

## Themis Software Task Priorities (In Play / In the Queue) - 5/23/08

### To Be Discussed - Top of Meeting

#### 1. Data Issues

- a. scw spikes
- b. esa files missing thm\_get\_eas\_pot aborts (Jim McFadden, Jim McTiernan)
- c. email dated 5/1 from Vassilis: Xiaoyan pointed out that SST moms (on board) are off: SST pressure and density are 2 orders of magnitude higher than they should be. This started at the time the scale factors were changed (a couple of weeks ago). (Davin to look into)
- d. L1 ESA CDF and thm\_load\_esa feedback to Thomas (Jim McFadden and Davin)
- e. Add "last processed" time to L1 (and L2?) CDFs BugZid=115
- f. Kyoto\_ae\_load (naming the old program)

#### 2. Davin

- a. email to Olivier - do you see noise? Davin to send Jim Lewis delta mod compression error.

#### 3. John B.

- a. Document EFI caveats
- b. Document how will the offsets be translated into other coord. systems.

#### 4. Harald

- a. Mozaic Movies - Harald checked with Larry Kepko for code to stitch them together. Larry's response: either used Quicktime Player (it might require the pro version) or this program <http://www.biermann.org/philipp/mpegcut/> which calls itself 'mpegcut' but can join as well by switching the radio button. It seems to work real nicely, and is available on all platforms. Vladimir will check if ImageMagic will work.
- b. Update Training Presentation for GEM by June 6.
- c. Process High Resolution data once Tim has put into the system (est. 6/13)  
Priority to 2/16, 2/26, 2/28
- d. Validate Tsyganenko work from Pat (6/30)
- e. Send SPA Newsletter and Mozaics info and blurb for Vassilis to submit.
- f. Production Data Processing info for Tim (on hold)

### Tim

#### 1. Support Mirror Sites: a. Japan (ISAS) b. Austria c. France

- d. UCLA - UCLA will need to supply SSH key - RSYNC Key

#### 1. Support gmag data remote sites: a. Augsburg b. Japan - **send info** c. Calgary

#### 1. Copy High resolution data into the system for Harald (est. 5/28)

#### 2. 2hr plots: fitmoms, and overviews [Note: people are using the DARTs site because of this feature; this small fix will make the main site more friendly]. **Once Jim M is completed**

#### 3. Mozaics - Movies (Harald makes, Tim puts on web site)

#### 4. 20 Themis scripts review to optimize processing. (40% complete)

#### 4. Order 20 Tbytes additional disk storage.

#### 5. ~~Inventory of Products, monitoring and building new alarms for Production Data Processing.~~

~~—Draft document produced.~~ Next version with Harald's info as well. (On Hold)

### Hannes

#### 1. V03 - L2 State cdf.

- a. definitive attitude info - in progress
- b. See email concerning parms ("thx\_sci\_mode", "thx\_hsk\_issr\_mode")
- c. quality flag for FGM data d. spin model data (talk to Jim Lewis)

## Jim L.

1. scw spike removal, L1 cdf reprocessing
1. Another pass through L1 master cdf's using the latest SKTEditor (Vassilis - FIT L1 cdf).
2. "Add spin model data to state CDFs", format change, reprocessing will be needed
2. L1 File definitions Document. BugzID=xx.
2. GOES 12 Test data - create read to cdf routine, load cdf routine, master cdf, telecon with Howard Singer, pass in other coordinate systems.
3. thm\_cotrans changed to use spin model instead of current method of interpolating spin period. Code will be reviewed with Hannes before testing begins. Once Jim completes his testing, Hannes will be asked to QA new functionality. BugzID=100.
3. Refactor repeated CDF library code in CDF processing tools BugZid=50
4. Bfield mid-packet jumps.
4. L0 to L1 processing: look ahead to the next packet before processing the current packet. BugzID=67
4. Repeated timestamps and gaps in spin fit data BugZid=113 (#67 may fix this one as well).
5. Separate E and B timestamps for spin fits
  - a) make a revised V02 master CDF with E and B separated
  - b) change thm\_load\_fit to support V01 and V02 of the L1 CDFs
  - c) change the L0->L1 processing code
  - d) change the L1->L2 processing code
  - e) test the changes, then reprocess to create the V02 CDFs (keeping the V01 files around for a while to ease the transition) BugzID=45
5. L0->L1 processing scripts need better logging. BugzID=96,
6. FGS sample times and values, showing repeated timestamps. BugzID=113 (BugzID=67 must be done first)
6. FGM range changes in the mid packet. Post Proc maybe a solution to eliminate the spike. BugzID=44.
7. Provide Higher Cadence State Files - Spin period and spin phase - double precision. BugzID=91
7. Non Monotonic timestamps. BugzID=72
8. Latest ESA modes not yet implemented (BugzID=4) (Hold until sent to Probes)
9. bau\_sunpulse\_met assumes x86 endiannes (BugzID=13)
10. FGL issue. We have learned that FGL data from probes C, D and E has a 0.25 sec timing error, starting in summer 2007, and continuing to the present (Feb 2008) time. We would like to fix these timestamps in the L1 CDF files. Process should be generic so future corrections can be easily handled. Low Priority steps or tasks:
  - a. create a flag for the affected L1 variables somehow, to prevent confusion about which corrections have or have not yet been applied. So each entry in the proposed correction file should have some sort of tag identifying what the correction is, which could be looked up in the CDF as a variable, variable attribute, or global attribute. (low priority)
  - b. Change L0-L1 code to take corrections into account. (low priority)
11. "Phantom packets" cause non-monotonic distribution times. BugzID=25, low priority.
12. Evaluate CDF compression algorithms BugZid=81, low priority.
13. L0 to L1 processing scripts should allow partial processing BugZid=49, low priority.
14. Spin modeling during shadows BugZid=43. low priority.

## Jim M.

1. L2 MOM, Fit and ESA mods complete. Re-reprocessing will occur the week of 5/27-5/30.  
(Bob McGuire email) completed. SPDF will wait to release until 6/2, post AGU.
1. 2hr plots: fitmoms, and overviews [Note: people are using the DARTs site because of this feature; this small fix will make the main site more friendly]. committed and will go into production the week of 5/27-5/30 **Coordinate with Tim**
1. fgh minor data problem (from Pat) - sort out
- 2 GMAG Stack Plots - committed and will go into production the week of 5/27-5/30. BugzID=86.
2. Update Training Presentation for GEM by June 6.
3. A separate paragraph or couple sentences on each L2 cdf's that are available to the public.
3. FFT (onboard) L2 cdf
- 4 thm\_load\_mom: for quantities like velocity, the coordinate system isn't stored in the meta data, and none of the units are stored in the place we normally try to store them (from Pat - Vassilis concurs)
- 4 Decouple display variable types in the 'Choose Data widget' from the valid data types in thm\_load\_\*.  
- Partially done.
4. SCM L2 cdf
- 5 Variable units – generic solution  
thm\_load\_spin.pro, thm\_load\_state.pro, thm\_load\_hsk.pro, thm\_load\_sst.pro  
thm\_load\_esa.pro, thm\_load\_bau.pro, thm\_load\_fgm.pro, thm\_load\_fbk.pro  
thm\_load\_fft.pro, thm\_load\_fit.pro, thm\_load\_scm.pro, thm\_load\_efi.pro  
thm\_load\_trg.pro, thm\_load\_asl.pro, thm\_load\_gmag.pro, thm\_load\_ask.pro  
thm\_load\_mom, thm\_load\_esa\_pkt
- 5 If requesting 1 hour of data using timespan, then load data using one of our load data routines.  
Recommend if there is a fix at the load cdf level.
- 6 Themis SCM CAL File Processing - produce table of contents and assign sections with Patrick R.  
Turnover from Ken
- 7 Administrator's Guide
- 8 Themis Developers Guide
- 9 thm\_load\_mom changes
  - a. reconcile mods with Davin at an appropriate time.
10. AE Indexes Issue Jan 8-12, keyograms Jan 12-13, Stripes- Vassilis: minor nuisance - low priority
10. Overview plot change: mode bar seems thick (nothing we can do easily - low priority)
10. Extraneous scmcsl directory under L1 products (from Jim L.) BugzID=98.
10. Mozaic Processing - permanent script needed (very low priority)

## L2 Product Status:

Completed: ESA, MOM, FIT (onboard), FBK, FGM, SST (needs upgrades), GMAG  
Yet to be done: FFT (onboard), SCM, EFI (Michael), ASI (Harald)

Pat

1. Plots for Vassilis using the plotxyz routine. In Progress
2. ~~IDL v7.0 - April when Release 4.0 of the Themis Software is QA'd.~~
2. executable crib for standardized Themis mapping ala plot below. thm\_map\_crib.pro  
Keywords[default]:trange[timespan],centerMLT[6:30],centerLAT[65deg], equatorial[0],neutral[0],  
probe['all'],gmags['all'],model['t89'],input=[2(kp=2)],fieldlines[1]  
Note:equatorial also shows equatorial trace, neutral also finds and plots neutral sheet. Sorted out with Vassilis.
2. Update Training Presentation for GEM by June 6.
2. fix "makes". Attached is a "fixed" version which plots what user sees on screen without much reshaping.  
This is good for publications. **Ask for feedback from Scientists**  
Also, plotxy and plotxyz bug fixed for postscripts yet postscript issues with plotxyz.
3. wavepol.pro and twavepol.pro - Put Olivier's into the distribution, test
3. Training on the day to day operations of the Summary Plots and Mozaics
3. VMO Deliverables: data product description files (only L2 data goes to VMO)
  - a. Corrections/Enhancements for FGM data Instrument and Numerical Data Files.
  - b. Generate EFI Instrument File & Update Person Files for EFI PI's (Forrest Mozer & John Bonnel)
  - c. Write FIT Numerical Data description.
  - d. Review Ephemeris SPASE numerical data, instrument files. This includes making improvements in the description of support quantities, particularly the mode descriptions.
  - ~~e. Review Observatory files for all probes and the person file for Themis.~~
  - ~~f Generate an instrument file for Thermal Plasma measurements(Moment Temperature) then~~  
~~numerical data files for this quantity for each probe, repeat this process for other moments.~~
3. Mini language to operate on tplot variables - first provide concept write up
4. boundary normal coordinates. On Hold. BugzID=59.
5. Christine's code to rotate the XY coord's along Earth direction was very effective. Also it was used by others. We need to streamline it, and it's very similar to the others you've already written.
5. Error msg for when timestamps of data do not match in tvector\_rotate, tdotp, and tcrossp.
6. Tplot auto scaling. BugzID=41.
6. invalid inputs to the version keyword
7. Clean-up of makepng and makegif
7. General Routine 'Add magnitude' vector - adding it's magnitude in it's structure. 4 vectors, colors=BGRB.

VMO Product Status:

Completed: FGM, State, ESA (second draft - one probe)

Yet to be done: MOM, FIT (onboard), FBK, SST, GMAG, FFT (onboard), SCM, EFI, ASI

## Bryan

1. ~~Tplot issue with angle mode changes. Since tplot only works with square arrays, it can't plot a time range that contains an angle mode change in which the number and distribution of the angles (y-axis) changes. The user is forced to limit the timerange that contains only the angle mode in which they're most interested.~~
2. Overplotting of not just lines and spectra, but also spectra over spectra. This means that the gap would be filled if another plot is below it. This way the data would not have to be merged, just tplot has to account for gaps and plot them as true gaps. (Submitted by Vladimir) Next up.
2. Update Training Presentation for GEM by June 6.
3. thm\_load\_state - phase I
  - a. hardcode (units = "km/s" or "km", or "deg") b. finish "no\_update" loading option (consult with Davin)
  - b. Finishing the coordinate transformation of the thm\_load\_state data at input, to include transformation of spinaxis attitude, need to determine keyword switch, implement the rotation of the spinaxis elevation/azimuth from gei to arbitrary coordinates (consult with Pat, Vassilis and Ken)
  - c. minor bug found by Pat (email of 2/15/08)
4. Think about making 2D slices through distribution. See medical imaging code in IDL demo."
5. thm\_load\_state - phase II (consult with Ken)
  - a. For STATE CDF files, the following variable attributes should be defined, consistent with they way they are defined in the L2 FGM file: units, coordinate\_system (consult with Jim L.)
  - b. Once defined in the CDF, thm\_load\_state should take the values from the dlimits.cdf.vatt to set the metadata for the tplot variables: dlimits.data\_att.units, dlimits.data\_att.coord\_sys
  - c. For thm\_load\_state, the suffix gets added to support data, but support data is not transformed: if you call thm\_load\_state, coord='gse', suffix='\_gse', /get\_support\_data only the pos and vel get transformed, but all get the \_gse suffix.
  - d. in thm\_load\_state, the code to delete support data that was loaded for coordinate transformation should be just del\_data, '\*\_state\_temp' e. THC braid photoelectrons
6. From Hannes:
  - a. Provided is the most common plot used by scientists that look at magnetic field data. Four panels Bx By Bz Bt and the position X Y Z as variables. Often the radial distance R is another variable. It would be great if someone enters e.g. tplot,'tha\_fgs\_gsm' such a useful default plot would appear. I am currently not able to produce such a plot using tplot. Another useful plot would be instead of one trace per panel, 5 traces per panel. One for each spacecraft and 5 sets of positions as variables at the bottom. For example: tplot,'th?\_fgs\_gsm' could produce such a plot. Also some standard plots that combine ground and spacecraft data could be useful. Notes from Vassilis: define keyword /positions default 'none', allow GSM X Y Z, R Lat Long,.....
  - b. The level 2 CDF files at [http://themis.ssl.berkeley.edu/data\\_download.shtml](http://themis.ssl.berkeley.edu/data_download.shtml) should contain position in various coordinate systems as well. Preferably in the same resolution as the data. Otherwise Scientists need to get the position from another source. Notes from Vassilis: option to introduce the data in RE with keyword (one RE =6,478 kilometers ???). Like thm\_load\_fgm /pos\_units= 'RE'. Also thm\_load\_state keyword out\_coord = 'GSM', 'GSE',...etc.
  - c. If one loads fgm data from probe 'a' and let's say there are no data for the chosen interval. The variables tha\_fgl and tha\_fgl\_gsm etc. should all be empty. It could be those variables still contain data from the previously loaded interval.
7. upgrade thm\_load to work with probe assignments
8. move functionality of thm\_load\_state2 into thm\_load\_state and delete thm\_load\_state2
9. Multiple enhancements concerning keywords, valid\_names and thm\_load routines

## Michael

1. Make code read Time-dependent calibration files - in progress (etc 5/31)
  - a. Apply T-D calibration parameters.
  - b. Reflect T-D calibration parameters in DATA\_ATT structure.
  - c. Maintain compatibility with EDC/EAC T-D gain conditional.
2. Update Training Presentation for GEM by June 6.
3. Make calibration files time-dependent. I will need these numbers from J. B., or instructions/code for producing them. (needed to allow user to use #3)
4. Get voltage offsets from J. B. (he has to pull bench-testing data).
5. Get EAC offsets from J.B. -- this \*cannot\* be done until AC-coupled data is taken.
6. deconvolution, any other tasks to have a working load and cal efi.
7. "Case-by-case" calibration parameters ("short-term" high accuracy corrections).  
involves generalizing some code from Chris C. as a tool for the general user. The tool will look at short time ranges, and pass out high-resolution calibration parameters in a structure. We envision that this structure will be passed into THM\_CAL\_EFI disabling those parameters that are normally gotten from the calibration files.
8. Training on the day to day processing of the L2 cdf's
9. EFI L2 cdf
10. EFI CAL Document
11. Modify THM\_CAL\_FIT.PRO to treat efs datatype - Install E12/E34 conditional based on th?\_fit\_code TPLLOT variable. If E12 switched to E34 software needs to be revised to handle (low priority).
12. Kyoto - tasks for Andreas - a) AE2tplot complete b) DST2tplot in progress
13. Add the DATATYPE kw to KYOTO\_AE\_LOAD.PRO, and load only AE data by default (low priority).
14. Get the downloader (KYOTO\_AE\_DOWNLOAD.PRO based on the new version of FILE\_HTTP\_COPY.PRO) working (low priority).
15. Build an informational widget.
  - a) (From Jim M.) Break THM\_UI\_SHOW\_DLIM.PRO out of THM\_GUI.PRO to use as a stand-alone routine. - Make the name of the displayed sub-structure(s) a parameter. (low priority)

## Hithesh

1. SCW spikes analysis - do not think it is a FSW issue (Instrument Issue)
2. FGM - 11hz noise
3. Coding for v5 of the FSW for the following patches is complete with testing in progress and documentation to follow:
  - patch 42 - patch bkg module for fgm sample timing change
  - patch 43 - add etckicker to the code
  - patch 44 - software to fix huffman compressor (256-byte was compressed not raw)
  - patch 45 - patches version 4.5 software to correct moment tracking software.
  - patch 46 - modify the ion density trigger function
  - patch 47 - improve command clock transfer timing
    - improve command responsiveness in compression
    - improve sc potential calculation timing
  - patch 48 - improve sc potential calculation timing (pfr-810)
    - remove false triggers (pfr-812)
    - remove orphan wave bursts (pfr-815)
  - patch 49 - improve 1m bps telemetry (pfr-818)
  - patch 4a - new compression algorithms 441,443,453 (pfr-820)
    - new sst attenuator calculation (prf-819)
4. Sort out dialing in to the FSW Engineering Test Unit (ETU) at SSL from UCLA with Jim Lewis.  
On hold until 8/1.
5. Review FSW code (ongoing)
6. Watch engineering is going along, tools for plotting (ongoing)
7. Review scripts and/or macros with Michael Ludlam (ongoing)

## Cindy

1. Sheng-Hsien help request
2. Button for Multi-Probe B field panels - implemented GUI part, tplot analysis in progress
3. Currently the GUI has the load SCM routine applied with the option without cleanup. As a second step we need to fix the GUI to allow the user to tweak the calibration options. Before introducing the SCM data a window should pop up, that has all the options below listed, with their defaults inserted. The user would then either click OK, or modify the calibration options before clicking OK. Then the user can click the button to introduce the data. - in progress
2. Update Training Presentation for GEM by June 6.
4. Develop functionality of Splash into Themis Gui (to begin by 5/27)
4. thm\_ui modules in separate directory (from Pat)
5. An IDL crib sheet has been provided that generates magnetic field and position data with the same resolution. Scientists very often like to have a set of dayfiles of magnetic field data and position. So the crib sheet could be called inside a loop and for each day an output ASCII file could be produced. An option could be all 5 spacecraft merged with only one time column. Additionally a desired resolution could be another option  
From Hannes.
6. Gui Mods - Mac (David Sibeck's machine from Ken)
  - a. The time span entered on the main window should be the default time span for tplotting. Specifically, if you change the timespan on the main window, the tplot timespan is unchanged.
  - b. tlimits does not work from the cursor when run from the GUI.. tlimits with the cursor works from the command line.
  - c. when selecting data, L1 and L2 can be selected at the same time and the result was confusing. since the low-level commands can only load one or the other, the GUI interface should enforce the same restriction.
  - d. the script output does not match the standard crib sheets: e.g. you don't see thm\_load\_fgm anywhere in the script. so you need a new document to describe to people how to modify scripts made with the GUI...or you need to change the GUI to follow the crib sheets...or just live with it..
7. Additional GUI Mods - Phase II
  - a. See email with history file ...231920 abort.
  - b Upper flatfile button (for Vassilis, work with Kate / UCLA Splash)
  - c Add new coord transf options to SM, GSM and GEO into GUI
  - d. buttons on overview plot sub widget for fgm, esa and sst Tohban plots
8. Additional GUI Mods - Phase III
  - a. current plot window - tell you which one (for UCLA)
  - b. Lower flatfile button (for Vassilis / Chris Russell)
  - c. Label S/C Position button (GSE or GSN - default) (for UCLA)
  - d. De-Gap widget add units
  - e. DP - Delete or Overview Plot or Clear History - warning message
  - f. Long Variable Names truncated in IDL-D

## Vladimir

1. Solar Wind code review in progress
2. Larry Kepko asked to review Outlier Removal code and Transformation to the boundary-normal coordinates.

## Kate

What's cooking?

## Andreas

1. L2 File Definitions Document - awaiting L1 document to be completed to use as template.

## UCLA

1. Clean-up the power ripples from the FGM data. (Krishan). Awaiting new programmer

## Christian Jacquey and Thomas Moreau (updated 4/29/8)

1. Converging toward our primary goal, i.e., to interface the THEMIS data with the CL software. It is almost finish for the ESA data, some details are now being fixed and then we will go to the SST data.
  - a. Compliance tests and primary data studies have shown matching data quantity values and plots between data processed and plotted with tdas and CL softwares. Subsequent data studies will normally validate CL reliability. At the time, and based on the successful primary tests that have been accomplished, we could obviously close this task.
  - b. We've have implemented the corrections for effective spacecraft potential, and obtained same derived products as computed tdas. Previous data studies have raised no anomalous features on this point. **Done.**
  - c. With the help of a young student (bachelor) , we have started a study of the response of the particle instruments.
    - As a first step, we are performing the statistical analysis of the perpendicular pressure (ESA i+ and e-, and SST i+) versus magnetic pressure observed during crossing or penetration of the spacecraft inside the plasma sheet during quite interplanetary conditions ( $BZ > 0$ ,  $P_d \sim ct$ ). Assuming 1D current sheet balance, the goal is to infer if there is under/over-estimation of the plasma pressure and to characterize it if necessary.
    - Then, we will study the ESA versus SST spectra and then see what can be done for adjusting them.
2. L1 ESA CDF and thm\_load\_esa
  - a) define and write a new skeleton cdf file that would be use as a data model for producing the new CDF ESA L1 files. This task needs to reconstruct entirely the skeleton of the CDF ESA L1 data file based on the IDL structure's content of the Jim's L0 code. Following the last suggestions from Jim L., data model will consist of 2 separated L1 ESA CDF files, one containing time varying quantities (as counts..), the other one storing calibrations stuff that have no time dependence and that may be so refined without the need to reprocess all the ESA L1 CDFs. I attached those new skeleton cdf files and wait for Jim L. analysis and comments.
  - b) submit skeleton together with a text file listing all items contained within the new model to Jim Lewis for feedback and validation. **Done.**
  - c) Develop the code assigned to create and read L1 ESA cdf files. 3-4 weeks should be sufficient. The reading code is almost finished. Particular but minimal developments have still to be done for incorporating returns of the L1 ESA CDF files exams. Detailed information about ESA L1 CDF related routines that compose the code, together with a list of all CDF data quantities contained within CDF files, are explained within the delivered guide titled guide\_readCDF\_ESAL1.doc. Hope to get feedbacks and corrections about it. Task still open
  - d) From Jim L. ESA packet loading routines use depreciated spinmodel.txt BugzID=101  
Not sure to be concerned by this part. Let me know



## Software Tasks To Be Discussed (TBD) / To Be Assigned (TBA)

1. TBA - Data contain engineering, deployment, maneuver, and science data are in the same stream.  
From the data description, only maneuver flag state\_man is provided. Do you provide information about the time intervals when the data are on, say, engineering level? This data, though valuable in many respects, may be confusing if interpreted as science data. To provide such information, it is possible, for example, to add some bits to existing state\_man flag. (from Vladimir)  
Quality flags (for each instrument to be added to L2 State cdf).
2. TBA - Tplot User's Guide (David and Vassilis to talk further)
3. TBD - print, dprint, msg continue, verbose options for a standard
4. TBD - Mini Language to operate on tplot variables
5. TBD - Tplot FAQ's (Amanda) Maybe replaced by #1
6. TBD - Mull over: Allow Tplot: overplot color spectra, multiple angles, variable angles.
7. Hold - Spin modeling during shadows (BugzID=43)
8. Hold - Separate E and B timestamps for spin fits (BugzID=45)
9. Hold - Refactor repeated CDF library code in CDF processing tools (BugzID=50)
10. Hold - Bugzilla enhancements: Graphical charts and graphs don't work (BugzID=7)  
Extend Platform/OS options (BugzID=73)
11. Hold - str\_element does not add to embedded structures (BugzID=69)
12. Hold - TDAS does not use L1 spin model cdf by default, yet available via thm\_load\_state (BugzID=99)

## Non GUI Future Release Mods

1. Many of the data processing routines that are tested here do not inherit the plotting options from the tplot variable that they take as input. For data processing routines that I've written Vassilis has had me modify them so that they inherit these options. It shouldn't be very hard to do this, but whether we do it or not depends on whether we think these data processing routines are useful only for the gui or for the command line user as well. (from Pat).
2. Load routines to all support keywords suffix and relpathnames\_all.
3. tplot does not fail gracefully after illegal margin set. In this case: tplot\_options,'xmargin',[100,100], tplot does not fail gracefully after illegal margin set. In this case: tplot\_options,'xmargin',[-1,-1]  
-tplot does not fail gracefully after illegal margin set. In this case: tplot\_options,'ymargin',[100,100]
4. Errors 45 and 46 are the same in character. In the former, THM\_COTRANS is called with IN\_COORD set to something that does not match the metadata. The test script expects an error, but THM\_COTRANS just prints an informational message without stopping. In the latter, THM\_COTRANS is called with COORD set to 'dsl' whereas the data is in 'scs' (this transformation is invalid). Again the script expects an error, but none is generated. (Michael and Jim M have different opinions)

There are two easy fixes:

- a. Remove /INFOMATIONAL from the call the MESSAGE, so execution stops and the command line test script catches the error.
  - b. Remove tests 45, and 46.  
#a will force the programmers to make sure that the initial coordinates are correctly predicted (or the metadata is up to date), to make sure that only valid transformations are requested, and it will make it harder to run scripts without stopping. #b will force the user to catch such "non-transformations" in the text output, and it will make it easier to run scripts without stopping.
6. fac\_matrix\_make: do a better job putting the inputs into the correct coordinate system.
  7. minvar\_matrix\_make documentation is a little sparse, so it couldn't hurt to improve the function header.
  8. With a pre-mission and future dates, thm\_gen\_overplot does not exit gracefully. The user sees a lot of "Remote file not found messages", but is not offered any indication that the date requested is before the mission began. It would also be useful to have a check for when DATE plus DUR is greater than the current date, and then ignore the requested days beyond the current.
  9. There's a possible bug thm\_gen\_overplot when an illegal device is set with the DEVICE keyword. The code doesn't check to make sure if the graphics device is valid. It passes the testscript because thm\_gen\_overplot has its own catch error statement embedded in the code. The catch statement does report, "Graphics device not available:

a", but only after data have been loaded and tplot vars have been created. If a long time range is requested this could be a significant waste of time to the user.

10. Issue with thm\_load\_fgm, I'm not sure if this is intentional or what but...an old version of thm\_load\_fgm would return the fgm data is whatever coordinate system you requested. It would call cotrans if the data was not available in that system in the file, but now, it seems like it will no longer automatically perform the transformation for you.

12. NO\_DOWNLOAD keyword missing from thm\_load\_fbk.

13. The plots should not be blank, and they weren't before the QA started. Fortunately, the code is working correctly in that when data doesn't exist the code gracefully moves on to the next datatype. However, perhaps the code should be modified such that a blank tplot var isn't created when this happens. (thm\_part\_moments2.pro).

14. a. When thm\_load\_fit is called requesting a single data type it will also return some auxiliary data types. For example: thm\_load\_fit,probe='b',datatype='fgs' returns:

1 thb\_fit\_code 2 thb\_fit\_npts 3 thb\_fgs (low priority load bug or testscript bug)

b. The relpathnames all keyword is broken. (low priority bug)

16. THM\_LOAD\_MOM doesn't recognize the datatype keyword for L1 data. (It does for L2).

17. thm\_Load\_Mom Dpwrspc button gives no results -- due to a problem in SVDFIT routine. Linear fit routine needed.

### GUI Mods with SPLASH Functionality Release or Later

1. Modify Time Range so user typed in inputs can be edited.

2. Modify the way messages are handled to correct messages appearing on incorrect widgets.

3. Issues with GUI State test suite: store\_data seems to be getting called twice for each variable loaded.

4. Issues with GUI State test suite: It sometimes loads more data than I asked for.

5. The Active Data Window does not always contain the data that was requested at load time. This happens when some or all of the data was already loaded.

6. The Plot Menu window, the scrolling message window does not correctly place the scroll bar at the most recent text (at the bottom of the text queue). Sometimes the scroll bar is halfway up previously displayed messages.

7. Make DP and Plot widgets bigger so msg box can be made wider and a bit longer.

8. If one of the submenus like dproc or options is already open, that if you click the button to open the submenus that it should bring those menus to the foreground.

9. deflag data processing option should have a button for 'linear' or 'repeat' not expect the user to type one of those words in. The possibility of user error is way too high.

10. shift clicked to select probes A & B then I tried to shift click on the level 2 data types to select them and got error #80 (also #86).

11. When block\_average is called with a block length(in seconds) that is shorter than the cadence of the data it will create nans between the data points. For example if an input vector at a 30 second cadence is block\_averaged with a requested block length of 10 seconds it will perform a transformation like this:

Input Data: [1,2,3,NaN,5]

Output Data: [1,NaN,NaN,2,NaN,NaN,3,NaN,NaN,NaN,NaN,NaN,5,NaN,NaN]

The problem is that when this output is plotted, it draws nothing because there are NaNs between all data points. This can be confusing and perhaps make the user think that the routine has a bug when it does not.

Pat proposes that only in the GUI we change the default so that the output from the input above is:

Output Data: [1,1,1,2,2,2,3,3,3,NaN,NaN,NaN,5,5,5]

This seems to be a reasonable expectation for how the block average should perform in this error situation. It will let the user know the routine worked, but also clue the user in to the fact that their requested block length is too short when they look at the shape of the output curve. Also, It is hard to detect the exact cadence of the data because it may change and may have gaps, but I would also have the GUI generate a popup error if the median cadence is longer than the requested block length. While this may not catch all instances of the problem, it will also ensure that the user is explicitly warned in most cases.

Vassilis: I think to first order we should leave block\_average as it was. These are standard problems the user faces when dealing with data analysis. There is a deflag routine that is supposed to take care of the situation.

The option implemented in 4.0 now is confusing for data analysis. A better option for block\_average would be to add two new features:

- a keyword /noNaN which would prevent adding NaNs (for blocks with zero points).
- an output array called npoints which contains an array with the number of points that went into the average (or median...) If zero then the average is presumably a NaN. The user can search and throw away data where confidence in statistical significance is low.

12. Issues with active data type in gui. While I'm sure we can use some tricky logic in the gui to figure out which data types actually get loaded, I think there are some reasons to prefer adding a flag to the tplot dlimits structure.

- a. It would make the gui logic simpler.
- b. If data is requested, but does not exist (but a previous version does under that same name) that data would still be made active by any logic that is only in the gui.
- c. I've heard some criticisms from users that they are often confused about which data is actually loaded when they use a load routine.

Adding the flag might give us a better way to provide this information to users on the command line.

13. add a button that applies the 'split\_vec' routine to the active data to GUI.

14. Create a Title Widget.

15. FGM and EFI GUI Test Suite (Error report #91):

```
% Attempt to subscript TV_NAMES with <LONG ( -1)> is out of range.
```

```
% Execution halted at: THM_GUI_EVENT 226
```

```
/Users/michf/Documents/THEMIS/software/tdas_4_00/idl/themis/common/thm_gui.pro
```

```
% $MAIN$
```

```
% Compiled module: THM_UI_ERROR.
```

Clicking in the "Loaded Data" window, just looking for something during Test 1, step 8.

16. a. When thm\_load\_fit is called requesting a single data type it will also return some auxiliary data types. For example: thm\_load\_fit,probe='b',datatype='fgs' returns:

1 thb\_fit\_code 2 thb\_fit\_npts 3 thb\_fgs (low priority load bug or testscript bug)

b. The relpathnames all keyword is broken. (low priority bug)

17. It would be nicer if you can put an option in the Ylimit widget to allow user to choose whether this will be applied to just the current panel or all the panels. Otherwise by selecting items in the "Loaded Data" column I am regenerating data items in the "Active Data" column for plotting every time I want to modify the "Ylimit" for each panel, since the modification of Ylimit is usually done after I have made at least one drawing of the already selected data items