What's New in User Release 1.1

Herschel Data Processing

1. Summary

- **HIPE**

  - Easy change of font size.

  - Source code of Jython tasks available.

  - Several files can now be opened at the same time.

  - Enhancements in the Jython editor.

  - Improved Product viewer.

  See Section 2 for more information.

  See also http://www.herschel.be/twiki/bin/view/Hcss/DpHipe.

- **Systematic Product Generation**

  - Logs for operational day processes.

- **Quality control**

  - New log viewer allowing filtering, searching and saving data to a text file.

- **Plot**

  Bugfixes and stability improvements.

  - Refreshing in the properties GUI is now automatic.

  - Property history in Property panel.

  - Axis can be of DATE type to plot time series.

  - Generate a line break for NaN values, rather than ignoring NaN value.

- **Datasets**

  - `SizeCalculator` utility class moved from the Product Access Layer package.

- **Dataset viewers**

  - Searching and sorting column names now available in the column selector.

  - Subtracting the time offset is now an option accessible through a reference menu.

  - Fixed wrong symbol in deselected layers (SPR 6587).

  - Fixed hang of Power Spectrum Generator with wrong input units (SPR 6705).

  See Section 3 for more information.

- **Image dataset**

  - Implemented drag and drop for sources.

- Brought WCS transformation up to date with JSky 3.0.

- **Image display**

  - Now possible to overlay a source list (from the source extraction) on the Image. In HIPE, you can use drag & drop for this.

  - Drag and drop available for images.

  - Added a WcsExplorer.

  - Added a preference panel for Display in HIPE. Try it with Alt-Enter.

  See Section 4 for more information.

- **Image slicing**

  - Added `SimpleStack`, which lets you keep a stack of images together.

  - Added `SlicedImage` and `SlicedCube`, which keep the image or cube on disk to save memory.

- **Image toolbox**

  - Several bugfixes, mostly in the image arithmetics, mosaicking and the daophot algorithm of the aperture photometry.

  See Section 5 for more information.

- **Calibration sources database**

  - A progress bar is now shown when starting the browser and when loading products.

  - Updated the graphical interface showing asteroid information.

- **Numeric library**

  - Data arrays now allow insertion of elements.

- **Product Access Layer**

  - Added cached pools.

  - Performance improvement of PAL Context Rules mechanism.

  - Removed simple pools.

  - Modified naming convention for exported FITS files: OBSID in decimal format.

  See Section 6 for more information.

- **Observation context**

  - Updated the `ObsParameters` utility.

  - Modified the getLevel/setLevel methods.

  - Added descriptions to some `ObservationContext` metadata.

  - Improved the `ObservationContext` viewer.

  See Section 7 for more information.

- **Interpolation toolbox**

  - Linear interpolation now available for monotonous X values, not just ascending (SPR 5349).

  - Fixed wrong results of linear interpolator with data sorted in reverse order (SPR 6807).

  - Added error propagation to Rebin utility (SCR 4833).

  - Added URM entry for Bilinear.

  See Section 8 for more information.

- **Astronomy toolbox**

  - Improved glitch correction.

  - Additional documentation for `RadialVelocity`.

  - Added naive Earth to Sun relative velocity correction for `RadialVelocity`.

  See Section 9 for more information.

- **Point source extraction**

  - Implementation of *SUSSEXtractor*. See Savage & Oliver (2007) for more details.

  - New graphical interface.

  - New `inputSourceList` parameter, to extract fluxes at known source positions.

  - Drag and drop of `SourceListProduct` onto displayed image.

  See Section 10 for more information.

- **Installer**

  The installer has been refactored to work with the new build system. The result is a great improvement in speed and memory usage

  See Section 11 for more information.

- **PACS**

  See Section 12 for more information.

- **SPIRE**

  See Section 13 for more information.

2. HIPE

- Easy change of font size.

  Font sizes can be changed through the preferences window, and with the same keyboard shortcuts as in the Firefox browser: Ctrl-+ or Ctrl-- (Meta key in Mac).

- Source code of Jython tasks available.

  Source code of Jython tasks that are included in the build can be viewed with the option *View source* of the popup menu in the Tasks view. The source code of Java tasks is not yet available.

- Several files can be opened at the same time.

Opening files through the Open file dialog allows you to select and open more than one file at once.

- Enhancements of the Jython editor.

  The script editor provides the following new functionality:

  - Incremental search with Ctrl-I (Meta-I in Mac).

  - Toggle comment with Ctrl-T (Meta-T in Mac).

  - Auto-indent when starting a new block with a colon.

  - Auto-closing brackets and quotes.

  - Line numbers on the left-hand side.

  - Current row and column shown in the status bar.

  - Indicator of 80-character line limit.

- Improved Product viewer.

  Products and contexts can be navigated within the same view, thus avoiding the need to open tabs while browsing them. Metadata and title are updated with the information of the selected node.

3. Dataset viewers

- SPR 6587 was implemented.

  The DCROSS symbol is now reserved for deselected layers *only*.

- SPR 6705 was implemented.

  The Power Spectrum Generator no longer hangs when there is no time column input data.

4. Image display

- Correction for using Display in JIDE.

- Implemented overlaying source list.

- Corrected error with default background color and axes.

- Added viewers for `SimpleStack`.

- SCR 4949: Display has no access to the RenderedImage.

- Fixed errors when zooming on an empty Display or zooming in an image with zoom factor between 0.5 and 1.0 (SPR 6745).

- Fixed problem with the numbers of the axes when flipping the image, Zoom to Fit moved to Display and the image now fits into the axes, SPR 2909: AutoRange functionality for Display requested

- An image can now be moved with drag and drop (SCR 6037).

- SPR 2677: Display should have auto scale as default and SPR 4195: A cube is a cube, not a collection of layers: cuts apply to the whole cube. Added a preferences dialog in HIPE where you can set the behavior of the layers.

- Added preferences to always show layers, always zoom to fit the available space, set the background color, set the default color lookup table.

- Fixed inconsistent display for Double2d and Double3d (SPR 6642).

- Proper integration of the `ManualContourTask` into HIPE, using `ManualContourPanel` instead of `ManualContourTaskSignatureComponent` (SPR 6047).

- Users are warned via a popup window if they forgot to draw the rectangle in the `RectangularSkyAperturePhotometryPanel`.

- No more error message sent to the Console if you forget to draw the ellipse/ circle/rectangle/polygon in the `EllipseHistogramPanel`, `CircleHistogramPanel`, `RectangleHistogramPanel` and `PolygonHistogramPanel`.

- Implemented solution for SPR 5888 for all explorers.

- Added the WcsExplorer for the Wcs, Image and Cube.

- When trying to open an image explorer for an empty Image/Cube, no more exception is thrown.

- Fixed the problem for profile plotting when you move the straight line and press the Accept button again

- Enabled overlaying a source list on an image.

- The mouse pointer now changes to *busy* stated when a component (WCS, image contour, source list...) is added to an image.

- Added text fields for setting the magnification and the layer of the cube.

- Flipping is no longer needed for `SimpleImage` and `SimpleCube`. A Numeric2d still has the different orientation.

- Fixed exception when trying to open an empty `SimpleImage` (SPR 5674).

- Corrected shown values for the height in arcsec for `EllipseHistogramTask` and `RectangleHistogramTask`.

- Adjusting zoom level on a layer no longer affects all layers (SPR 5047).

- Fixed the Zoom-to-fit button (SPR 3414).

5. Image toolbox

- Fixed the `importImage` task (SPR 6302).

- Extra check in RotateTask and ScaleTask.

- Added logger.

- Corrected check for flagged out pixels in MosaicTask.

- Fixed the cut() method for the Polygon class.

- The isCompletelyInsideQuadrilateral() method in MosaicTask is rewritten based on the experience in the Polygon class.

- ImageAddTask and ImageSubtractTask: a warning is printed when the two input images do not use the same unit (using the Logger).

- Added the WcsExplorer for Wcs, Image and Cube.

- Rewritten the daophot algorithm for sky estimation in aperture photometry.

- Correction of mosaicking and image arithmetics.

- Progress set for AutomaticContourTask.

6. Product Access Layer

- Cached pools are now available.

  A CachePool is caching products and queries accessed from a remote system. This product pool
  implementation that can cache any remote product pool and stores the data on the local delegated
  pool. See SCR 5968 for more information.

- Performance improvement of PAL Context Rules mechanism.

  Caching the metadata in ProductRef to improve the performance of PAL Context Rules mechanism.
  See SCR 6701 for more information.

- Removed simple pools.

- Naming convention for exported FITS files: OBSID now in decimal format.

7. Observation context

- Updated the `ObsParameters` utility:

  - Added the `formatVersion` parameter, containing the version of the product format.

  - Added the `origin` parameter, containing the site that created the product.

  - Changed the `RADESYS` comment to `ICRS`.

- Modified getLevel/setLevel methods.

  - Removed deprecated warnings for getLevelN/setLevelN methods.

  - getLevelN/setLevelN will not be removed.

  - Added getLevel0_5/setLevel0_5 methods.

- Added default descriptions to some metadata.

  Updated default descriptions of: obsState, obsid, odNumber, cusMode, instMode and obsMode

- Improved ObservationContext viewer.

  Browsing an ObservationContext, as well as any other context, is now easier. Instead of needing
  to open each sub-context or product in a separate view (tab), its tree can be navigated within the
  same view. Moreover, nodes in the tree can be seen in a viewer located at the right side of the tree,
  by just clicking on them; they are loaded at that time if not already done. Non-loaded items appear
  coloured in red; their size is shown when hovering the mouse cursor over them.

8. Interpolation toolbox

- SPR 5349 was implemented.

  The LinearInterpolation works for monotonous input data, while before it accepted ascending input
  data only.

- SPR 6807 was implemented.

  The LinearInterpolator now provides correct results for ascending data.

- SCR 4833 was implemented.

  Error propagation in Rebin was added. There are two kinds of error propagation, weighted or not weigthed.

9. Astronomy toolbox.

- Fixed glitch correction.

  Glitches are now properly removed from the data after they are found.

- Additional documentation for RadialVelocity

  Added more information in the Javadoc entry.

- Added naive Earth to Sun relative velocity correction for RadialVelocity.

  The algorithm assumes a perfect circular orbit with inclination = 23.45 deg and x axis aligned with the Vernal Equinox.

10. Point source extraction

- The module now supports *SUSSEXtractor* in addition to *DAOPHOT* as an algorithm for identifying point sources. The decision of which algorithm to use is made via an input parameter to the task. New parameters `fluxPriorsLambda`, `fitBackground` and `subtractMedianBackground`, which are only applicable to SUSSEXtractor, have been added.

- A new graphical interface has been added, which changes according to the extraction algorithm used and can show advanced options.

- It is now possible to drag a `SourceListProduct` onto a displayed image. This will place a circle on the image around each source position, allowing easy visualisation of the results of the source extraction task.

- A new optional parameter, `inputSourceList`, allows the user to provide a `SourceListProduct` that contains prior information about the source positions. When this parameter is provided, the task will find the source flux at each of these positions. This is useful for when you have images at multiple wavelengths - for instance SPIRE low, medium and high wavelength images. You can run the source extractor once to find sources at one wavelength, and use that output to find the fluxes of those sources at other wavelengths.

11. Installer

- The installer has been heavily refactored to work with the new build system. As a result, the installer requires significantly less memory and time to complete an installation. For instance, on Windows systems the installation time has been reduced by at least 50%.

- The uninstallation time has also been significantly reduced.

- The installer does not change the operating system environment in any way. It does not set any system variable or patch any system file.

- New custom Herschel and ICC icons are available for the application launchers. The icons depict the Herschel satellite and the instruments.

12. PACS

Changes in the Spectrometer Pipeline:

- Implementation of sliced products from Level 0.5 onwards.

- Implementation of first version of Flux calibration.

- Implementation of Level 2 Product generation.

- Improved usage of the PointingProduct.

- Implementation of first version of glitch detection.

- Stabilization of all pipelines.

- Calibration data updates.

- Improved overview Block Table.

Changes in the Photometer Pipeline:

- Implementation of sliced products from Level 0.5 onwards.

- Implementation of MMT Deglitching.

- First version of Second Level Deglitching.

- Implementation of first version of Flux calibration.

- Implementation of first version of Drift Correction.

- Improved mapping tools (photProject and madMap).

- Improved usage of the PointingProduct.

- Stabilization of all pipelines.

- New HighPassFilter implementation.

- Calibration data updates.

- Astrometric Product for PointSource Observations.

- Activation of MadMap in the pipeline.

- Improved overview Block Table.

Changes in the PACS framework:

- Resolving of circular dependencies.

- Usage of the HPSDB.

- Additional TestHarnesses.

- Improve stability by testing against SOVT data.

13. SPIRE

Changes in the common pipeline:

- Preprocessing:

  - Implement workaround for Test Facility telemetry having wrong modelName.

- Set creator metadata in level 0 products accordingly to policies.

- Use the MissingTm product to look for potential telemetry drops.

- Engineering conversion:

  - Flag slow detectors.

  - Flag detectors that are chopped inside the instrument in chopped observations.

  - Set creator metadata accordingly to policies.

  - Correct algorithm for time conversion and reordering.

  - Add mask values in metadata.

  - Add flag parameter to process detector data with dummy detector offsets.

- PCAL history product:

  Added the following statistical parameters for analysis:

  - Flash mean and standard deviation.

  - Base level noise.

  - Standard deviation of mean signal differences (provides an error bound on the estimate of the mean signal difference).

  - Number of stable samples in the flash and base level intervals.

  - Mean duration of start of flash (and base) intervals prior to stability.

Changes in the photometer pipeline:

- The POF9 pipeline has been renamed to PARALLEL.

- Second level deglitching added to POF2 and POF3 pipelines.

- Deglitching parameters have been updated.

- The Optical Crosstalk task and Electrical filter response tasks have been renamed.

Changes in the spectrometer pipeline:

- Data products:

  - References to `pixel` (e.g. `get/setPixel`) have been removed from the Interferogram and Spectrum products/datasets. Use e.g. `get/setChannel` instead.

  - References to `wavenumber` and `complexFlux` have been deprecated in the Spectrum products/datasets. Use `get/setWave` and `get/setFlux` instead.

  - Added arithmetic overloading to the SDI product.

- Scripts/general:

  - Clipping correction has been removed from the SPG scripts. To be used in IA only.

  - Time domain module order is now the following:

    1. Electrical Crosstalk Correction

2. First Level Deglitching

3. Non-linearity Correction

4. Bath Temperature Correction

5. Time Domain Phase Correction

- Both the SOF1 and SOF2 pipelines now generate both Apodized (Norton Beer 1.5 -- Hanning) and unapodized Level 1 spectral products. In addition, the Level 1 context has been changed to be more readable.

- First Level Deglitching:

  - Pipelines now set default Task parameters as follows:

    - `scaleMin = 1`

    - `scaleMax = 8`

    - `hMin = -2.0`

    - `thresholdHolder = 0.0`

    - `thresholdCorr = 0.6`

- Interferogram Creation

  - Mask information is now propagated.

  - Pointing information (RA/DEC) is now affixed to each interferogram.

  - Truncated samples at OPD extrema are now removed from the output interferogram.

  - A BadDataException is raised if the output interferogram product is empty.

  - Task now accepts as input the spec Calibration context.

  - Task now removes all channels that are not valid SPIRE channel names.

- Baseline Correction

  - Truncated samples at OPD extrema are now removed from the output interferogram.

  - A BadDataException? is raised if the output interferogram product is empty.

- Phase Correction

  - Task accepts the Non-linear (optical) phase calibration product and applies this before fitting to the measured phase.

  - Task no longer checks to see if a data channel is present in a calibration product. If such a channel is not in the calibration product, an exception is raised.

- Flux Conversion

  - Task now removes all non-seeing channels.

  - Task no longer checks to see if a seeing data channel is present in a calibration product. If such a channel is not in the calibration product, an exception is raised.

- Optical Crosstalk Correction

- Task no longer checks to see if a data channel is present in a calibration product. If such a channel is not in the calibration product, an Exception is raised.

- Spectral Averaging

  - Pointing information (RA/DEC) is now propagated to each spectrum.

  - Dead channels are assigned NaNs in their flux/fluxError columns.

Changes in calibration products:

- Added new products for:

  - Instrument Mode Mask.

  - Telemetry Mask.

  - Photometer Beam Profiles (single profile per array).

  - Spectrometer Beam Profiles (single profile per array - no wavenumber dependence).

  - Phase Correction Limits (replaces Band Edges).

- Updated values in:

  - Photometer Flux Conversion Coefficients.

  - Spectrometer Non-Linearity Correction Coefficients.

  - Photometer and Spectrometer Temperature Drift Coefficients.

  - Spectrometer Flux Conversion Table.

  - Bolometer Parameters (update to Hien's parameters v4).

  - Channel Gains (a few corrections).

  - Channel Number Mapping (add JFET membrane information).

- Spectrometer Reference Interferogram product given editions for each spectral resolution.

- Linking of the Flux Conversion/Non-linearity products with the Temperature Drift Correction product so that the correct pair are always used by the task.

- New SPIRE Calibration Viewer in Hipe displays the dependent products with information on the dependency and different editions.

Changes in interactive analysis and tools:

- New version of the detector timeline explorer.

- Customised viewer for SPIRE calibration contexts.

Changes in documentation:

- The User Manual has been updated following the recommendations of the Science Validation Groups.

  - Flow charts updated.

  - Module calls and optional parameters checked and updated.