THEMIS and ARTEMIS Science Data Analysis Software (TDAS) Enhancements and Bug Fixes (Command Line) May 2013

THEMIS and ARTEMIS Science Data Analysis Software (TDAS) - Post v7.0

1. The following enhancements were made to the TDAS command line functionality:

- TDAS now has support for loading CDFs with TT2000 timestamps.
- New routines are available to calculate the distance to the neutral sheet, with several models available.
- GEO to MAG coordinate conversions are now supported in cotrans and thm_cotrans.
- GMAG data from Antarctic stations PG1 and PG2 can now be loaded through TDAS.
- The following enhancements have been made to the Slices functionality of TDAS:
    a) The standard set of field-aligned coordinates (e.g. xgse, rgeo, phigeo, etc.) has been added to the 2D velocity slices.
    b) Custom orientations may now be used with 2D interpolation method.
    c) The slice plane's x-axis can now be specified by the user.
    d) Particle data can now be averaged about a specified axis to improve statistics for velocity slice plots.
    e) User may specify formattnig for X and Y axis annotations.
    f) The number of X and Y axis minor ticks can now be specified.
    g) Multiple slices plotted with fixed range (GUI only).

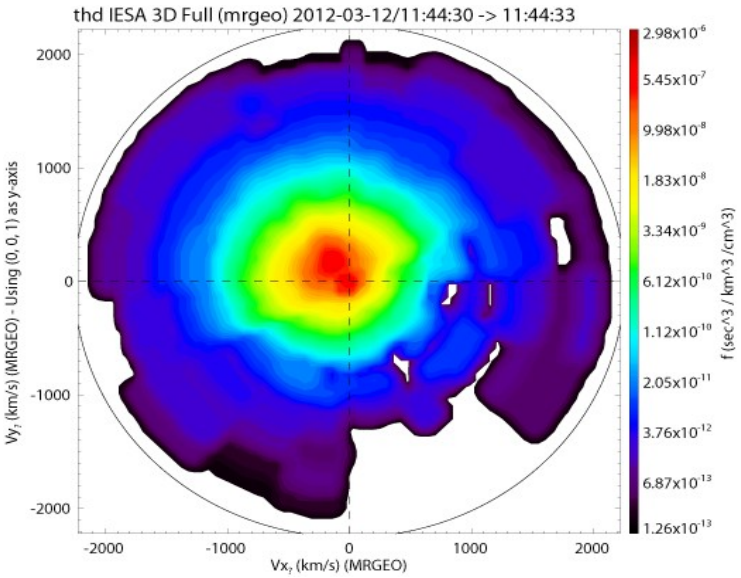

Illustration 1: Sample slice using the new field aligned coordinates option. The y-axis is parallel to the magnetic field and the x-axis is pointing towards the earth

- Improved notifications for invalid input to command line load routines.
- Expanded ability of file download routine to accommodate data from other missions. Files from multiple web sources can now be downloaded simultaneously.
- Updated ASI mosaic program with color_annotation keyword to allow users to change label colors.
- Updated thm_part_moments2 with new limit for the size of particle spectra in PHI (angle relative to probe-sun direction in spin plane), to allow for correct spectra in burst mode.
- Colors may now be set directly on tplot pseudo variables (instead of needing to be set on its constituents).
- Added extra support for downloading files from behind a proxy server.
- thm_load_state now performs coordinate transforms for spinaxis attitude, if a coordinate system other than the default GEI is requested.
- The true_dsl keyword, formerly used to fully enable eclipse spin model corrections in thm_load_fit and thm_load_mom, is no longer required. Examples showing the use of the eclipse spin model corrections are now included in the crib sheets thm_crib_fgm, thm_crib_fit, and thm_crib_mom
- THEMIS SST calibration files enabling intercalibration of anodes for all spacecraft (allowing more trustworthy pitch angle distributions) have been upgraded. The new calibrations can be used by calling thm_load_sst2, and when computing moments or spectra, use the keyword: /sst_cal. For more information, see: thm_crib_sst_calibration.pro .
- Added warning to smoothing routine TSMOOTH2, to alert users to data gaps larger than the smoothing width.
- Updated THM_INIT program to assure that themis local and remote data directory names end with a slash ('/'), and to propagate the !themis.verbose parameter into the TPLOT verbose parameter.
- Implemented /twonanpergap keyword in degapping procedure XDEGAP. This allows spectrogram plots to correctly show gaps.
- Added alternative scalings to THM_ESA_ENERGY_PARS, the program that calculates ESA energy weights for moment calculations, to match values for weights currently used in the probes' EEPROM configuration.
- Updated procedures THM_DFB_FILTER_RESP and THM_EFI_CLEAN_EFW to properly handle AC-coupled EFI data.
- Added simple despiking option to EFI calibration routine.
- Fixed crash due to type conversion error in thm_scpot2dens.pro.
- Added thm_part_dist_array.pro, a new vectorized system for loading particle data, improving performance and simplifying data sanitization.
- Added thm_part_conv_units.pro to calibrate loaded array data.
- Added thm_part_smooth.pro to apply smoothing to loaded array data.
- Added thm_part_energy_extrapolate.pro to apply energy extrapolation/interpolation of particle data to new “virtual” energy bins.
- Added thm_part_copy.pro to allow deep copying of data loaded by thm_part_dist_array.pro.
- Added cribs thm_crib_sst_set_calibrations.pro and

thm_crib_part_extrapolation.pro to demonstrate usage of new vectorized particle system (both in themis/examples).

- Added routines to load and save ASCII formatted data files
- Fixed SST ground-processed moment calculation routine to remove 1.5 second time offset
- Fixed a bug in specplot data gap handling code so that all time intervals are plotted with consistent z-range scaling.
- Updates to SPDF URL structures for certain missions and data sets
- “Calc” module (embedded mini-language) now uses better plotting defaults when creating TPLOT variable outputs.
- Added units and coordinate systems to output variables in THM_PART_MOMENTS.
- Added fix to file_http_copy.pro that allows full links (starting with 'http') to be processed correctly while globbing.
- Fixed problem in Level 2 FFT CDF generation procedure caused by support data that does not have the same number of time elements as field data.
- Allowed 'units' keyword to be passed into THM_PART_MOMENTS2. This allows for angular distributions in counts, which allows the estimation of uncertainties.
- Eclipse spin model corrections were implemented for ground-generated moments.
- A crash in thm_load_sst (occurring when 6-angle data is present and 1-angle data is not) was fixed.
- thm_load_sst.pro and thm_load_mom.pro were enhanced to permit loading of ESA and SST configuration variables from L1 CDFs.
- The IUGONET plugin has been added to the bleeding edge zip file.
- Some TDAS code, copied and slightly modified to support IUGONET development, was merged back into the TDAS bleeding edge to ease installation and management of the IUGONET plugin code.
- A new load routine thm_load_carisma_gmag has been added, to retrieve data directly from the CARISMA site.
- Many new GMAG sites are now supported:
  a) **NRCan network**: FCC: Fort Churchill, YKC: Yellowknife, BLC: Baker Lake, CBB: Cambridge Bay, IQA: Iqaluit, MEA: Meanook, OTT: Ottawa, STJ: St. John,VIC: Victoria
  b) **McMAC network**: AMER: Americus, KS; BENN: Bennington, NE ; GLYN: Glyndon, MN; LRES: Linares, Mexico; LYFD: Lyford, TX; PCEL: Purcell, OK; RICH: Richardson, TX; SATX: San Antonio, TX ; WRTH, Worthington, MN
  A map view of the supported GMAG sites is available from the THEMIS web site: **http://themis.ssl.berkeley.edu/instrument_gmags.shtml**
- tdpwrspc.pro, the wrapper for dynamic power spectra, now calculates the units and other metadata correctly using the metadata from the input variable. Applying tdpwrspc to EFW waveform data now gives results comparable to the onboard FFT data.
- An array indexing bug in dpwrspc.pro and pwrspc.pro has been fixed.
- thm_convert_esa_units has been fixed so that conversions from counts to energy flux, and back, are now symmetric.