for calculating the gradient of a scalar field.
  Examples of usage can be found in themis/examples/thm_crib_plotxyvec.pro

Plotxyvec – Position/Velocity Plot





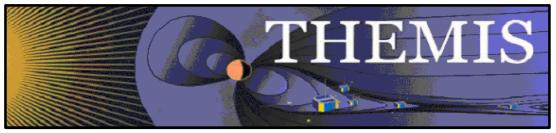
THEMIS New GUI Features

THEMIS – New GUI Features

- UCLA SPLASH GUI used as a model for the design
- Windows Environment - provides a universal and standard interface
  Pull Down Menu's Tool Bar Accelerator Keys
- Increased User Interaction – added cursor, mouse, and keyboard features
  Click and Drag, Single/Double Clicks, Tab/Backspace, and Right/Left Arrow keys
- Plot Capabilities – multiple pop up windows allow user to control plot settings
  Line/Spectral plots X/Y Axis and Grid styles Panel layout Page setup
- Tracking –vertical and horizontal tracking features cross hairs displayed as cursor moves over plot region, data is displayed and updated as cursor moves
- Markers – users can select regions of interest by Ctrl-Click-Drag
- Variables - user can select any loaded data to be displayed at bottom
- Analysis – additional capabilities include the new mini language, a nudge function, and analysis routines
- Original GUI – all current functionality will be preserved, including data analysis

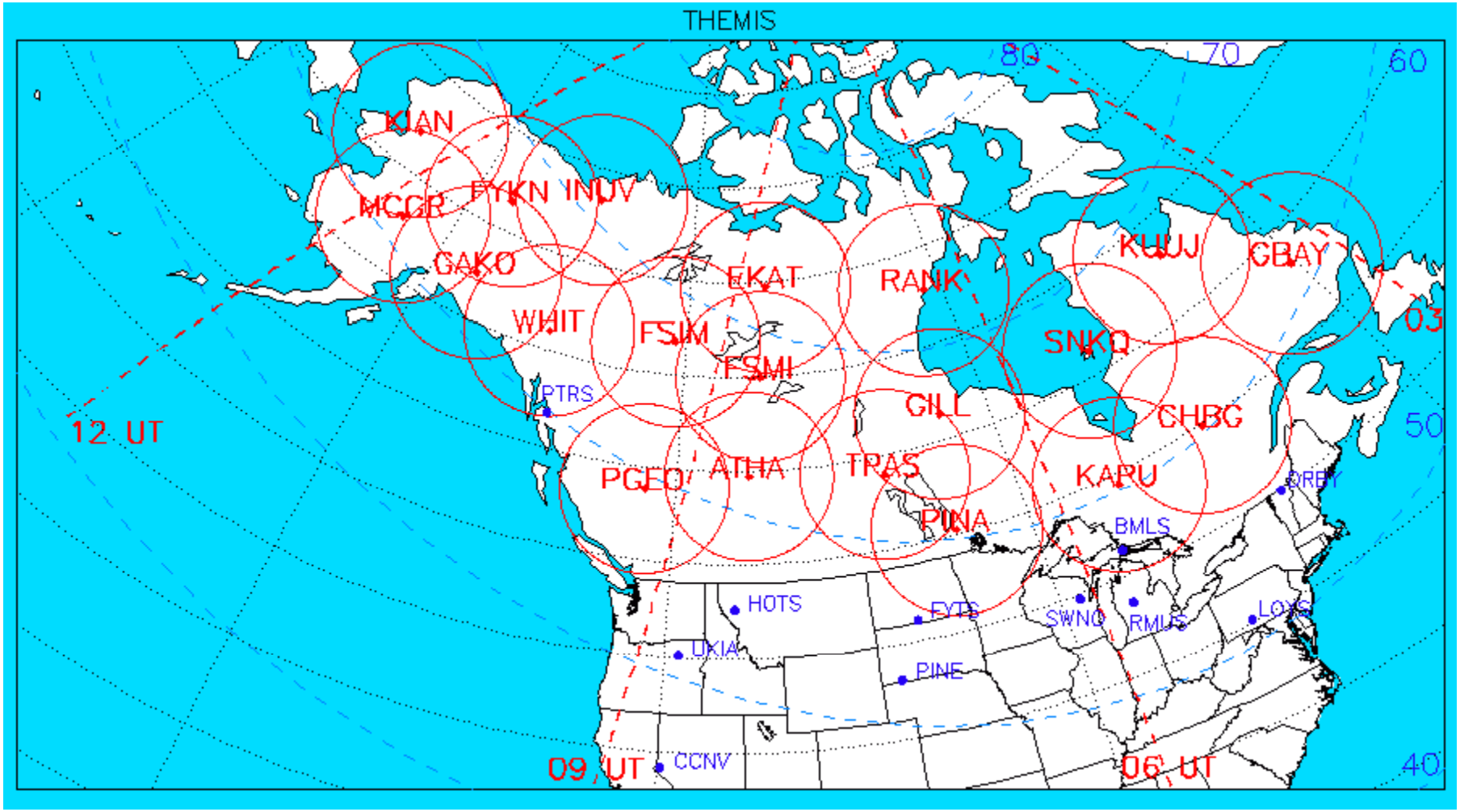
New THEMIS GUI Availability Dates

- Release with TDAS v5.0 during January 2009
- Webcast Trainings during January 2009
- January 2009 Release for PC – Windows
  Phase II Release for Mac and Linux
- Original GUI will still be available until April 2009



THEMIS software for GBO all-sky imager
Thm_crib_asi.pro
Harald U. Frey

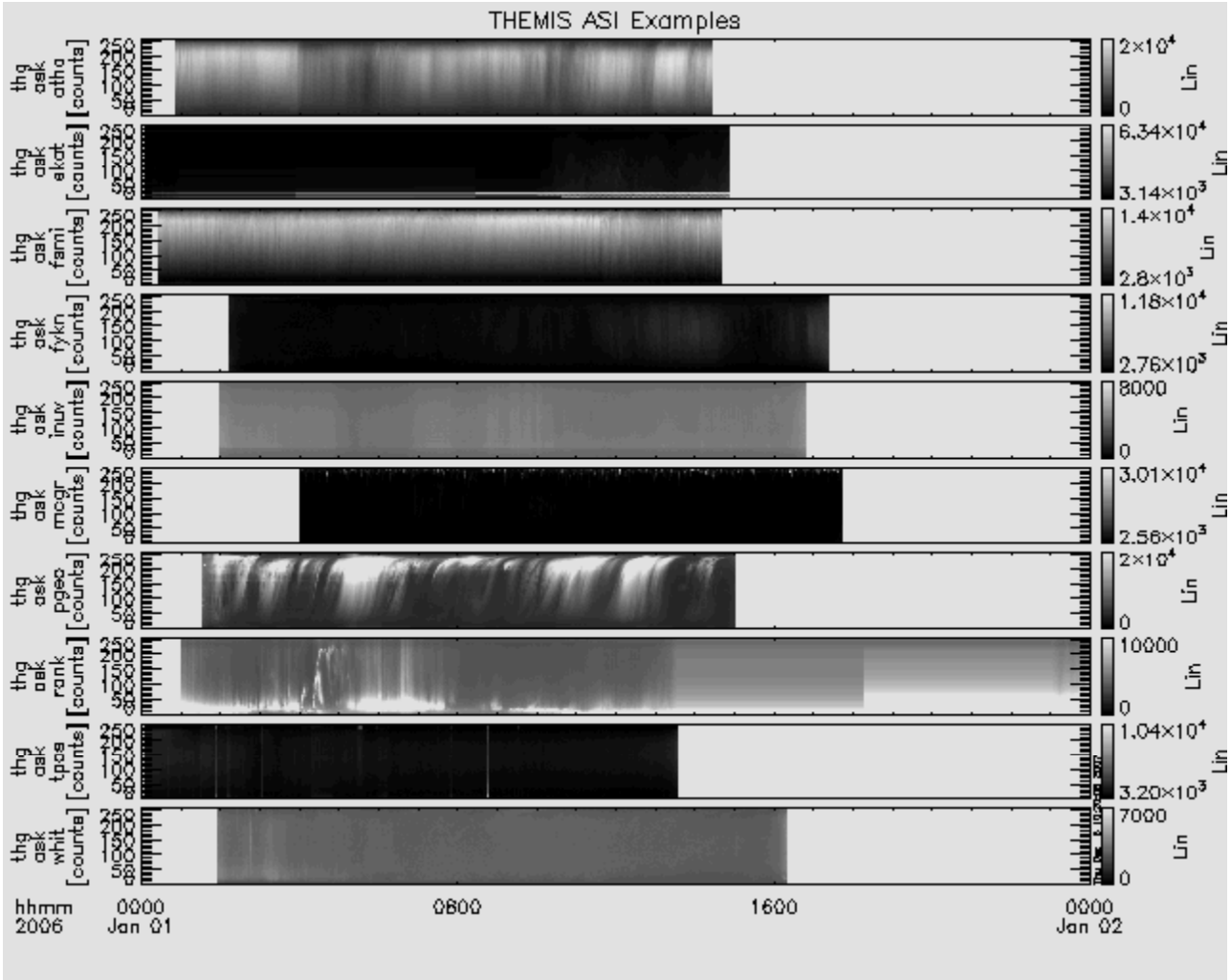
THEMIS GBO network



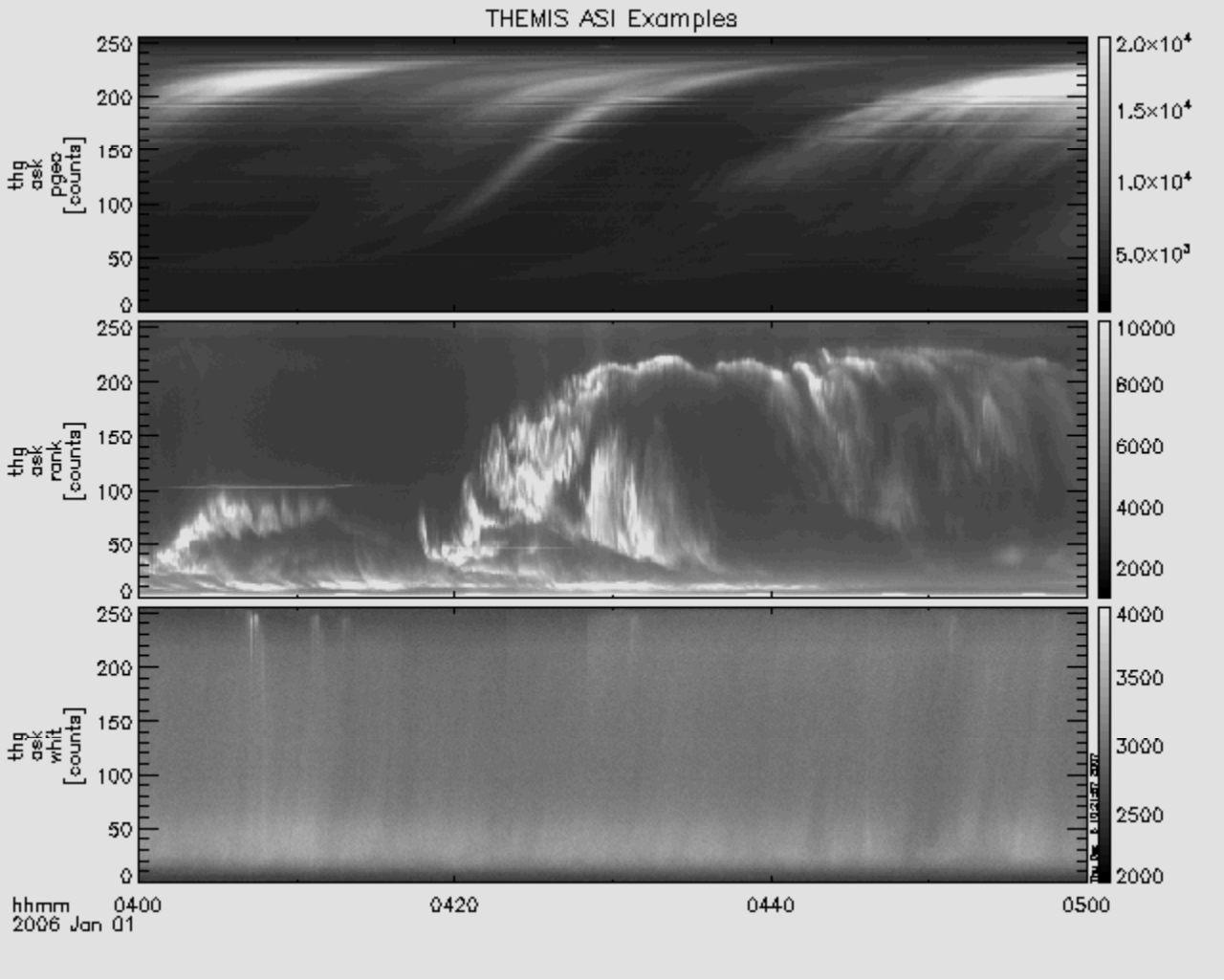
All-sky imager data products

1. Keograms along local magnetic meridian
   - Delivered daily jpeg-compressed
   - Reprocessed ½ year later with full resolution images
2. Geomagnetically mapped thumbnail images
   - Delivered daily square-root intensity compression
   - 1024 pixels within +-8^{o} magnetic Latitude and ~+-12^{o} Longitude
   - 3 seconds temporal resolution
3. Full resolution images
   - 256x256 pixels covering about 600 km radius around station
   - Delivered about ½ year later
   - 3 seconds temporal resolution
   - Full 16 bit intensity scale

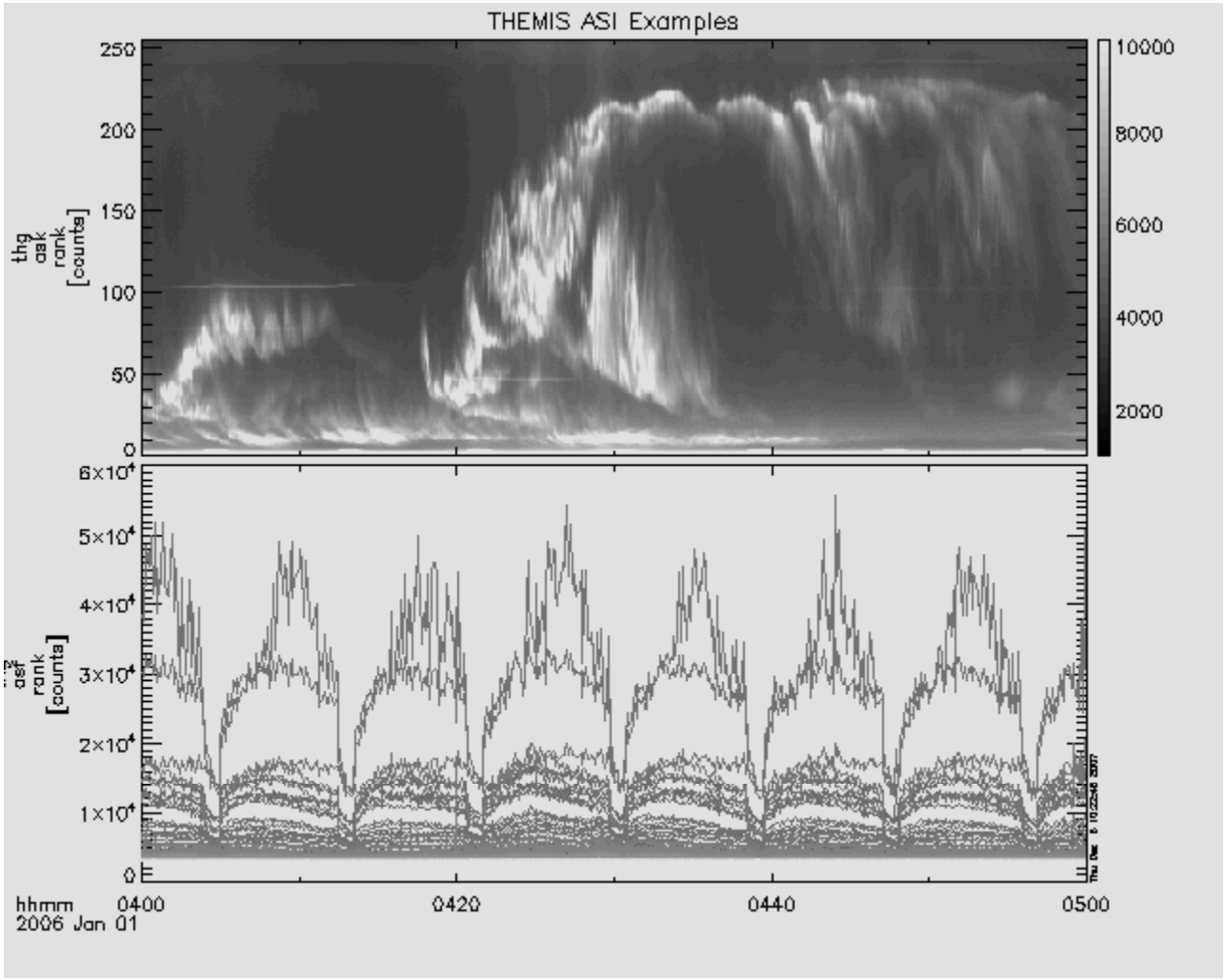
Daily overview of available keograms

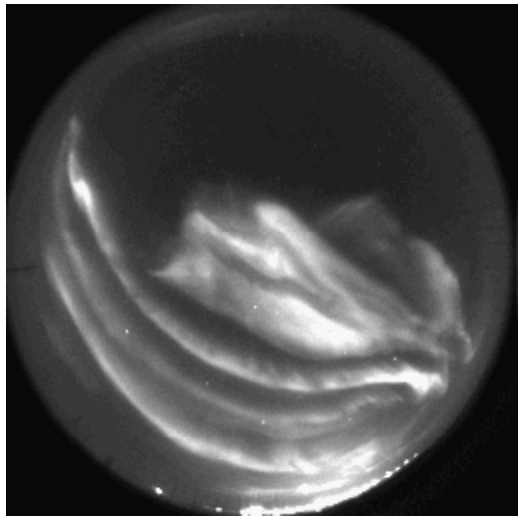


Zoom into interesting time

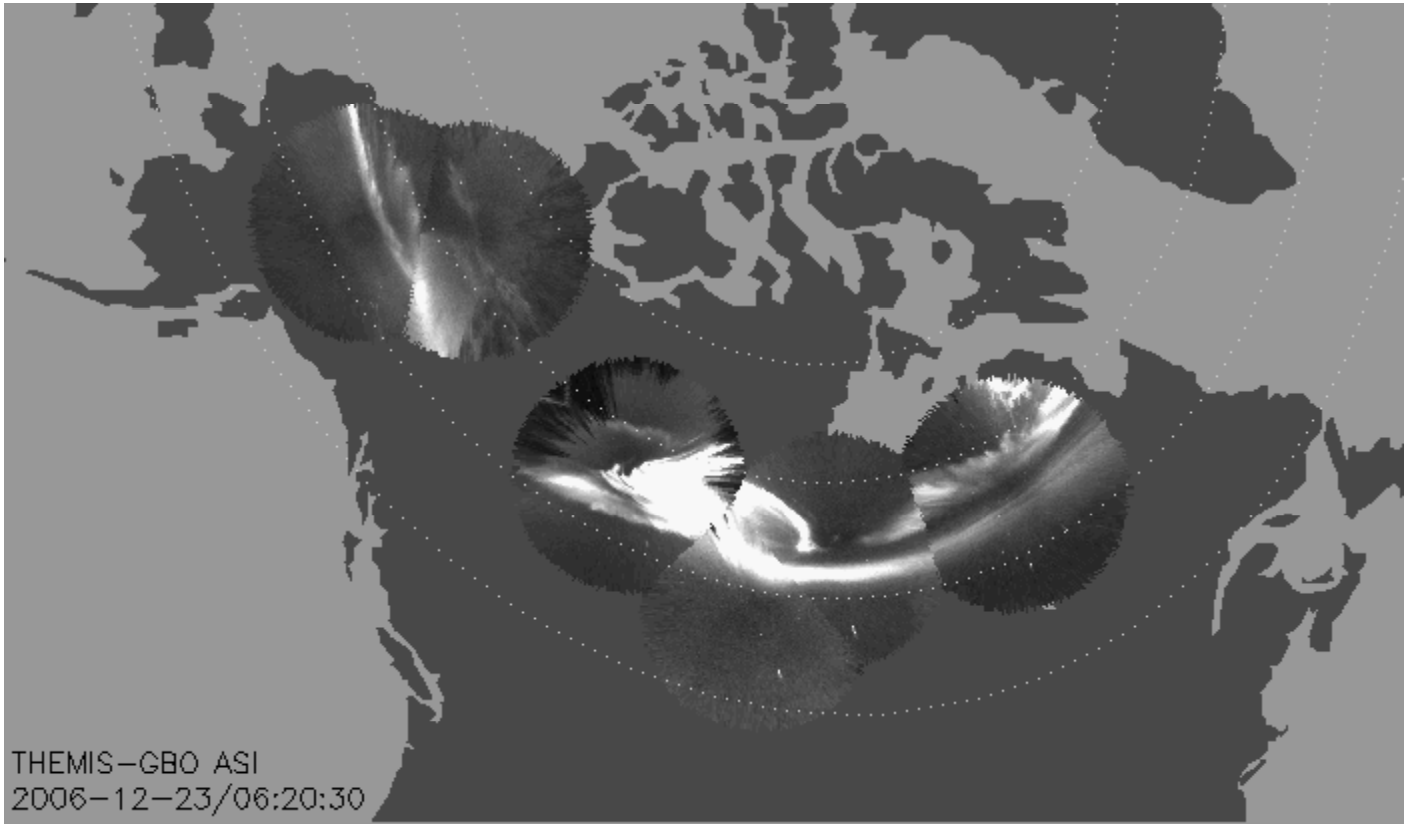


Watch “movie” of single station

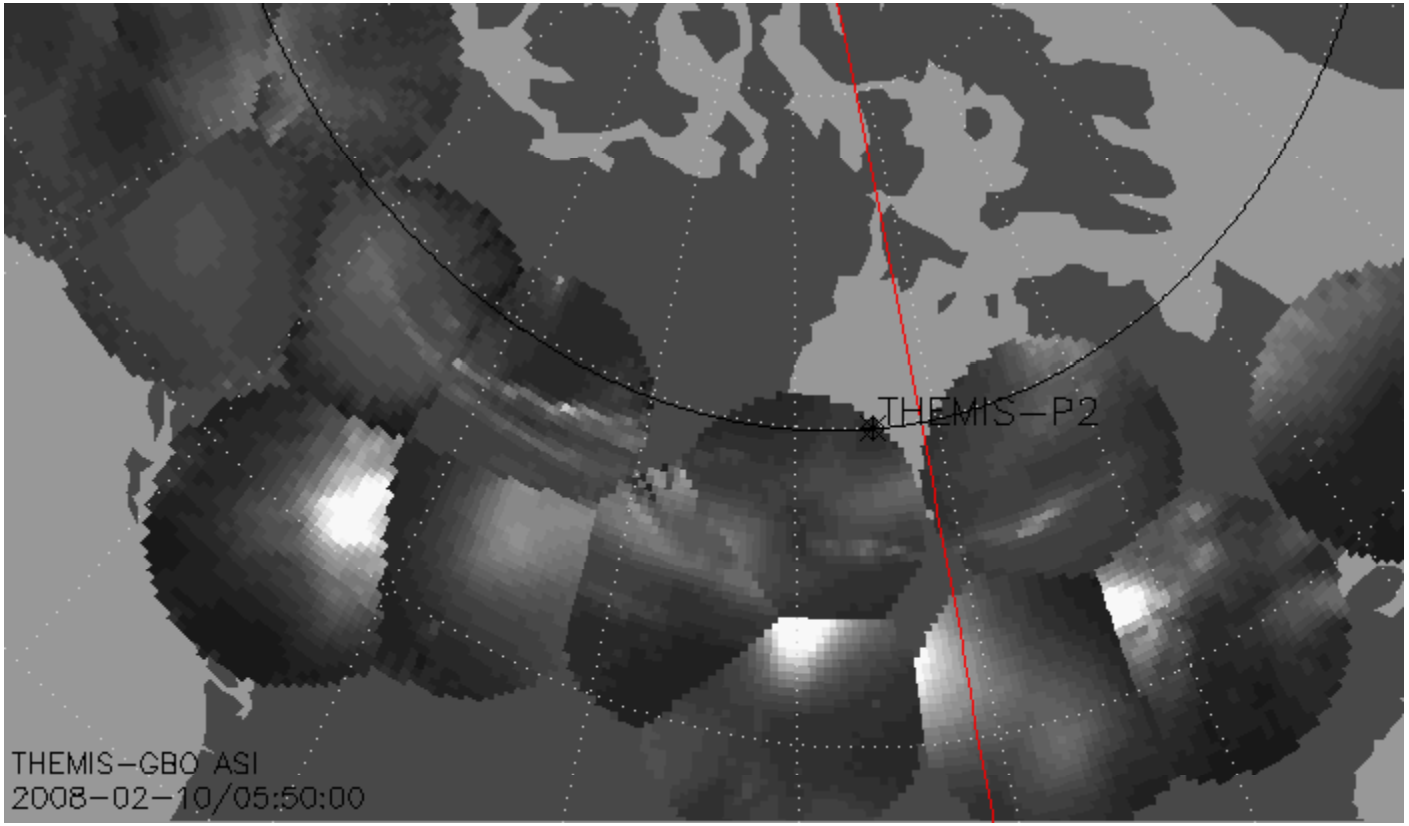




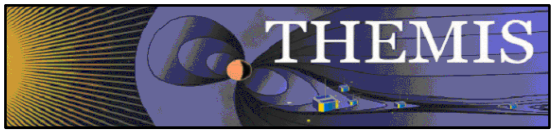
Mosaic of whole GBO array from full resolution images



Mosaic with S/C footprint From thumbnail images

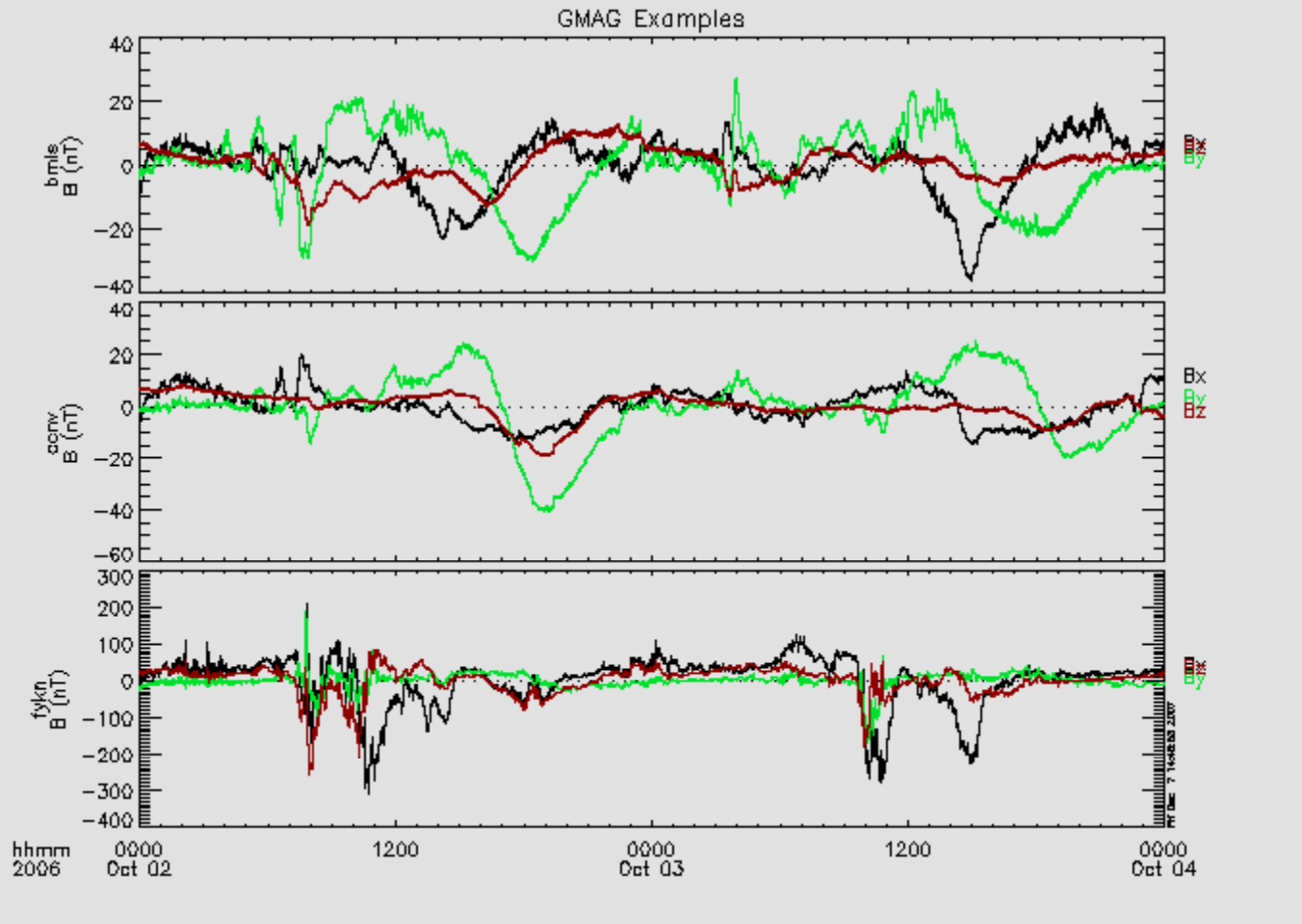


Black line marks footprint of THEMIS-P2 during whole night
Asterisk marks location at time of mosaic

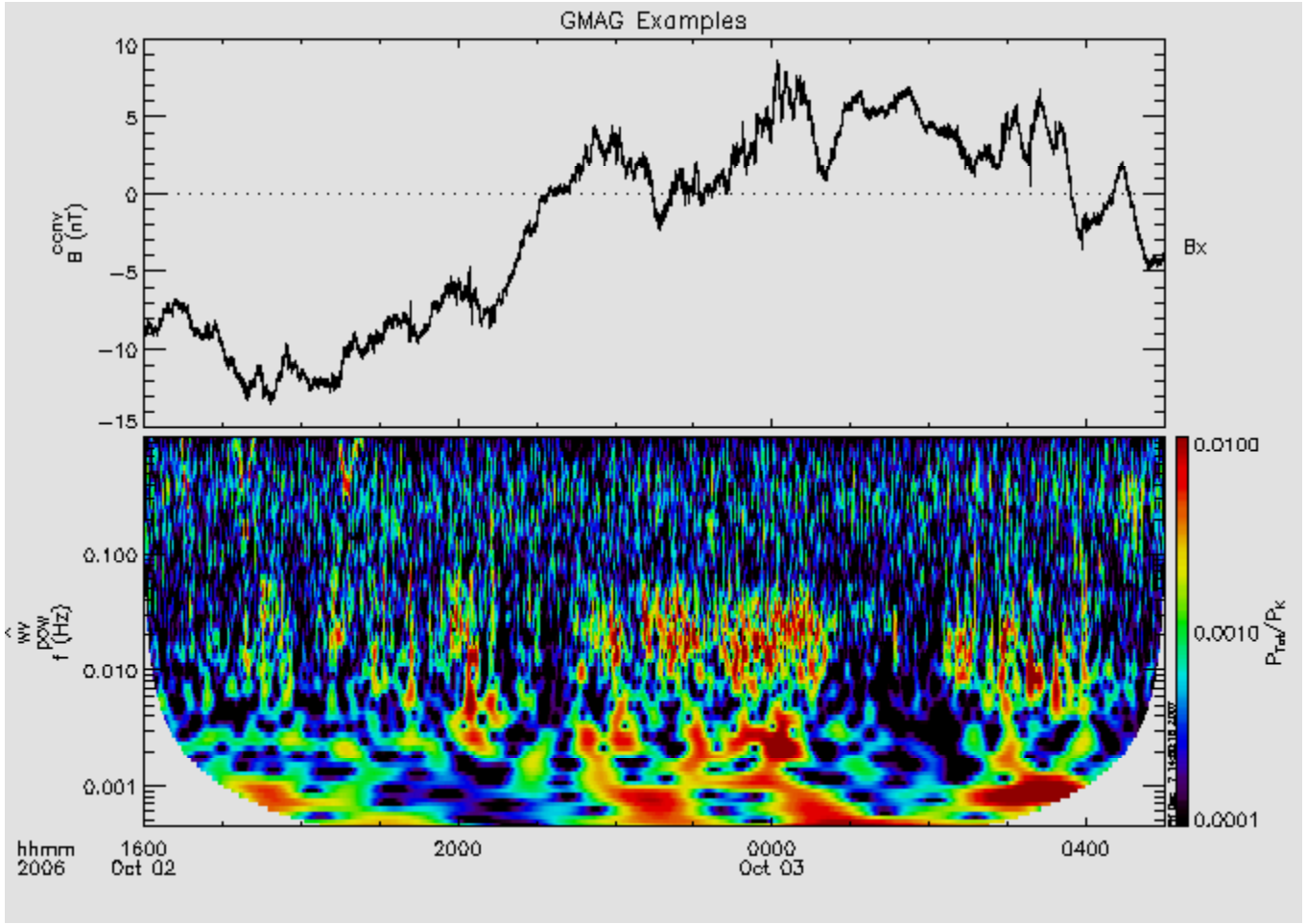


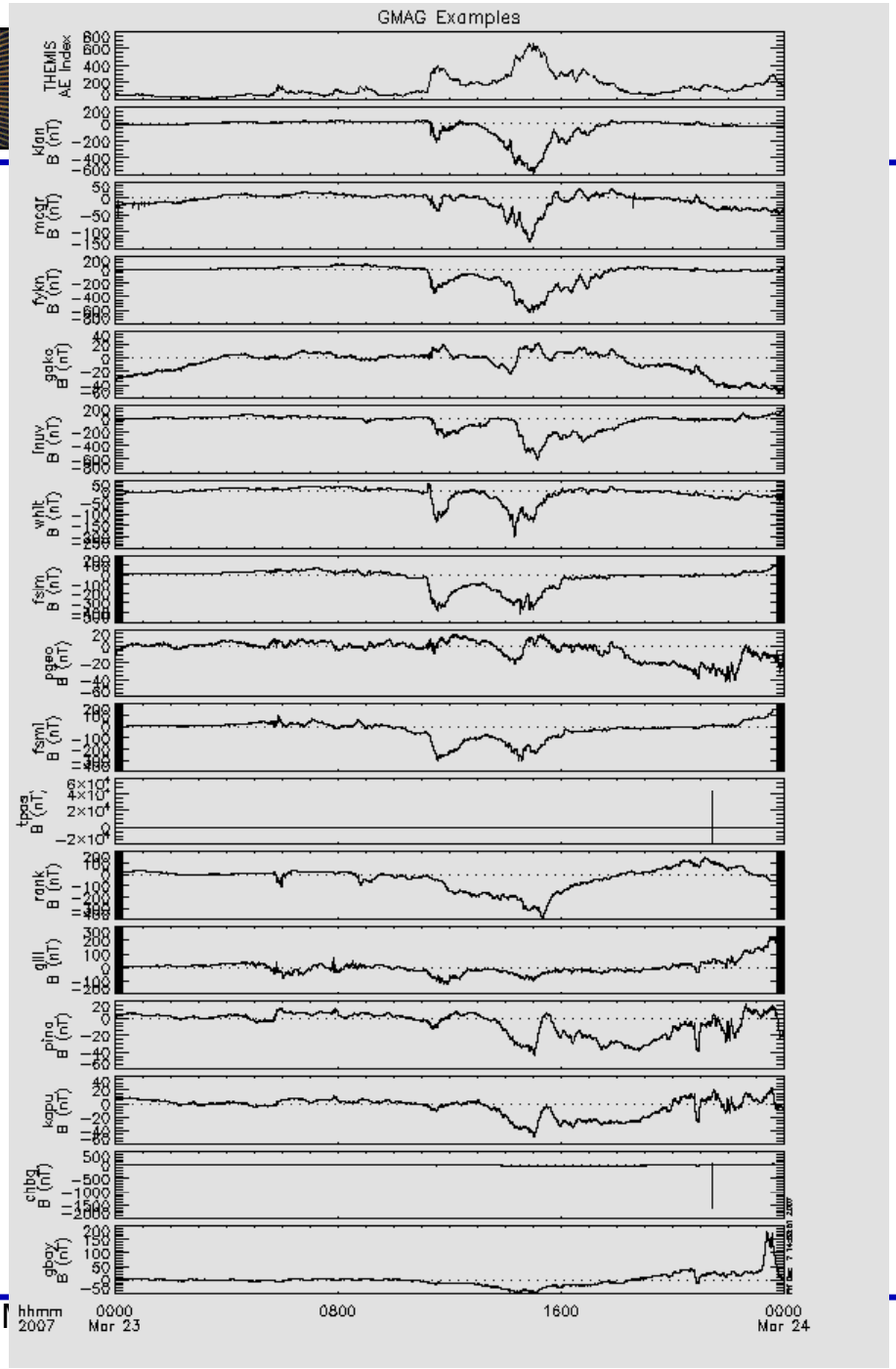
Ground magnetometer Examples
Thm_crib_gmag.pro

Three station example

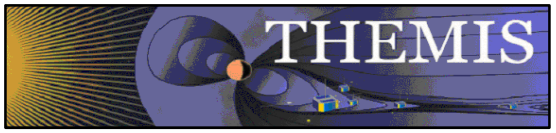


Wavelet transform example





Pseudo-AE of network

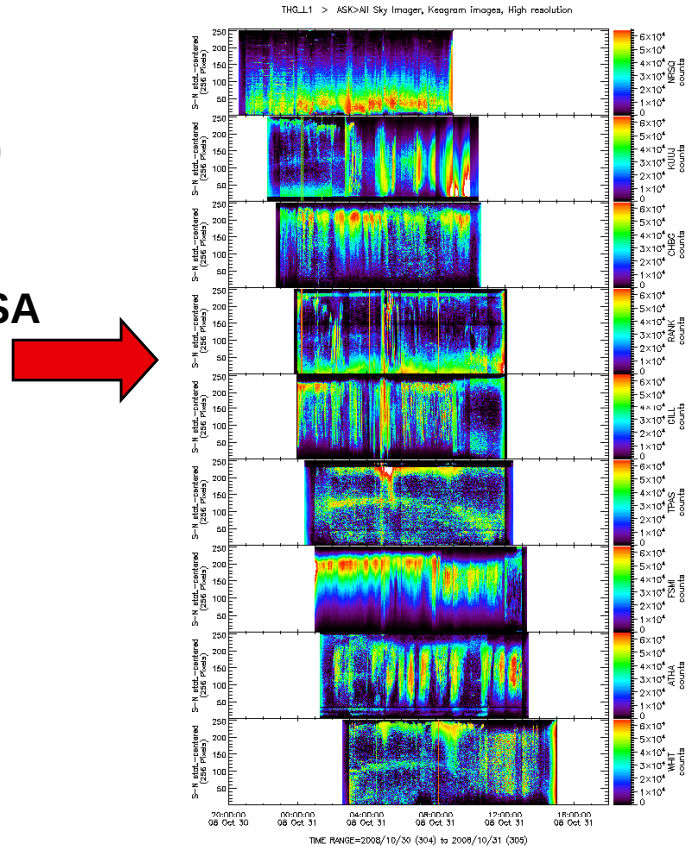


Data and Orbits

at SPDF

CDAWeb - THEMIS data

- Level-2 Data from all 4 Instruments on all 5 Satellites
- Ground Magnetometer Data from 42 stations (GBO, GEONS)
- NEW: Keograms from 22 All-Sky-Imagers (ASI) going back to 2005.
- All data updated daily (auto-ingest) from THEMIS data site.
- GIF-Walk: pre-generated Magneto-pause Crossing Survey plots (David Sibeck, NASA GSFC)



CDAWeb - News

November 25, 2008: All THEMIS L2 FIT files reprocessed to fix data problem - new files available in CDAWeb on November 24, 2008.

November 10, 2008: CDAWeb has been updated to contain all of the newly reprocessed THEMIS ESA, FGM, SST and State files. This new version of the THEMIS L2 ESA files contain data quality variables (which are applied to the marked variables when plotted).

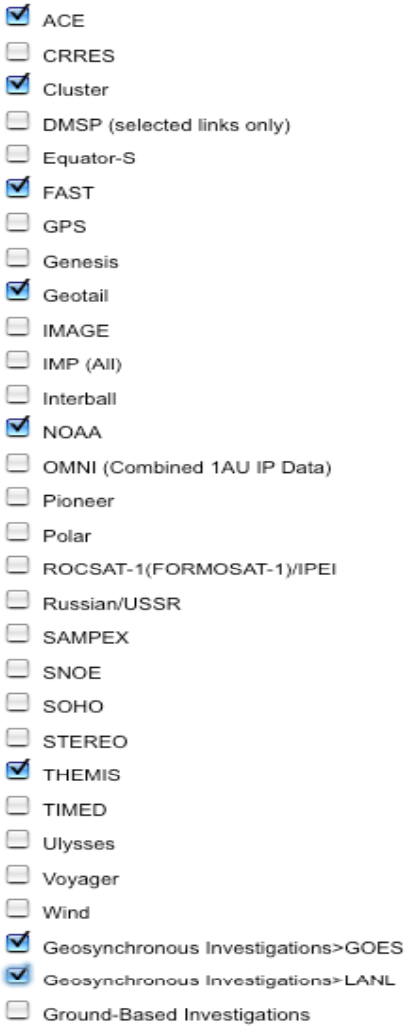
New functionality added to all output pages: Previous/Next buttons produce the next or previous plot, listing or cdf.

Postscript and PDF plotting files now supported for all plot types except images.

CDAWeb - Other Data

Many data products of THEMIS interest:
ACE, Cluster, Geotail, FAST, NOAA, GOES, LANL, Wind …

ITM data to study storm effects in ITM region: TIMED, ROCSAT, GPS (under development)



http://cdaweb.gsfc.nasa.gov

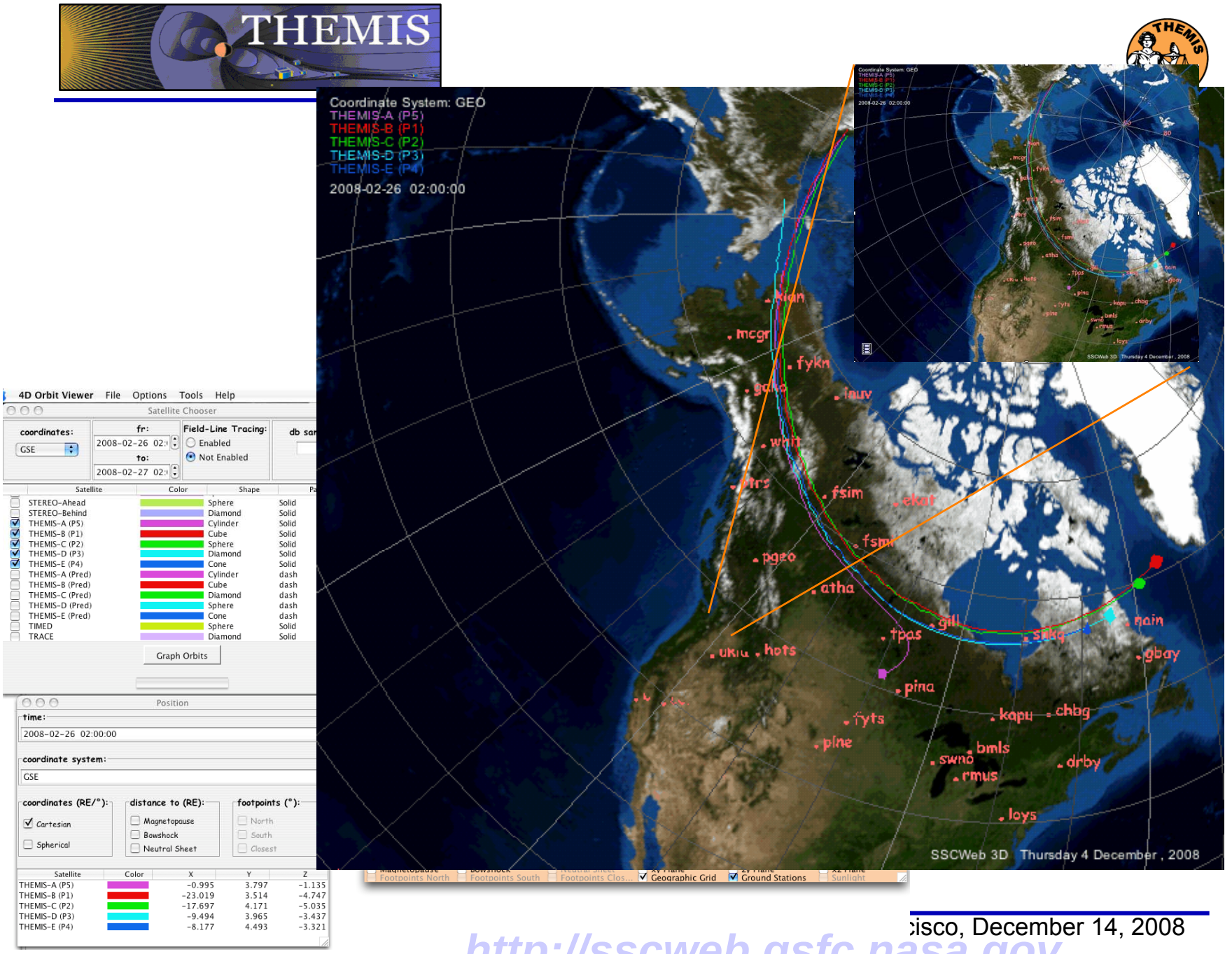
SSCweb TIPSOD

Orbits for most science satellites, updated regularly and often including predicts.

TIPSOD 4-D orbit viewer

Saved queries for typical THEMIS-related SSCweb runs (1-click access).

http://sscweb.gsfc.nasa.gov



http://sscweb.gsfc.nasa.gov


Satellite Chooser
coordinates:
GSE
fr:
2007-03-23 00:
to:
2007-03-24 00:
Field-Line Tracing:
Enabled
Not Enabled
db sampling:
2
Satellite
Color
Shape
Pattern
ST5-B
ST5-C
STEREO-Ahead
STEREO-Behind
THEMIS-A (P5)
THEMIS-B (P1)
THEMIS-C (P2)
THEMIS-D (P3)
THEMIS-E (P4)
THEMIS-A (Pred)
THEMIS-B (Pred)
THEMIS-C (Pred)
THEMIS-D (Pred)
THEMIS-E (Pred)
Cone
Sphere
Sphere
Diamond
Cylinder
Cube
Sphere
Diamond
Cone
Cylinder
Cube
Diamond
Sphere
Cone
Solid
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Solid
Solid
Solid
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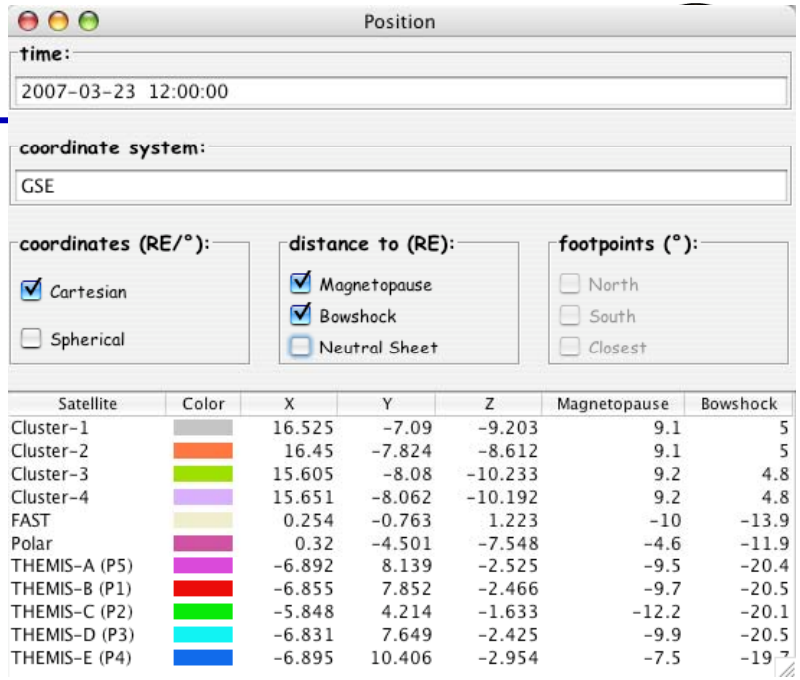
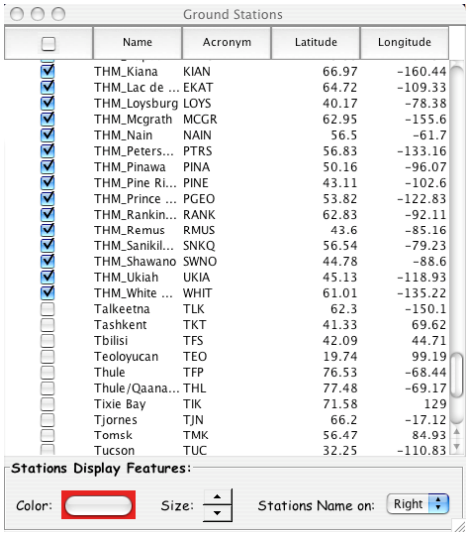
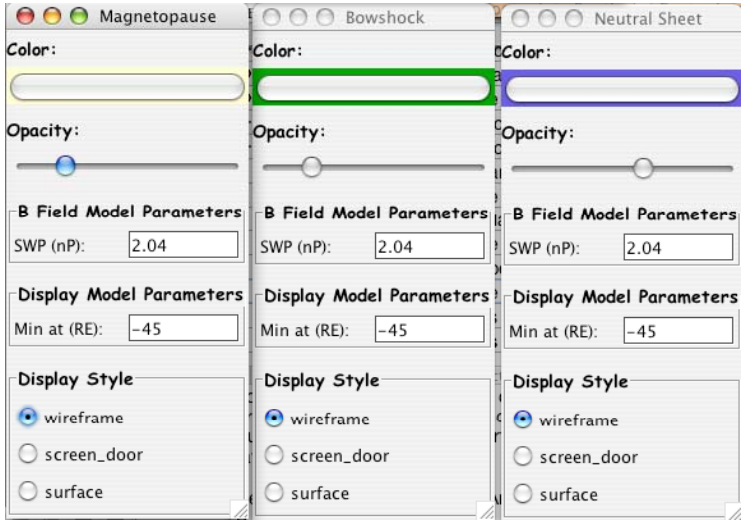
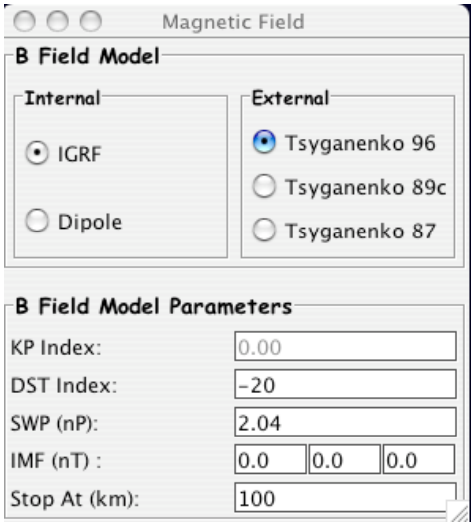
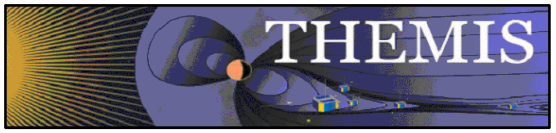
dash_dot
dash_dot_dot_dot
dash
dash
dash
dash
Graph Orbits


Position
time:
2007-03-23 12:00:00
coordinate system:
GSE
coordinates (RE/°):
Cartesian
Spherical
distance to (RE):
Magnetopause
Bowshock
Neutral Sheet
footpoints (°):
North
South
Closest
Satellite
Color
X
Y
Z
Magnetopause
Bowshock
Cluster-1 16.525 -7.09 -9.203 9.1 5
Cluster-2 16.45 -7.824 -8.612 9.1 5
Cluster-3 15.605 -8.08 -10.233 9.2 4.8
Cluster-4 15.651 -8.062 -10.192 9.2 4.8
FAST 0.254 -0.763 1.223 -10 -13.9
Polar 0.32 -4.501 -7.548 -4.6 -11.9
THEMIS-A (P5) -6.892 8.139 -2.525 -9.5 -20.4
THEMIS-B (P1) -6.855 7.852 -2.466 -9.7 -20.5
THEMIS-C (P2) -5.848 4.214 -1.633 -12.2 -20.1
THEMIS-D (P3) -6.831 7.649 -2.425 -9.9 -20.5
THEMIS-E (P4) -6.895 10.406 -2.954 -7.5


Ground Stations
Name
Acronym
Latitude
Longitude
THM_Kiana KIAN 66.97 -160.44
THM_Lac de ... EKAT 64.72 -109.33
THM_Loysburg LOYS 40.17 -78.38
THM_Mcgrath MCGR 62.95 -155.6
THM_Nain NAIN 56.5 -61.7
THM_Peters... PTRS 56.83 -133.16
THM_Pinawa PINA 50.16 -96.07
THM_Pine Ri... PINE 43.11 -102.6
THM_Prince ... PGEO 53.82 -122.83
THM_Rankin... RANK 62.83 -92.11
THM_Remus RMUS 43.6 -85.16
THM_Sanikil... SNKQ 56.54 -79.23
THM_Shawano SWNO 44.78 -88.6
THM_Ukiah UKIA 45.13 -118.93
THM_White ... WHIT 61.01 -135.22
Talkeetna TLK 62.3 -150.1
Tashkent TKT 41.33 69.62
Tbilisi TFS 42.09 44.71
Teoloyucan TEO 19.74 99.19
Thule TFP 76.53 -68.44
Thule/Qaana... THL 77.48 -69.17
Tixie Bay TIK 71.58 129
Tjornes TJN 66.2 -17.12
Tomsk TMK 56.47 84.93
Tucson TUC 32.25 -110.83
Stations Display Features:
Color:
Size:
Stations Name on:
Right


Magnetopause
Bowshock
Neutral Sheet
Color:
Opacity:
B Field Model Parameters
SWP (nP):
2.04
Display Model Parameters
Min at (RE):
-45
Display Style
wireframe
screen_door
surface


Magnetic Field
B Field Model
Internal
IGRF
Dipole
External
Tsyganenko 96
Tsyganenko 89c
Tsyganenko 87
B Field Model Parameters
KP Index:
0.00
DST Index:
-20
SWP (nP):
2.04
IMF (nT) :
0.0
0.0
0.0
Stop At (km):
100



Common Data Format- CDF

CDF Version 3.2.2 release, fixes memory leak and ReadOnly mode problems, and includes some changes for the tool programs.
CDF Patch for Matlab
CDF Patch for IDL 6+ (strongly recommended)
CDF's Java Network Launching Protocol latest development