Pre-THEMIS-Launch
SCIENCE MEETING
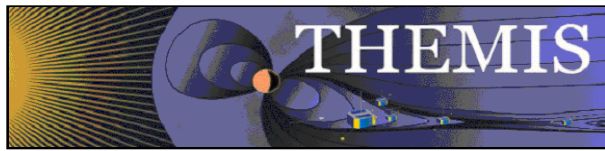
Data Analysis
Software Tools

Bromund

GST Inc. for NASA/GSFC

Larson, Frey, Bonnell, McTiernan, Lewis, Quinn, Angelopoulos – UC Berkeley
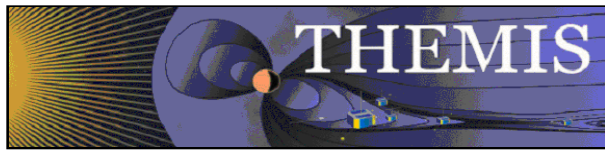
Schwarzl – UCLA, Georgescu – MPE, Robert – CETP
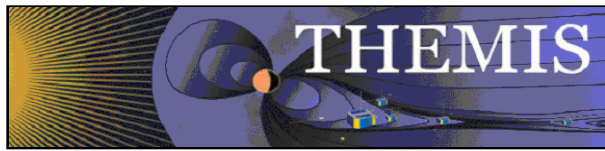
Jackel, Donovan – Calgary

Overview

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

- Code is available to everyone, but not required to analyze data.
- IDL based (library of routines –but no main program!).
- Command driven.
- Separates the tasks of:
    - Reading files.
    - Manipulating data
    - Plotting
- Platform independent. Works on:
    - Solaris
    - Linux
    - Windows
    - MacOSx
- Implements automatic file retrieval
    - Given time interval and data type as input
    - Relies on well defined directory structure.
    - Automatic WEB download to local directory cache.
- Raw data is easily "loaded", "manipulated", "plotted".
- Software maintains variables (data quantities) and associated metadata.
- Command line interface commands are building blocks usable for batch mode processing and/or GUIs.

The software operates on Level 1 and Level 2 data.

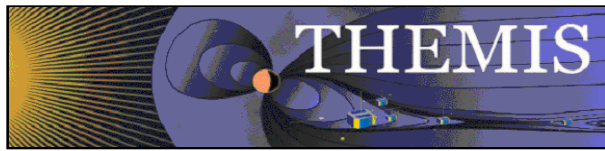Data Level Definitions:

Level 0 Data –

- Raw files (*.pkt) one per APID.
- Not used at all by Scientific community.

Level 1 Data -

- CDF (Common Data Files) files (*.cdf)
- Contain raw (uncalibrated) data. i.e. counts, DAC units.
- Used by many scientists.
- Typically requires software to interpret.

Level 2 Data

- CDF files – contain physical quantities.

- Data Directory structure will be large! (scores of files per day)

- Consistent across all platforms.
  - Same Directory hierarchy on WEB and local file system.
  - Root directory of hierarchy is configurable

- Software performs automatic file retrieval.
  - Software maintains directory hierarchy.
  - Can be set to 'No Download' or 'No Update' mode
  - Root directory of local copy of hierarchy determined automatically, but configurable.
    - Environment variables
    - thm_config.pro
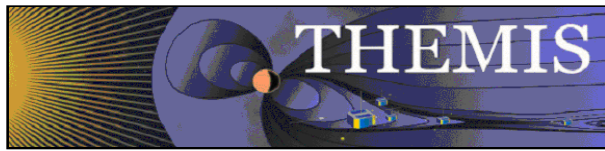
Loading Routines:

Thm_load_gmag   - ground magnetometer

Thm_load_ask   - All Sky Keograms

Thm_load_asi   - All Sky Imagers

Thm_load_fgm   - Flux Gate magnetometer

Thm_load_scm   - Search coil magnetometer

Thm_load_efi   - Electric Field Instrument

Thm_load_fit   - Onboard Fields spinfit

Thm_load_fbk   - Fields Filter Bank

Thm_load_mom   - Particle Moments

Thm_load_sst   - Solid State Telescope

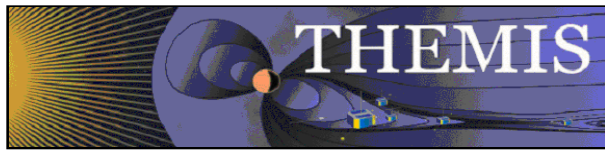Thm_load_state   - Orbit and attitude data
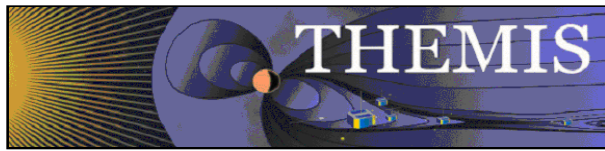
Calibration Routines

- thm_cal_fgm
- thm_cal_fit
- thm_cal_fbk
- thm_cal_efi
- SCM – crib sheet to calibrate with FORTRAN exec.
- thm_cal_mom

Coordinate Transformations

- ssl2dsl
- dsl2gse
- cotrans

Plotting

- tplot

Crib Sheets for Loading, Processing and Plotting

thm_crib_gmag

thm_crib_mom

thm_crib_sst

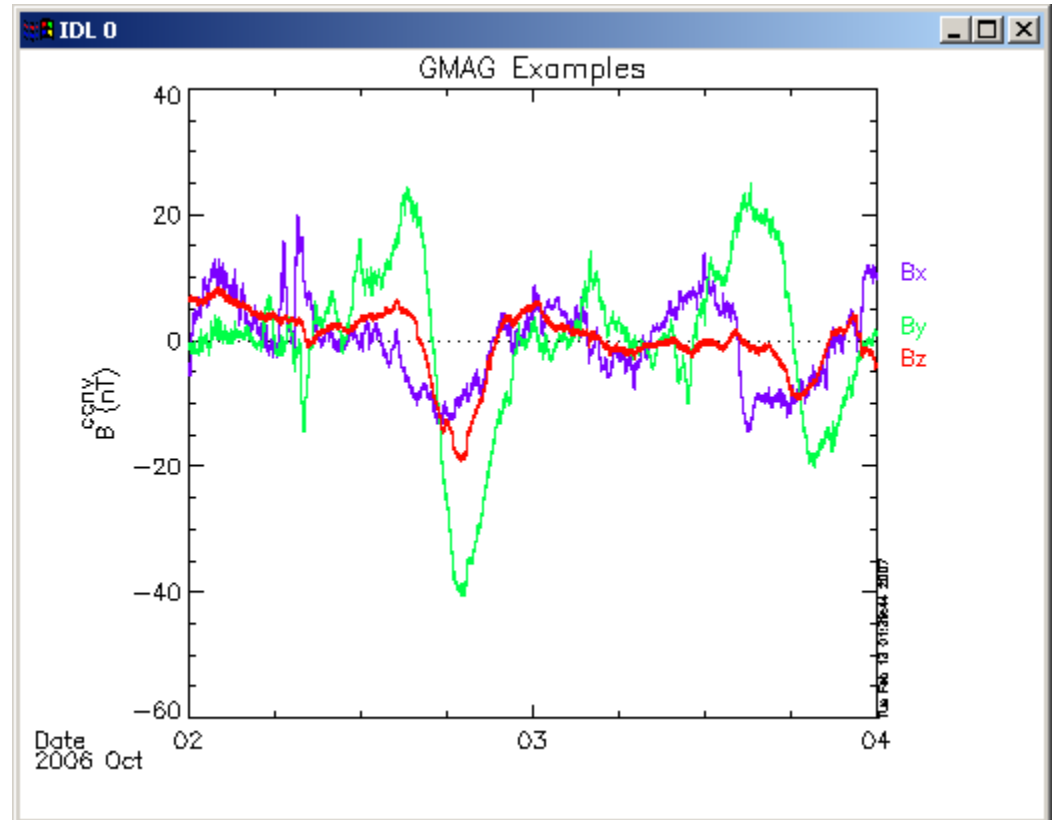thm_crib_fgm

thm_crib_scm

thm_crib_efi

thm_crib_fbk

thm_crib_scm

thm_crib_asi

thm_crib_tplot

- To load data:
  - » timespan,'6-10-2',2,/days
 - » thm_load_gmag,site='ccnv'
- To plot data:
  - » tplot,'thg_mag_ccnv'

- – Do a 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
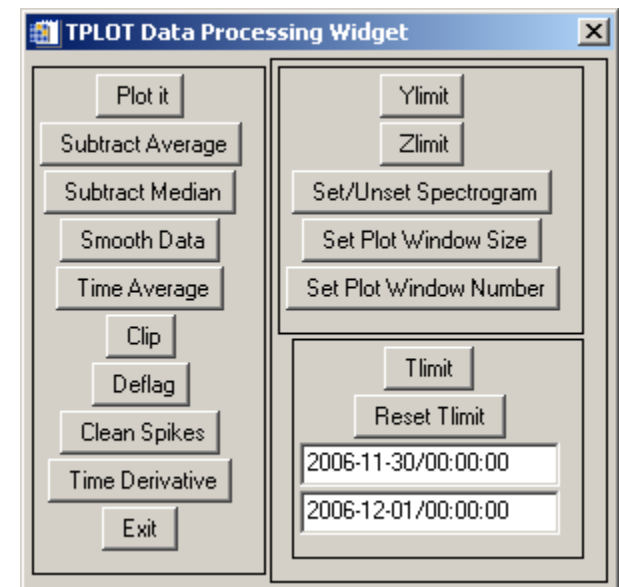- – Plot it.
  - » tplot,'*ccnv_x*',trange=tr
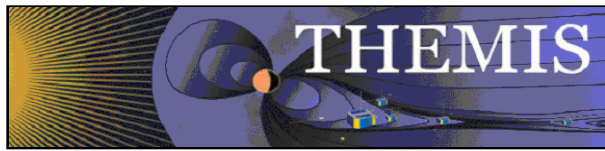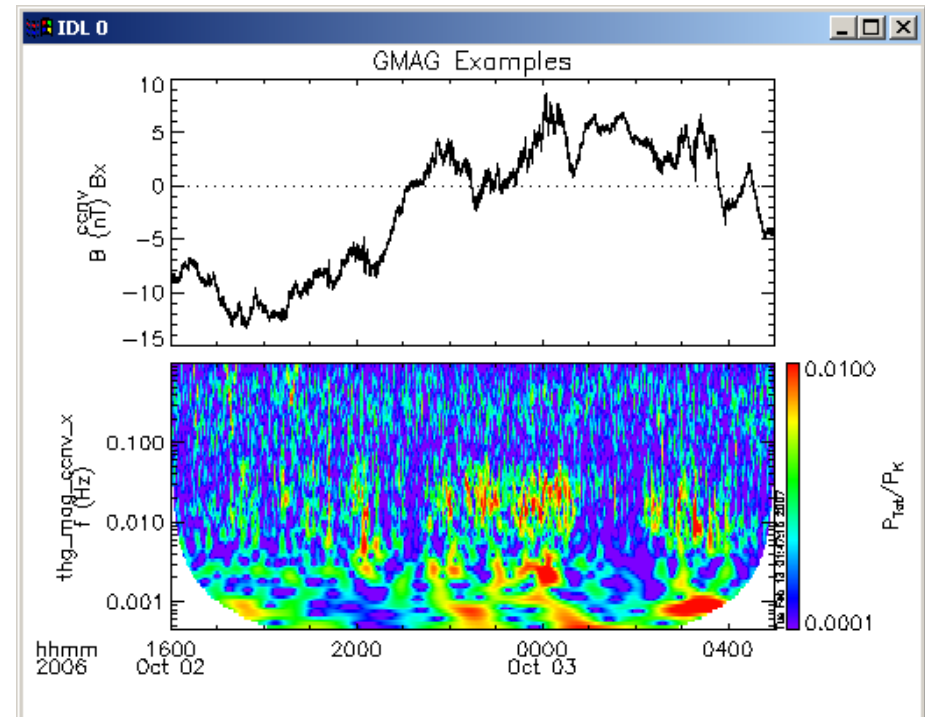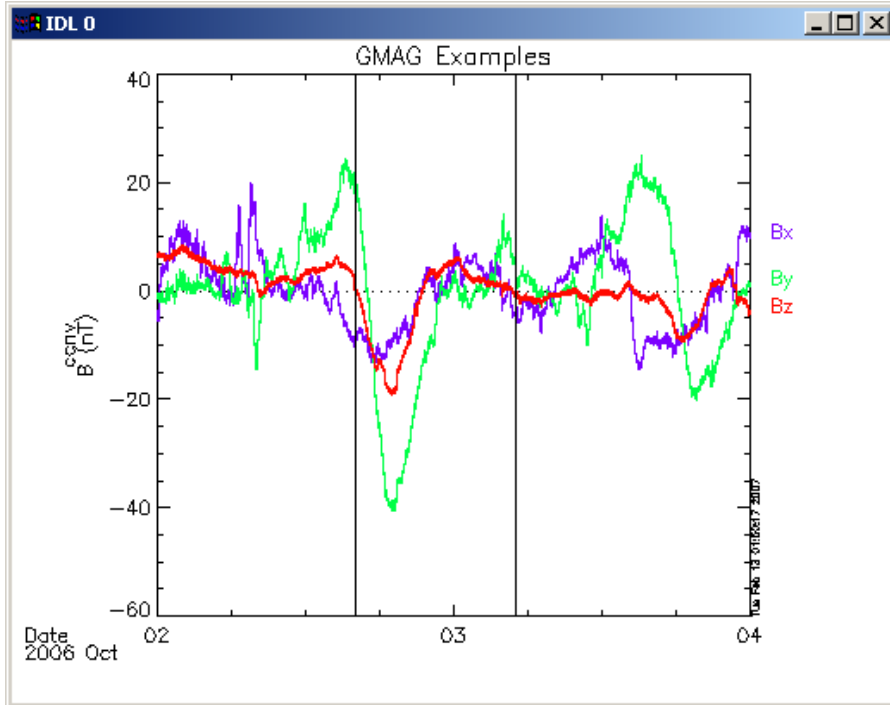
Graphical User Interface
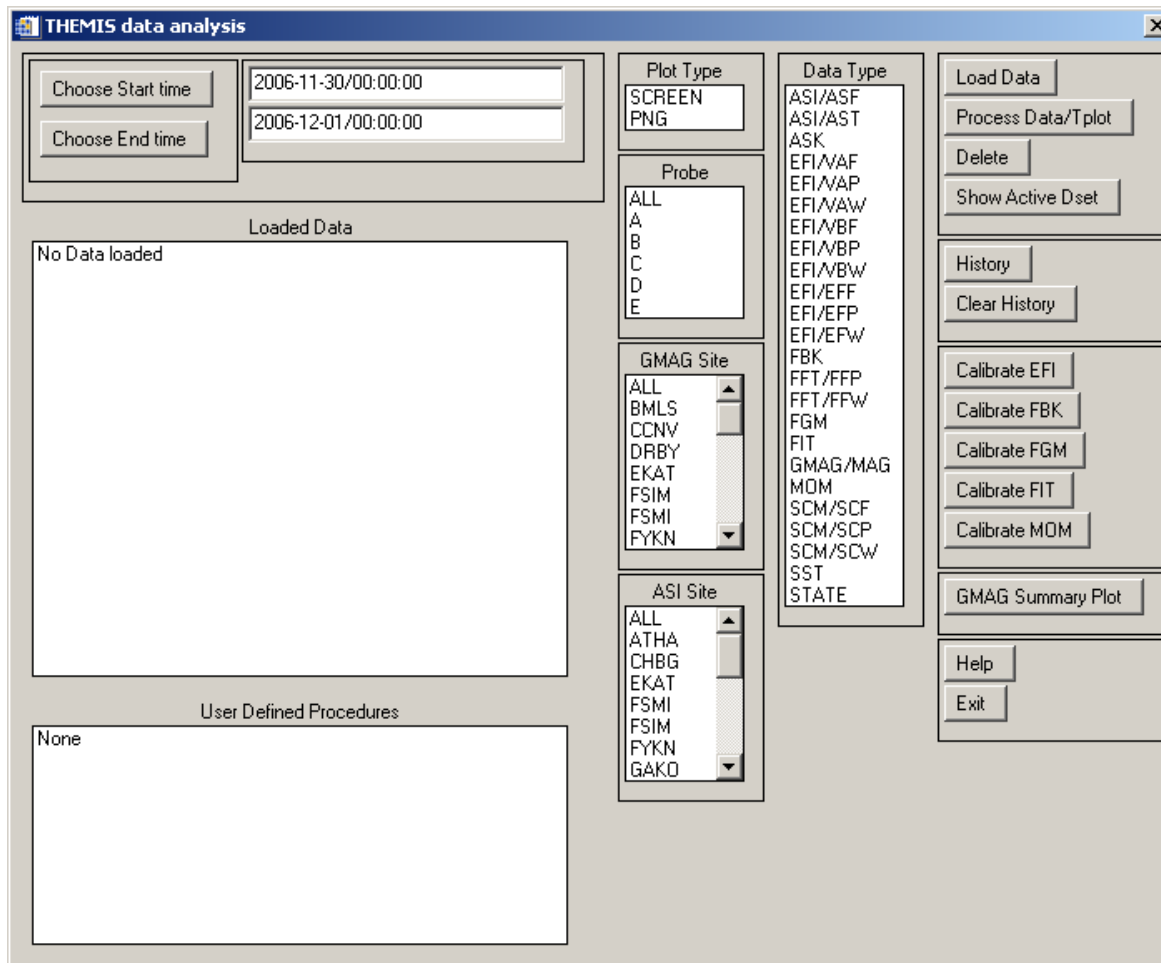
IDL> thm_gui

Can select data for loading, calibration, processing, and plotting.

Can save the history of processing.

http://themis.ssl.berkeley.edu/socware/

Choice of 'bleeding edge' or tested releases.

- Bleeding Edge

    latest development snapshots

- Thmsw_1_0_20070213
    - Software release tested and documented for pre-Launch configuration.
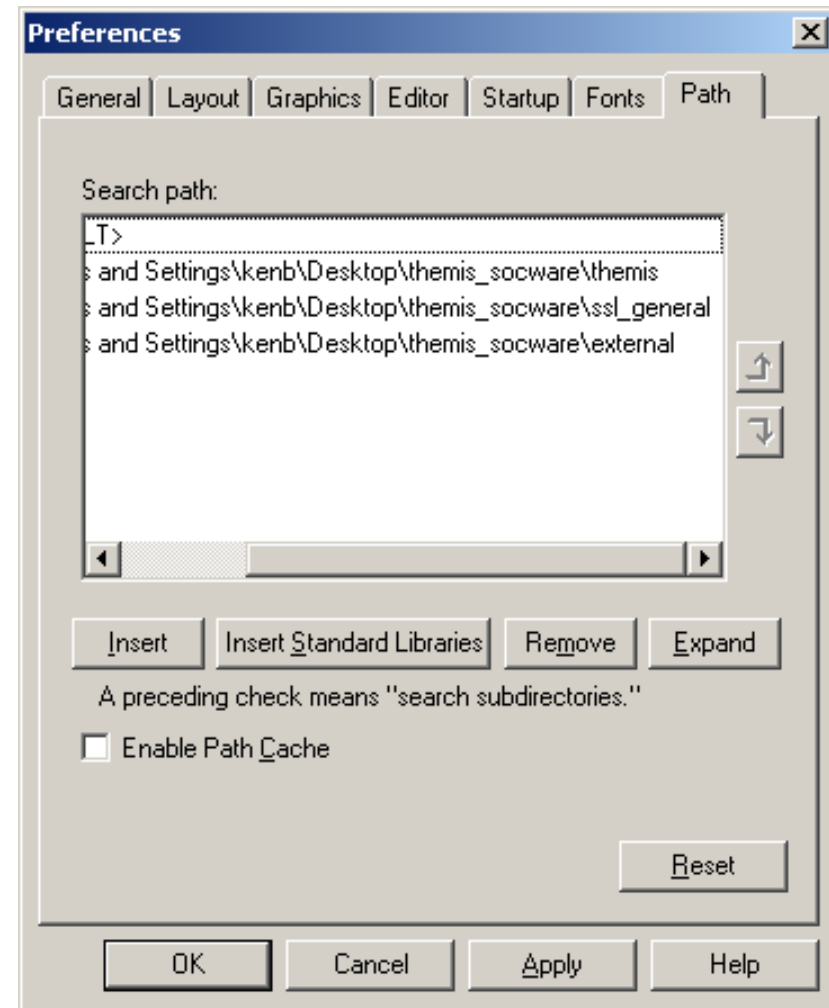
Set up the IDL path

There are 3 subdirectories of the IDL distribution, which must be placed in the following order:

- themis
- ssl_general
- External

See THEMIS Data Analyis Software User's Guide for more details.

http://themis.ssl.berkeley.edu/socware/development/
thm_soc_120_ANALYSIS_SFW_USERS_GUIDE.pdf