

RHESSI Software Status and Improvements, Glasgow April 2011

IDL 6.1 is now the minimum version required to run the RHESSI software.

RHESSI software is working and the users are not in revolt.

Major software changes are documented at

http://hesperia.gsfc.nasa.gov/ssw/hessi/doc/software/changes/sw_changes.html

RHESSI Quick Look Products

- A new data product: hsi_full_rate, which has decimation and live time corrected count rates in the 9 obs_summary channels, for each detector segment.
- Updated flare_list_fill routine (See: [http://sprg.ssl.berkeley.edu/~tohban/wiki/index.php/Hsi flare list fill: How the RHESSI Flare List is Generated](http://sprg.ssl.berkeley.edu/~tohban/wiki/index.php/Hsi_flare_list_fill:_How_the_RHESSI_Flare_List_is_Generated)) to better deal with 6 to 12 keV energy range. Added GOES flux values at RHESSI flare peak.

RHESSI Aspect Solution

- Improved management of problematic SAS data. All solutions are local in time. Before problems could cause errors at distant times, no more. Meaningful export of error term to calling program.

- Error term will be used to mask out (livetime set to 0) bad solutions for appropriate grids

RHESSI Imaging Software

- New `clean_regress_combine` control parameter (default is 0) combines component map with residual map based on regression analysis, and results in better match between observed and measured profiles.
- New comparison between observed and expected modulation profiles is available for all image algorithms. Plots showing the observed and expected profiles for each detector are available. Fit statistics from the comparison are stored as info parameters in the object. Also a Monte Carlo distribution analysis is performed to determine the uncertainty in the C-statistic computed from the profile comparisons.
- New PLOTMAN image overlay feature. Select overlays for multiple images based on pattern searches or closest time. Makes it possible to easily make a movie, for example of TRACE images overlaid by the closest (in time) RHESSI image.
- Attenuation state change compensation. Change in attenuation applied to gridtran field of calib eventlist. In testing. Energy dependent. Enabled with non-negative `CBE_MULTI_ATTEN_THRESHOLD` (default -1)
- More robust `flux_var` computation. Nothing fancy, just transmission corrected rate averaging ignoring coarse grids as `SMOOTHING_TIME` becomes sub-second.

- Calibrated eventlist simulation suite. Script driven. In use for testing algorithms but adaptable to general simulation problem. Not rate limited. Includes real data gaps.

RHESSI Spectrum Software

- Added method (and button in GUI) to write separate-detector spectrum FITS files with native energy bins.
- Extend incident photon response to 150 MeV and disable anti-coincidence condition for rear segment data.

SHOW_SYNOP

- Completed integration with PrepServer. Allows for pre-processing of instrument data even if you don't have the instrument's SSW branch, by using a remote IDL server. Started adding the capability of user-selected options for pre-processing on remote server, but only have EIT so far.
- Handles Hinode/EIS, Callisto, Fermi/GBM, and SDO/AIA data.

Fermi

- Fermi Solar Flare Observations web page at http://hesperia.gsfc.nasa.gov/fermi_solar/
- FERMI/GBM quicklook plots integrated into Browser.
- Flare catalog online.

- GBM and LAT can be analyzed in OSPEX. For GBM, RSP (DRM) files are automatically created for each flare interval, and data and RSP files can automatically be downloaded for selected time interval/flare by OSPEX. LAT data must be requested from LAT team.

OSPEX

- Nuclear template function was added to enable analysis of high-energy gamma-ray events.
- Calculation of uncertainties on fit parameters and background error estimates were improved.
- Two new methods available to help determine uncertainties in fit parameter values - chi-square mapping and Monte Carlo analysis.
- Added two more function components - albedo (can now fit on albedo parameters), and thin_ndistr (thin-target bremsstrahlung spectrum for electron n-distribution).

GUIs

- Tried to make all widget interfaces accommodate small laptop screens. Widgets are now limited to a specified fraction of the screen size, and will be created with a scroll bar when necessary.

'BROWSER'

- Fermi/GBM quicklook plots available.

- SDO/AIA movie link available for many RHESSI flares (select RHESSI flare time and see if AIA Flare Cutout link on left is crossed out or not).
- Latest Flare button, and drop-down flare list for selecting events.
- Click directly on the red time arrow to display vertical red line.

New RHESSI Web Site

- A new RHESSI web site is under construction - <http://hesperia.gsfc.nasa.gov/rhessi2/>.
- The goal is to fill in holes in the old web sites, and ensure that all pages are up-to-date and accurate (and to be compliant with NASA standards). This new site will replace both old sites at <http://hesperia.gsfc.nasa.gov/hessi/> and <http://hesperia.gsfc.nasa.gov/rhessidatcenter/>.

HELIOVIEWER

- Adding RHESSI image upload to Helioviewer (<http://helioviewer.org/>) for automated movies.

`It's on the List'

- Add ability to fit multiple data sets (independent RHESSI detectors, or different instruments) in OSPEX.
- Develop automated optimized time/energy binning for image cubes.

- Automate energy dependent detector masking based on time dependent thresholds. I. e. 26-feb-2002 threshold goes from 3 to 15 keV.
- Integrate calibrated eventlist simulation into image and simulation tasks.
- Complete migration and new documentation for new RHESSI web site.
- Enhance gamma-ray fitting through expanded, parameterized template database.
- Enable default control parameter sets (Right now)
- Incorporate an improved version of the program that assigns each flare to the closest active region.
- New control parameter defaults recommendations
 - CLEAN_BEAM_WIDTH_FACTOR 1 -> 2.
 - PIXON_SENSITIVITY 0.0 -> 0.5
 - PIXON_VARIABLE_METRIC 0 -> 1 (Uses Fast Algorithm)
 - DET_INDEX_MASK [0,0,0, 1,1,1,1,1,0] -> [0,0,1,1,1,1,1,1,0]
 - SMOOTHING_TIME 0.5->2.0
 - CLEAN_REGRESS_COMBINE 0->1
 - USE_PHZ_STACKER ->1