

SPEEDAS 3.2 release notes

November, 2019

TPLOT updates:

1. Updated some tplot tools to support long64 data type
2. Added 'fix' keyword to ctime tool to reset cursor crosshairs if needed
3. Added 'verbose' keyword to store_data tool
4. Updated tplot for better layout of titles and timestamps for short time intervals
5. Updated auto_downsample tool (as suggested by ERG team) to prevent interpolating through bins where valid data not available
6. Added 'graybkg' option to tplot color table routine, to change background color to gray
7. Added 'tres' tool to detect time resolution of a tplot variable
8. Tplot_restore updated to use backing store on Linux/MacOs, fixing some strange behavior when deleting/restoring/replotting tplot variables
9. Added no_zoffset option to tplot multi-axis plot tools
10. Updated tplot_ascii tool to allow higher number of data dimensions, to facilitate saving particle distributions
11. Updated interpolation algorithm to improve plot appearance in auto_downsample tool, in response to request from ERG team
12. Added new "version 6" tplot annotation style, in response to request from ERG team
13. Improved rounding method in time_ticks routine for more accurate tick labels
14. Added "next" and "previous" keywords to tlimit program, to simplify scrolling through times
15. Added 'verbose' keyword to tplot options, ylim, and zlim tools
16. Enhanced tplot_save program to include secondary tplot variables referenced by string variables
17. Added tplot_remove_panel tool, to remove specific panels from plot window by panel number or tplot variable name
18. Added null keyword to get_data routine, to avoid keeping old values of output parameters if not set in current tplot variable
19. Added tplot annotation option number 7, like option 6 but without 'hhmm' and only 1 line for date
20. Added ability to use color strings in timebar tool
21. Added color keyword to scat_plot tool
22. Added tplot_fill_color tool to fill area under a line in tplot panels

Enhanced CDF support:

1. Improved tplot2cdf tool to better handle cases where global attributes structure is missing from input variable

2. Added `local_data_dir` parameter to CDF TT2000 leap second table management tools
3. Improved accuracy of conversions between TT2000 and Unix timestamps
4. Added code to rename downloaded CDF or NetCDF files that cannot be opened, to ease cleanup of corrupted downloaded files (which can happen with “captive portal” wifi access points which return a login page rather than the requested data)
5. Updated `cdf_info_to_tplot` to ensure the TT2000 fillvals are correctly converted to Unix times
6. Added version check for CDF library, to use version-specific recommended setting of ‘readonly’ attribute for best CDF reading performance
7. Added more robust error checking in `cdf_info_to_tplot` when assigning timestamps to `tplot` variables
8. Set `ylog` and `zlog` in `tplot` `dlimits` based on CDF `scaletyp` attribute

Enhancements to other analysis and visualization tools:

1. Removed unnecessary IDL 8.4 dependence in `spd_slice2d`
2. Improved colors and line styles for `spd_slice2d` plots
3. Added `erange` keyword, GIF and JPG output options to `spd_flipbookify`
4. Added additional color table options and crib sheet for enhanced usability by users with color blindness
5. Added `spd_get_color` tool to convert color names to color table indices
6. Updated `loadct2` tool to support user-specified color table files (via keyword or environment variable) with color table indices greater than 43
7. Several tools updated to use 64-bit indices to support large datasets
8. Improved memory management in `wavpol` tool
9. Added ‘dens’ keyword to `scat_plot` tool, to allow visualizing scatter plots as densities
10. Enhanced `mplot` autorange feature for compatibility with `tplot`
11. Added `/tensor_rotate` keyword to `tvector_rotate`, to allow proper coordinate transforms to be performed on rank 2 tensor quantities (e.g. moments)
12. Changed order of operations in tensor rotation routine for consistency with vector rotations
13. Added more robust detection and repair of non-monotonic times in `tvector_rotate` tool
14. Fixed an issue with `file_touch` tool to prevent crashes, in cases where user has installed a Linux command distribution providing the ‘touch’ command under Windows
15. Updated ‘`mplot_sym`’ tool to be more consistent with ‘`mplot`’ tool in terms of handling colors, labels, and y-axis limits and defaults.
16. Updated `tkm2re` tool to return an error if `tvar` parameter is null or undefined
17. Added tool to export 3D particle structures to ASCII files
18. Enhanced `str_element` tool to extract attributes from hashes and dictionaries
19. Added `do_stdev` keyword to `avg_data` program, to return standard deviation in a new variable
20. Updated SPICE `time_ephemeris` routine to indicate “no leap second” at end of Dec 2019
21. Added `spd_get_spectra_units` tool to return the units of a spectral variable from the CDF metadata

22. Added error check for missing data in `spd_pgs_limit_range` tool
23. Added more robust error checking to `mplot_symlog` tool
24. Added `timebox_mean` tool, to allow box averaging by time, rather than index
25. Modified 'fit' curve fitting tool to ignore NaNs in the data
26. Added `tformat` keyword to `read_asc` program, to allow more flexibility in time input format
27. Added 'reform' call to `rot_mat` tool to ensure output is in the expected format
28. Added default plot legends to `spec3d` plotting tool
29. Enhanced `mplot_symlog` tool for better handling of colors and labels
30. Added MDD (Minimum Directional Derivative) and STD (Spatio Temporal Difference) tools, to support multi-spacecraft data analysis workflows

Updates to mission-specific plugins, interoperability, and archive browsing tools:

1. Extensive updates and enhancements to the MMS plugin
2. Command-line support for working with Parker Solar Probe data (in the `projects/SPP` directory)
3. Updated several RBSP routines to use `spd_download` to support HTTPS downloads
4. Ensure that latest version of THEMIS ASI calibration files are downloaded when available
5. Updates to THEMIS ASI mosaic routines, REGO load routine, ASI calibration routines
6. Improved error checking for THEMIS SST attenuator and configuration variables
7. Added 'coord' keyword to `thm_part_products`
8. Updated THEMIS cotrans routine to support operation on tensor quantities
9. Enforced 10-minute minimum duration when calibrating THEMIS L1 FGM data (to avoid eliminating needed support data by time clipping to too short an interval)
10. Changed GOES summary plots to use uncorrected proton flux variables, delete `tplot` variables before beginning a new daily plot
11. Updated GOES plugin to improve error checking for timestamps, and to use interpolated variables to assure that times are consistent for all energies
12. Updated GOES plugin to reflect changes in directory layout at NOAA servers
13. Added support for MIGHTI Level 1 and Level 2, EUV level 2 data to ICON plugin
14. SECS: Applied bug fix to filename handling in `sec_read_ascii_data` (contributed by Tomo Hori)
15. Updated load routine for Kyoto Dst to reflect updated URL structure and file format on data server
16. Fixed filename handling in `kyoto_load_dst` to work properly in Windows shared folders
17. Changed WIND `wi_3dp_load` routine to get timestamps from Epoch variable in CDF
18. Enhanced WIND `wi_3dp_load` routine to find master CDFs from SPDF, if data source is SPDF
19. Added more robust handling of missing attributes in `wi_3dp_load`
20. Updated ERG (Arase), IUGONET, and Akebono plugins with most recent code from project developers
21. Updated "load via CDAWeb" tool to ensure necessary virtual functions get compiled
22. Removed old test server from `hapi_load_data`

23. Updated hapi_load_data with new list of HAPI servers
24. Added support for importing larger datasets from Autoplot

Updates to SPEDAS GUI:

1. More consistent use of 'busy' cursor for long-running operations, such as generating particle products
2. Added GUI panel interfaces for STD and MDD tools.
3. Added link to SPEDAS wiki on 'help' page
4. Updated calendar widget to allow inputs with fractional seconds
5. Added Y-range and replot controls to MDD/STD panels
6. Fixed a bug in B field plots in MDD/STD panel
7. Updated HAPI panel in GUI with new list of servers
8. Better error checking when saving data in GUI bug report page
9. Fixed infinite event handling loop when performing a 'stop' in IDL 8.3 and above
10. Updated tooltips to be more consistent with pulldown menu item names

Updates to documentation and crib sheets:

1. Added crib sheet for tplot annotation styles
2. Added comments to tplot and tplot_options describing usage of the 'version' keyword to control plot annotation formats
3. Added and updated examples in ICON crib sheet for MIGHTI and EUV instruments
4. Added basic crib sheet showing use of hash tables in IDL
5. Updated crib_colors.pro to show usage of tplot_fill_color
6. Added 'tshift' example to tplot crib sheet
7. Updated HAPI crib sheet to use CDAWeb HAPI server