HIPE Owner's Guide

1. Preface

This document gives you a general overview of HIPE (Herschel Interactive Processing Environment), the main interface to the Herschel Data Processing (DP) software. HIPE provides a graphical interface plus command-line access to the data processing capabilities of the Herschel Common Science System (HCSS).

Read this document if you want to obtain a first understanding of how HIPE looks and its functionality.

Tip

If you are interested in more advanced features, including scripting and batch processing, please have a look at the *Scripting and Data Mining* guide.

1.1. When things go wrong

In the unfortunate event of a HIPE crash, or a freeze that forces you to kill the application, please submit a Helpdesk ticket so that developers can look into the problem.

In some cases, a *dump file* is created, listing the values of crucial parameters when the crash happened. Please include it in your ticket, since it will greatly help developers in diagnosing what went wrong. Here is how to look for the dump file:

- Sometimes HIPE crashes because the underlying Java Virtual Machine has crashed. In this case, the JVM produces a dump file called `hs_err_pid*.log`, where `*` is the process identification number. This dump file is created in the working directory, that is, the directory HIPE was started from. If you are not sure, please use the search function of your operating system.

- When you kill HIPE manually, a dump file called `hipe_dump_`*`yyyymmdd_hhmmss`*`.txt`, where *`yyyymmdd_hhmmss`* is the date and time of creation.

Depending on how you kill HIPE, the dump file may or may not be created. The following table shows the various cases and the location of the home directory for each supported operating system. Dump files are created in a `.hcss/apps/hipe/dumps` folder within your home directory.

Table 1. Where and when HIPE creates a dump file

Operating system	Dump file created	Dump file *not* created	Home directory location
Linux/Unix	**Ctrl+C** or **kill**	**kill -9**	`/home/`*`username`*
Mac OS	**Ctrl+C**, **kill** or *Force Quit*	**kill -9**	`/Users/`*`username`*
Windows	**taskkill** or *Task Manager → Applications*	**taskkill /f** or *Task Manager → Processes*	`C:\Documents and Settings\`*`username`* (Windows XP), `C:\Users\`*`username`* (Windows Vista)

2. Getting to know HIPE

HIPE (Herschel Interactive Processing Environment) provides an integrated suite of graphical interfaces that can interact with each other. It allows for interactively choosing your active data in your session, visualizing that data in various ways and selecting tools that can operate on the data. Both command-line and GUI interfaces are available. High-level interactions, which can involve GUIs, are also echoed as commands on the command-line that allow the saving of commands used in a session and the generation of scripts from these interactions.

This section provides an overview of the fundamental elements of HIPE.

2.1. Installation and startup of HIPE

Warning

Before installing HIPE, please make sure that your default file compression program can unzip FITS files without corrupting them. Otherwise calibration files shipped with HIPE may be corrupted during installation. For more information see the *Data Analysis Guide*: Section 1.4.6.2.

In case of any other problems during installation please check the *Known Issues* page or contact the Herschel Helpdesk via the Herschel Science Centre website.

HIPE is part of the Herschel Data Processing system. You can download an installer from the Herschel Science Centre on this page. Installation instructions are provided at the bottom of the page.

Development builds are available via the Continuous Integration system. These builds are meant only for Herschel software developers. If you are not a software developer, but you still want to get access to these developer's builds for any particular reason, please contact the Herschel Helpdesk.

HIPE needs the Java SE Runtime Environment version 6. We recommend to install the latest update for best performance. To see which Java version is installed on your machine type the following in a terminal window:

```
java --version
```

You can run HIPE on a server or individual workstation under one of these operating systems, either 32-bit or 64-bit:

- Windows XP and Vista.
- Any Linux distribution compliant with the Linux Standard Base version 3.0 or higher. A list of compliant distributions is available on this page. HIPE may work on non-compliant distributions too, but this is not guaranteed.
- Mac OS X 10.5 *Leopard*.

HIPE is also known to run under Snow Leopard and Windows 7, but is not yet officially supported on these platforms.

The minimum amount of memory needed is two GBytes. Four GBytes are the highly recommended minimum for data processing; more may be needed in some cases (e.g. large PACS maps).

The maximum amount of memory available to HIPE can be set by choosing the *Advanced* installation. To change the available memory afterwards, modify the properties `java.vm.memory.min` and `java.vm.memory.max` in the `installed.properties` file within your HIPE installation directory, as shown below:

```
java.vm.memory.min=64m
java.vm.memory.max=512m
```

The **Advanced** installation also allows you to specify the name and location of a Versant database. Only advanced users and calibration scientists should need to specify a database: if you are unsure about this option, you probably do not need it.

For viewing the HIPE Help System, you can use any modern browser, such as Firefox, Chrome, Safari, Opera, Internet Explorer and so on.

You can start HIPE via its icon or from the command line:

```
hipe
```

The installer will tell you where the `hipe` executable is located.

Note

Under Mac, starting from the command line only works if you installed a developer build via the Continuous Integration System. If you used the *InstallAnywhere* installer instead, you have to start the application via its icon.

When starting HIPE under Windows, you might see two command prompt windows called `hipe` and `ia_hipe.exe` appear alongside the HIPE main window. Both can be safely closed once HIPE has started.

Upgrading and uninstalling

To uninstall HIPE, either follow the usual uninstallation procedure for your operating system, or execute the **uninstall_hipe** command in the `uninstall_hipe` directory, located in the HIPE installation directory.

It is possible to install different HIPE versions alongside each other. However, the safest way to upgrade to a new version of HIPE is to uninstall the existing version first.

Important

Most files of a HIPE installation are stored into a `.hcss.d` folder within your home folder. This folder is shared among all the HIPE installations on a computer, which means that *the uninstaller will not clean it up* to avoid damaging other installations. You can remove this folder manually after you have removed HIPE completely from your system. Any HIPE installations left *will stop working* after removing this folder.

2.2. Mouse clicks in HIPE

The following table shows how left, middle and right mouse clicks are simulated on different platforms.

Table 2. Mouse clicks in HIPE

Mouse click	Windows	Linux with two-button mouse	Mac with two-button mouse	Mac with one-button mouse
Left click	Left click	Left click	Left click	Click
Middle click	Ctrl + left click	Ctrl + left click	Alt + left click	Alt + click
Right click	Right click	Right click	Ctrl + left click	Ctrl + click

Three-button mice work as expected on all supported operating systems. The Mac five-button mouse can be configured via the Mouse utility in the Mac System Preference Pane as a standard three-button mouse.

Different HIPE tools may associate different actions to the same mouse gesture. For details please refer to the documentation of each tool in the *Data Analysis Guide*.

2.3. Obtaining help in HIPE

You can open the HIPE Help System via the Help menu. Help pages will open in a new tab of your default web browser. Note that the help contents are installed on your computer, so you do not need to be connected to the Internet.

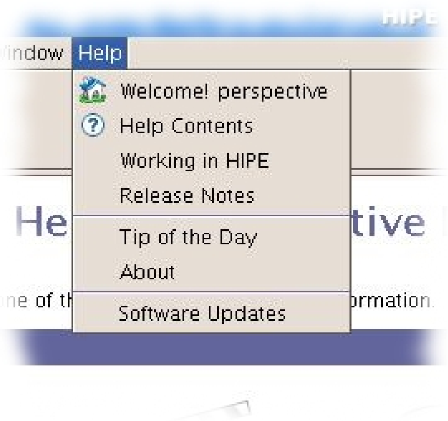


Figure 1. Accessing the HIPE Help System.

You can access the following help pages from the Help menu:

- **Help Contents:** opens the main help window. The table of contents on the left displays the available documentation, with more advanced material appearing towards the bottom (see Figure 2).

- **Working in HIPE:** opens Chapter 1 of the *Hipe Owner's Guide*, the same you are reading now.

- **Release Notes:** opens the *What's New* document, which contains the latest additions and changes to the system.

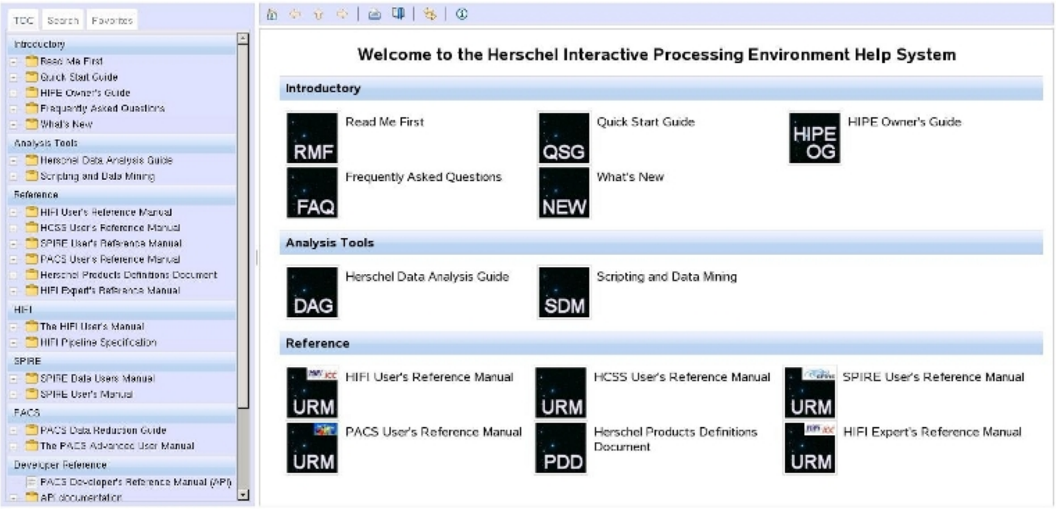

TOC
Search
Favorites
Introductory
Read Me First
Quick Start Guide
HIPE Owner's Guide
Frequently Asked Questions
What's New
Analysis Tools
Herschel Data Analysis Guide
Scripting and Data Mining
Reference
HIFI User's Reference Manual
HCSS User's Reference Manual
SPIRE User's Reference Manual
PACS User's Reference Manual
Herschel Products Definitions Document
HIFI Expert's Reference Manual
HIFI
The HIFI User's Manual
HIFI Pipeline Specification
SPIRE
SPIRE Data Users Manual
SPIRE User's Manual
PACS
PACS Data Reduction Guide
The PACS Advanced User Manual
Developer Reference
PACS Developer's Reference Manual (API)
API documentation
Welcome to the Herschel Interactive Processing Environment Help System
Introductory
RMF
Read Me First
QSG
Quick Start Guide
HIPE OG
HIPE Owner's Guide
FAQ
Frequently Asked Questions
NEW
What's New
Analysis Tools
DAG
Herschel Data Analysis Guide
SDM
Scripting and Data Mining
Reference
URM
HIFI User's Reference Manual
URM
HCSS User's Reference Manual
URM
SPIRE User's Reference Manual
URM
PACS User's Reference Manual
PDD
Herschel Products Definitions Document
URM
HIFI Expert's Reference Manual

Figure 2. The HIPE Help System home page.

2.3.1. The HIPE Help System

As shown in Figure 2, the HIPE Help System window contains three components:

- A pane on the left-hand side, containing the Table of Contents (TOC), the search facility and the list of bookmarks (see Figure 3).

- A toolbar at the top of the screen.

- The main screen area where the documents appear. When you start the Help System, this area shows a series of links to the main manuals.

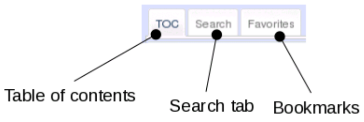


Figure 3. The tabs of the left-hand pane of the HIPE Help System.

The table of contents

Manuals are grouped into categories and represented by a folder icon next to a plus sign. Click on the plus sign to view the contents of a manual. You can do the same with manual sections containing subsections. Click on any entry to display the corresponding page.

Searching the help system

Click the *Search* tab to display the search pane (see Figure 4).

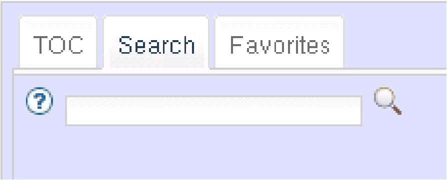


Figure 4. The search pane of the HIPE Help System.

Enter your search keywords and press **Enter**, or click on the magnifying lens icon, to perform a search. Hover your mouse pointer on the question mark icon to display a tooltip with the advanced search syntax, also described below:

- Boolean operators: `herschel AND (archive OR store)`; `archive NOT store`; `+archive -store`. The boolean operator words must be upper case. When writing multiple search keywords, the default operator is `AND`.
- Wildcards: `te?t`; `maxim*`. A question mark replaces a single character, an asterisk replaces from zero to any number of characters.
- Boosting a term: `herschel^4 archive`. The boosted term is considered more relevant, which influences the ordering of results. The default boost level is one.
- Proximity searches: the string `"herschel archive"~10` searches for `herschel` and `archive` within ten words from each other.
- Fuzzy search: `herschel~`; `herschel~0.6`. Finds words with similar spelling. You can specify a fuzziness level between zero and one (the default is 0.5). Lower values of the fuzziness parameter mean that greater spelling variations are considered.
- Limit search to one manual: `manual:hipeowner AND herschel`; `(manual:hipeowner OR manual:faq) AND herschel`. See Table 3 for a list of identification strings for the manuals. Some strings (like `howtos` for the *Data Analysis Guide*) do not resemble the name of the manual for historical reasons.

Table 3. Identification strings for manuals

Manual	**Id string**	**Manual**	**Id string**
Read Me First	`readmefirst`	SPIRE User's Reference Manual	`spire_urm`

Manual	Id string	Manual	Id string
Quick Start Guide	`quickstart`	HIFI User's Manual	`hifi_um`
HIPE Owner's Guide	`hipeowner`	HIFI Pipeline Specification	`hifi_pipeline`
Frequently Asked Questions	`faq`	PACS Data Reduction Guide	`pacs_drg`
What's New	`wnew`	PACS Advanced User's Manual	`pacs_um`
Data Analysis Guide	`howtos`	SPIRE User's Manual	`spire_um`
Scripting and Data Mining	`um`	SPIRE Data User's Manual	`spire_dum`
Product Definitions Document	`pdd`	HCSS Developer's Reference Manual	`hcss_drm`
HCSS User's Reference Manual	`hcss_urm`	HIFI Developer's Reference Manual	`hifi_drm`
HIFI User's Reference Manual	`hifi_urm`	PACS Developer's Reference Manual	`pacs_drm`
HIFI Expert's Reference Manual	`icc_hifi_urm`	SPIRE Developer's Reference Manual	`spire_drm`
PACS User's Reference Manual	`pacs_urm`		

Note

When you use the search feature for the first time, HIPE must build the search index. This can take up to a few minutes, depending on the speed of your system and on the amount of installed documentation. A progress bar tells you how close HIPE is to completing the operation.

After the index has been built, subsequent searches should take a negligible time.

The toolbar

Figure 5 shows the toolbar at the top of the HIPE help window.

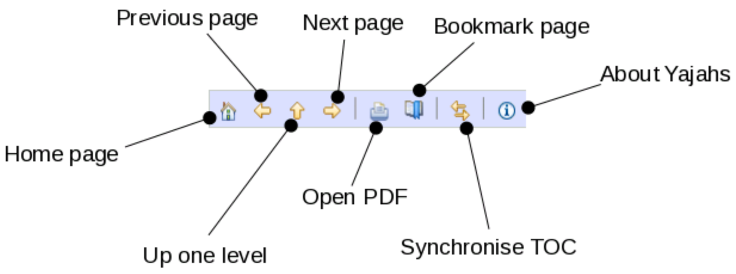


Figure 5. The toolbar of the HIPE Help System.

Please note the following points:

- The *Previous page* and *Next page* icons lead to the previous and next page in the manual you are viewing. They let you move through a manual, *not* through your browsing history. For that, please use the *Back* and *Forward* buttons of your browser.
- The *Bookmark page* icon adds the current page to the list of favourites in the HIPE Help System, *not* to your browser's favourites.

- The *Synchronise TOC* icon will show the current page in the Table of Contents pane, for example by expanding the nodes leading to it.
- *Yajahs* is the engine that powers the HIPE Help System. The name stands for *Yet Another JAva Help System*.

2.3.2. Command line help on tasks

There are two ways to obtain help from the command line in the *Console* view of HIPE.

1. The **help** command opens the help page corresponding to a given task, class or topic:

   - `help()` opens the main Help page.
   - `help(`*`taskName`*`)` opens the task help page in the *User's Reference Manual*. For example: `help(imageAdd)`. Note that not all tasks and classes have a dedicated help page: if no page is found, you get an error message. All the tasks listed in the *Task* view of HIPE (see Section 3.3.17) have help pages.
   - `help("plot")` or `help("plotxy")` opens the Plot chapter in the *Data Analysis Guide*.
   - `help("display")` opens the Data display chapter in the *Data Analysis Guide*.

   For more information see the *User's Reference Manual*: Section 2.167.

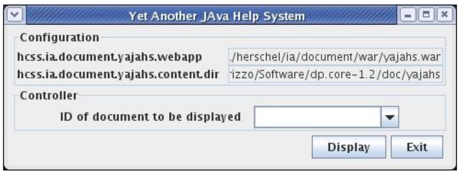
2. The `__doc__` attribute of a task (note that there are two underscores on each side of `doc`). Print this attribute to get a short text describing how to use the task. For example:

   ```
   print imageCeil.__doc__
   ```

2.3.3. Obtaining help outside HIPE

When you quit HIPE, links in any help pages will not work anymore. Even if you restart HIPE, you will have to open the Help System again.

To access help outside HIPE you can use the **show_help**, which resides in the same folder as the **hipe** executable. This brings up the following window:



hcss.ia.document.yajahs.webapp ./herschel/ia/document/war/yajahs.war
hcss.ia.document.yajahs.content.dir izzo/Software/dp.core-1.2/doc/yajahs
ID of document to be displayed

Figure 6. The standalone Help System.

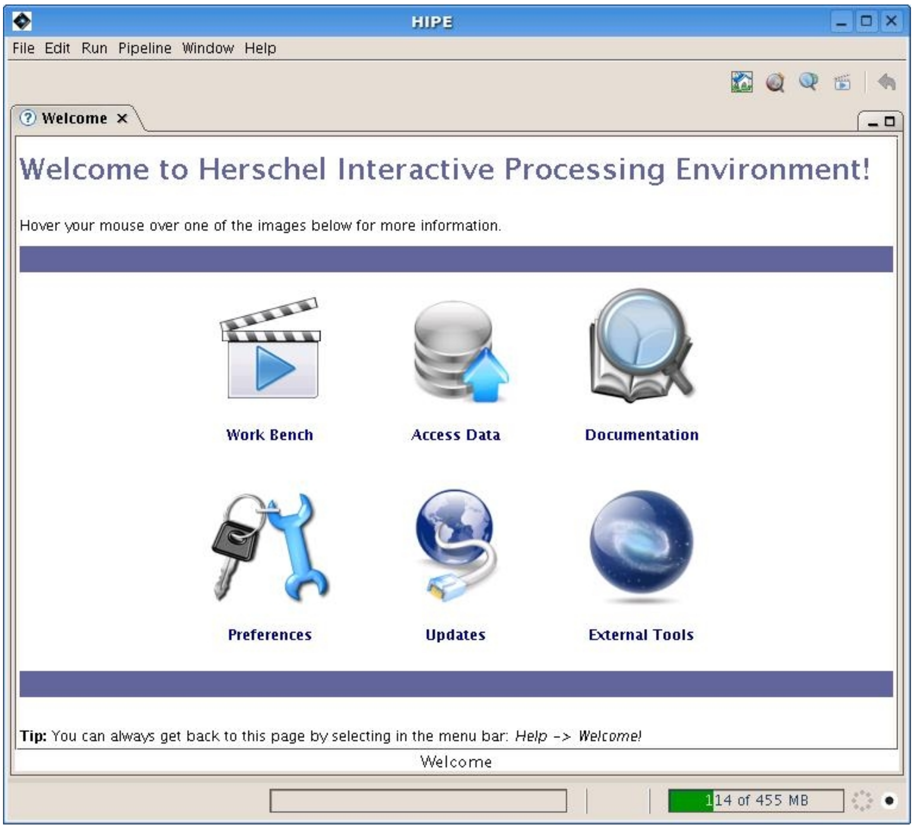
Click the *Display* button to start the HIPE Help System. The other controls in this window are only useful to developers of the Help System.

For advanced users: accessing the Javadoc

If you are comfortable with Javadoc documentation, you can access it in the HIPE Help System home page by clicking on *API documentation* in the *Developer Reference* section at the bottom of the table of contents. To obtain the traditional frame-based Javadoc layout, click on the *FRAMES* link on any Javadoc page. To get back to the HIPE Help System layout you will have to use the Back button of your browser (clicking on the *NO FRAMES* link will not work). To have both layouts available, you may want to open the Javadoc layout in a new tab or window of your browser, by right-clicking on the *FRAMES* link.

2.4. The HIPE Welcome screen

When you start HIPE you are greeted by a Welcome screen with six icons, which are described in the next sections. Placing the mouse over each of the icons on the screen provides a small description in the status bar at the bottom (see Figure 7).



Welcome to Herschel Interactive Processing Environment!

Hover your mouse over one of the images below for more information.

Tip: You can always get back to this page by selecting in the menu bar: *Help -> Welcome!*

Figure 7. The *Welcome* perspective.

You can return to the Welcome screen at any time by selecting *Help* → *Welcome! perspective* from the menu bar or by clicking on the icon at the top right of the HIPE window.

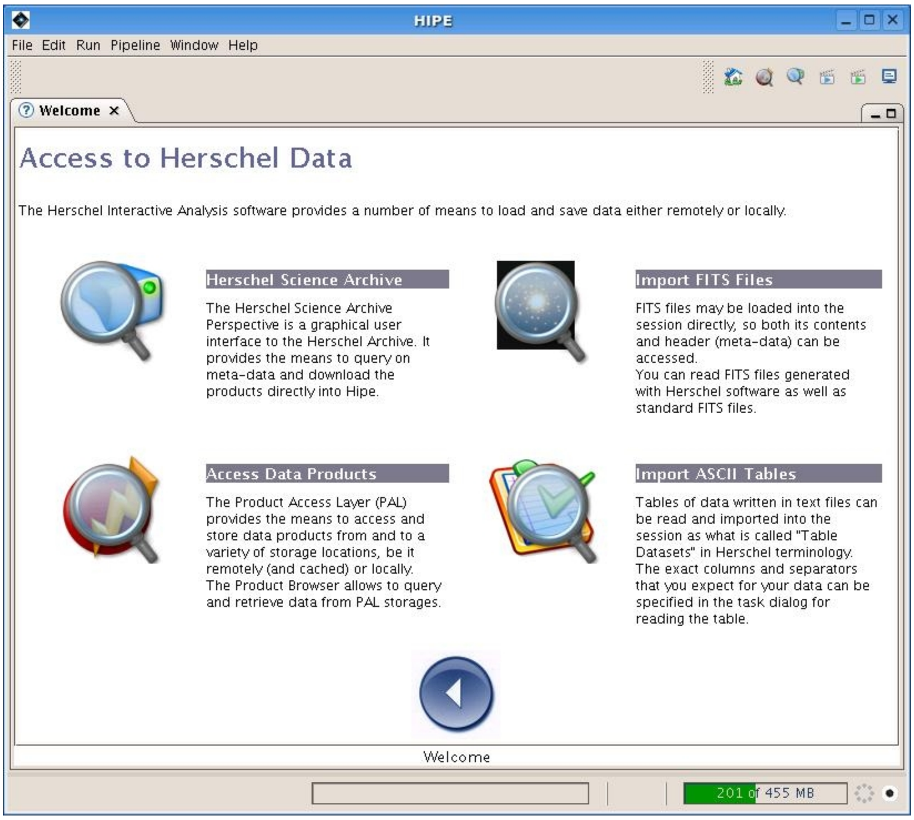
2.4.1. Icon: Work Bench

Clicking on the icon takes you to the *Work Bench* perspective (for information on perspectives in HIPE see Section 3.1). The default workbench is shown in Figure 16. This is the main work area for doing data analysis. Here you can look at data values, plot spectra and images, create scripts for batch processing and run analysis tools. The contents of the workbench can be updated with various *views* available under the *Window* menu (see Section 3.3 on available Views).

2.4.2. Icon: Access Data

The icon opens a window with four more icons, providing access to data held either locally or at a remote site (for example the Herschel Science Archive). It also allows the import of FITS and ASCII table files (see Figure 8).

For more information on these features see the Data input/output chapter of the *Data Analysis Guide*.



Access to Herschel Data

The Herschel Interactive Analysis software provides a number of means to load and save data either remotely or locally.

Herschel Science Archive

The Herschel Science Archive Perspective is a graphical user interface to the Herschel Archive. It provides the means to query on meta-data and download the products directly into Hipe.

Import FITS Files

FITS files may be loaded into the session directly, so both its contents and header (meta-data) can be accessed.
You can read FITS files generated with Herschel software as well as standard FITS files.

Access Data Products

The Product Access Layer (PAL) provides the means to access and store data products from and to a variety of storage locations, be it remotely (and cached) or locally.
The Product Browser allows to query and retrieve data from PAL storages.

Import ASCII Tables

Tables of data written in text files can be read and imported into the session as what is called "Table Datasets" in Herschel terminology.
The exact columns and separators that you expect for your data can be specified in the task dialog for reading the table.

Figure 8. HIPE Data Access initial page.

Click the arrow at the bottom to go back to the *Welcome* screen.

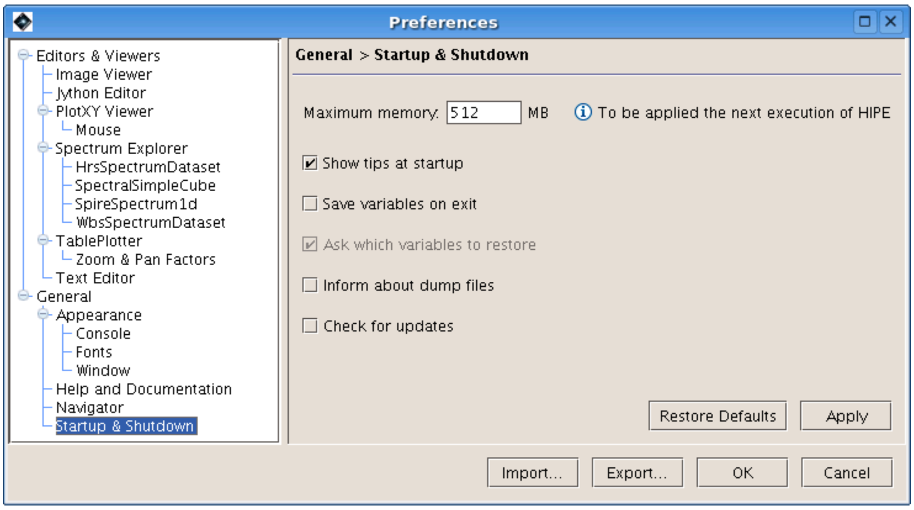
2.4.3. Icon: Documentation

Click on the icon to open HIPE documentation in your default Web browser. For more information see Section 2.3.

See the *Read Me First* document for a brief description of all the available manuals.

2.4.4. Icon: Preferences

The icon allows you to access the *Preferences* dialogue window shown in the following figure:



General > Startup & Shutdown

Maximum memory: 512 MB ⓘ To be applied the next execution of HIPE

☑ Show tips at startup

☐ Save variables on exit

☑ Ask which variables to restore

☐ Inform about dump files

☐ Check for updates

Figure 9. The HIPE preferences window.

You can set preferences in the available categories and revert to the default values at any time. You can also export/import the values of the preferences to/from an XML file.

2.4.5. Icon: Updates

Click on the icon to check if a new user release is available. If so, HIPE will give you the link to the web page where you can download the new release. The same feature is available by choosing *Help → Software Updates*.

Note

This feature only works with user releases. It does not work with developer builds.

2.4.6. Icon: External Tools

The icon takes you to a set of icons linking to Virtual Observatory tools, including VOSpec, VOPlot and Aladin. Included in this listing is the Herschel Science Archive (HSA) browser, as Herschel components are VO-compliant. The HSA also uses a VO-like interface with HIPE. Clicking on any of the icons launches the external VO tool. Help and assistance with these tools are provided separately from within the tools or associated websites, except for the HSA browser interface which is described in the *Data Analysis Guide*.

When you click on the icon of an external application, it will be automatically downloaded and launched. After the download you may see a security dialogue window telling you that the application's digital signature is missing or has an error. For the applications shown in this window you can safely click on the Run button. You can check the *Always trust content from this publisher* checkbox to avoid being prompted again.

Note

An external application is downloaded the first time you click on its icon, and whenever a new version becomes available. Note that the application will be downloaded *even if you have a version already installed* on your hard disk.

Click the arrow at the bottom to go back to the *Welcome* screen.

2.5. The toolbar and status bar

The HIPE toolbar is the row of icons just below the menu bar (see Figure 10). The icons on the right are related to perspectives (see Section 3.1) and never change. The icons on the left, apart from the first two (to create/open a file) may change or become deactivated according to which view is active. The active view has a title tab of a lighter colour (see Figure 11). Figure 10 shows the icons that appear when you work on a file in the *Editor* view.

If you cannot find an icon in the toolbar, it is probably because the active view does not use it.

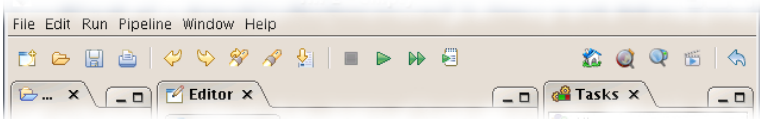


Figure 10. The HIPE toolbar.

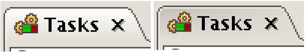


Figure 11. Active (left) and inactive (right) HIPE view.

The HIPE status bar is at the bottom of the main HIPE window and is shown in Figure 12.

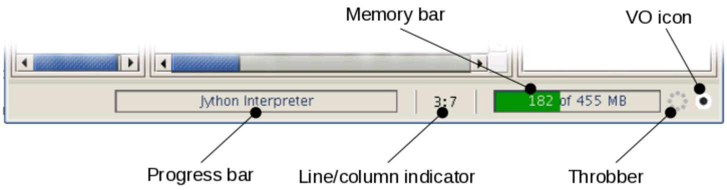


Figure 12. The HIPE status bar.

The status bar contains the following elements, from left to right:

- The *progress bar* shows the state of advancement of any operation being executed. Useful for data processing tasks that take a long time.
- The *line/column indicator* shows the line and column where the cursor is located whenever you are working on a file in the *Editor* view.
- The *memory bar* shows the amount of memory used by HIPE. The bar goes from green to orange and then to red as the amount of used memory increases.
- The *throbber icon*, a series of dots forming a circle, becomes animated whenever HIPE is busy doing a task.
- The *VO icon* becomes yellow when HIPE is connected to a Virtual Observatory hub.

3. Views and perspectives

A *view* is a window embedded in the main HIPE window, like the one shown in Figure 13.

A *perspective* is a collection of related views. You can customise a perspective by adding, deleting and moving views. To save space, you can also rearrange different views as tabs of the same window.

The following sections describe in detail the views and perspectives available in HIPE.

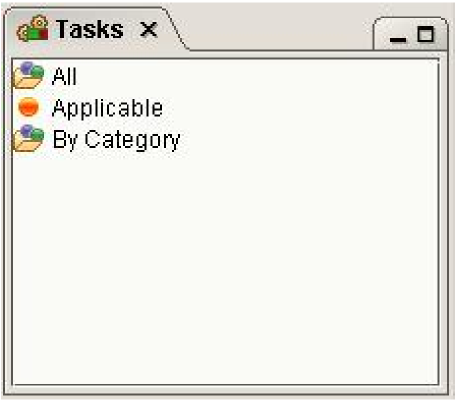


Figure 13. A single element (view) for a HIPE perspective.

3.1. HIPE perspectives

HIPE comes with three perspectives, available in the Window → Show Perspectives menu.

3.1.1. The Product Browser perspective

The **Product Browser** perspective provides a way of getting and briefly viewing data from databases and data stores, both locally and remotely stored. This is illustrated in Figure 14.

For more information see the *Data Analysis Guide*: Section 1.3.7.

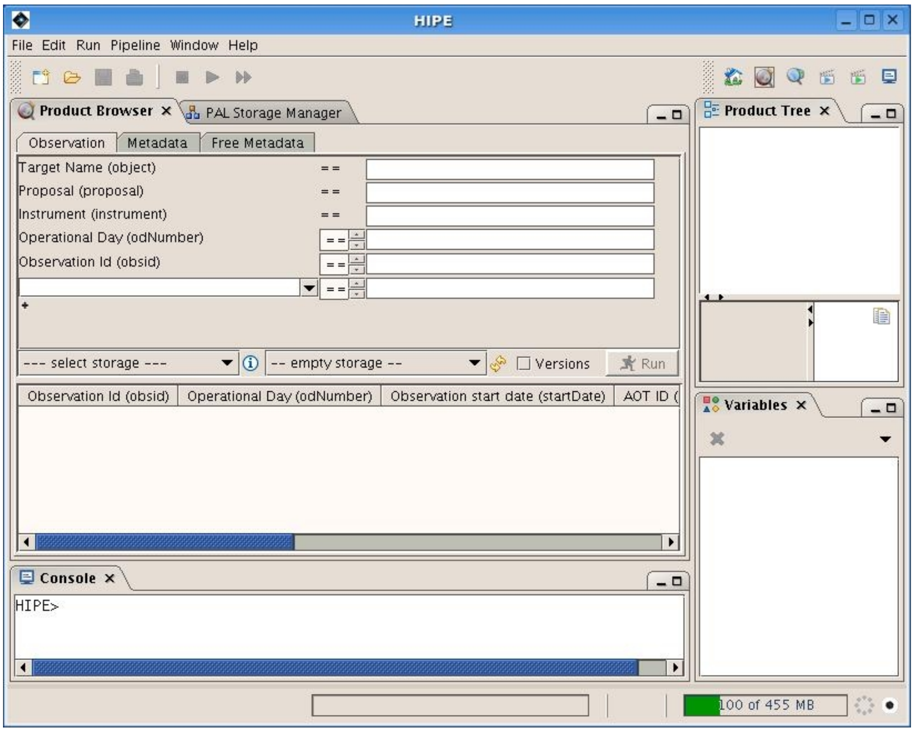
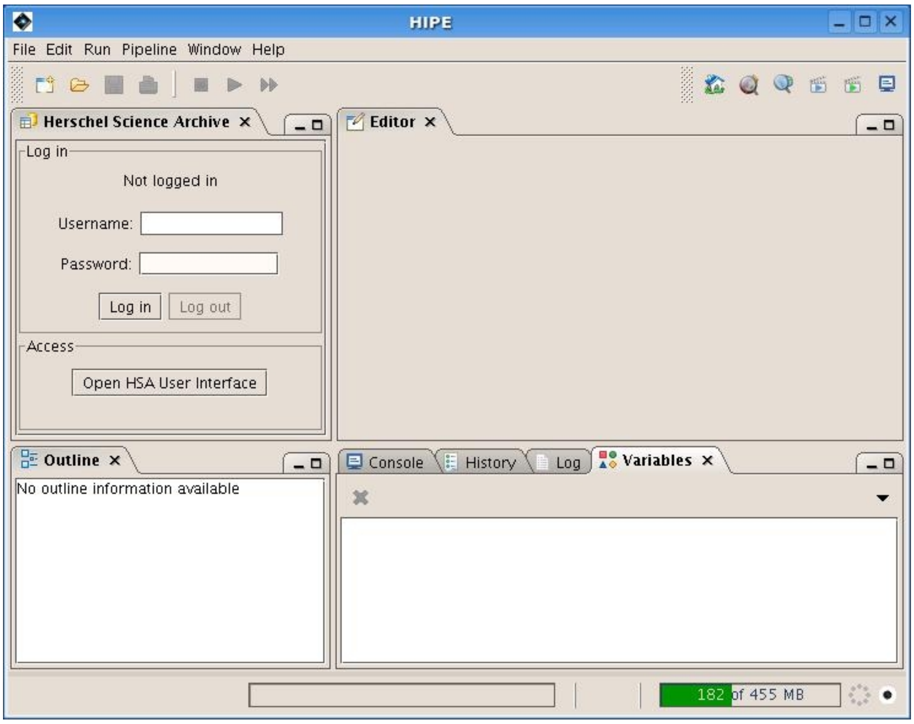


Figure 14. Product Browser perspective. This provides access to data stores both on-line and on your computer.

3.1.2. The Herschel Science Archive perspective

The **Herschel Science Archive** perspective provides a convenient means of querying and obtaining data from the Herschel Science Archive (HSA). For more information see the *Data Analysis Guide*.



Not logged in

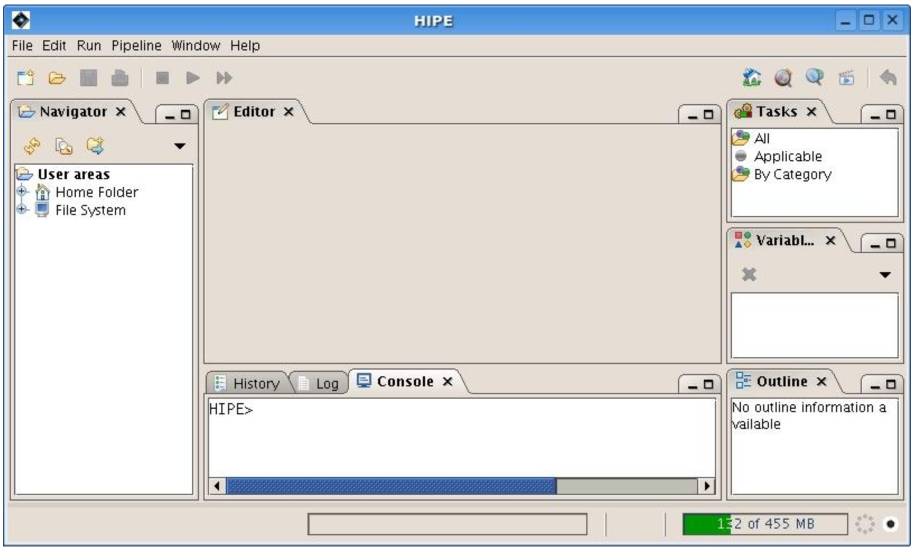
No outline information available

182 of 455 MB

Figure 15. Herschel Science Archive perspective.

3.1.3. The Work Bench perspective

The **Work Bench** perspective provides eight views for working with tasks, variables, scripts and command-line inputs. You can also navigate in your file system and check log messages and the command history. Note that the *History*, *Log* and *Console* are arranged as tabs (see Figure 16).



```
HIPE>
```

No outline information a vailable

1[illegible]2 of 455 MB

Figure 16. HIPE default view of the work bench perspective.

3.2. Changing HIPE Perspectives

You can modify a perspective by deleting and adding views, and by moving, resizing and rearranging existing views. The following actions are available:

- **Closing, minimising and maximising views**. Each view has the usual icons for closing (next to the view title), minimising and maximising (in the small tab on the right-hand side). Minimised windows appear at the bottom of the workspace (see Figure 17).

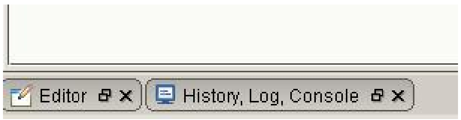


Figure 17. Minimised views at the bottom of the HIPE window.

- **Resizing views.** Click and drag the borders of a view.

- **Customising tabs**. If you right click on the title of a view, a context menu appears. With the *Tab Orientation* and *Tab Direction* submenus you can change the position and orientation of title tabs. Experiment with the various options until you find what works best for you.

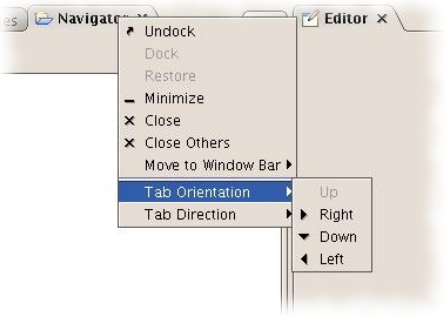


Figure 18. Customising tabs in a HIPE view.

- **Moving views.** To move a view within the main HIPE window, click on the view title and drag it around. A black outline box shows where the view will be placed when you release the mouse button.

- **Undocking views.** Undocking a view means turning it into an independent window, separate from the main HIPE window. To undock a view, click on its title and drag it away. A small rectangle under the mouse pointer (see Figure 19), with *no black outline* anywhere in the HIPE window, means that the view will be undocked when you release the mouse button. To dock an undocked view, right-click on its title and choose *Dock* from the context menu.

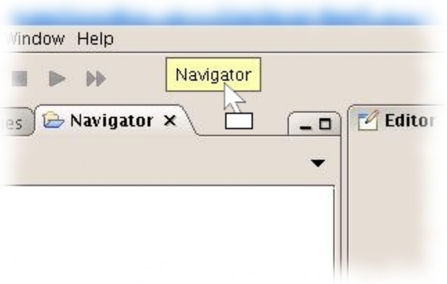


Figure 19. A view being undocked.

- **Moving through tabs**. If a window is too narrow to display all its tabs, three new controls appear: two arrows to cycle through the tabs, and one more arrow to get the list of tabs (see Figure 20).

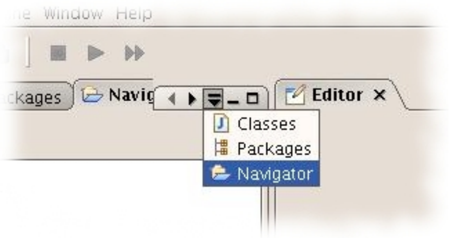


Figure 20. Moving through tabs.

- **Adding views**. To add a view to a perspective, select it from the Window → Show View menu. If a view is already in a perspective, it will *not* be added again.
- **Resetting a perspective**. Any change you make to a perspective will be kept in future HIPE sessions. To restore a perspective to its original settings, choose Window → Reset perspective, or click the arrow icon on the toolbar, next to the perspectives icons (see Figure 21). You can also right-click on the icon of the modified perspective and choose *Reset perspective* from the context menu.

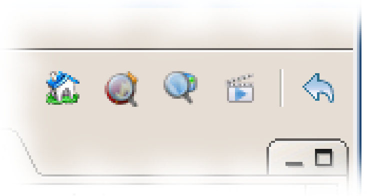


Figure 21. The icon to reset a perspective.

3.3. HIPE views

3.3.1. Classes

This view lists all the classes (routines) available in the session. These can include scripts you loaded into the system. To obtain help on an item, right-click on it and choose *Help in URM*. This opens the corresponding entry of the *User Reference Manual* in your web browser. If there is no information available in the URM, the menu entry does not appear.

3.3.2. Console

The *Console* view provides a command-line interface to all HIPE commands and functions.

Press the **Up** key to access previous commands. This feature also works *across* sessions: if you have just started HIPE, pressing the **Up** key will show the last command of the previous session.

Most graphical tools within HIPE echo in the *Console* view the commands corresponding to the action being taken. This is useful if you want to automate a certain procedure through a script.

For more information on the scripting language used by HIPE, see Scripting and Data Mining.

3.3.3. Editor

Use the *Editor* view to display and edit scripts and other files. When you open a Jython script, a set of editing commands becomes available under the Edit menu (see Figure 22) and as icons in the toolbar below. Hover your mouse over each icon to obtain a tooltip.

You can customise the Editor window for Jython scripts and other text files by choosing Edit → Preferences. This opens the main HIPE Preferences window. Set the options under Editors & Viewers → Jython Editor and Editors & Viewers → Text Editor to change how the editor behaves.

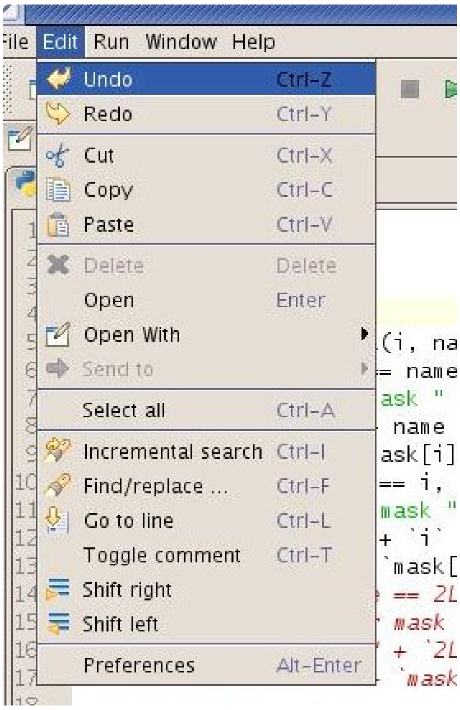
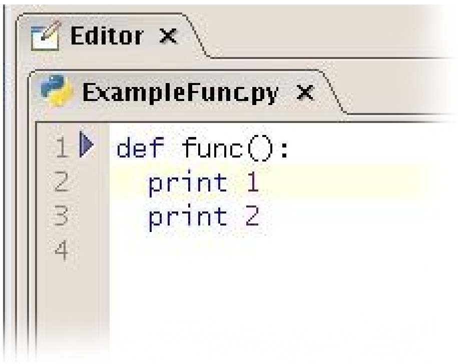


Figure 22. The Edit menu.



```
def func():
   print 1
   print 2
```

Figure 23. Editing a Jython script. The line with the cursor is highlighted. The arrow shows the next line to be executed.

You can run scripts with the following four icons:

- *Run*: runs either a single line of your script (the one indicated by the arrow) or all the *selected* lines at once.

- *Run all*: runs the entire script.

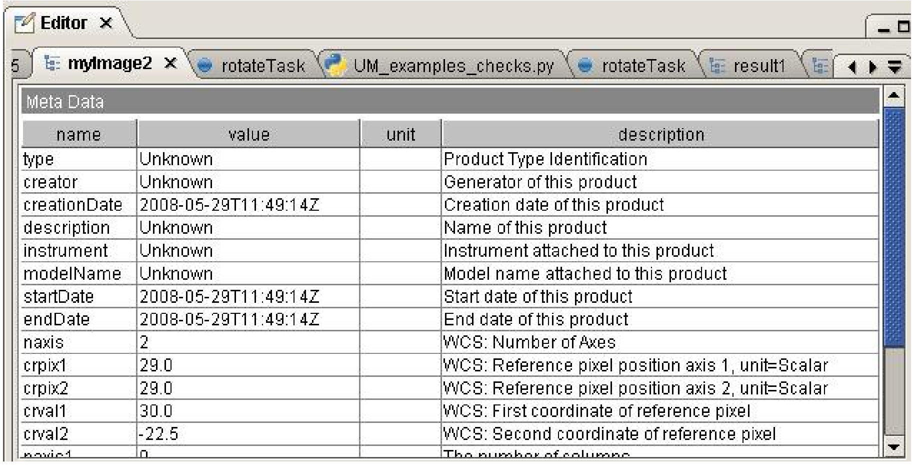
- *Stop*: stops execution of the script. Note that the current line of the script will be completed before the script stops running. This can lead to a delay before the script stops.

  This button also stops other activities within HIPE, like data analysis tasks. Note that if a task has not been programmed to "listen" to the *Stop* button, pressing it will have no effect.

- *Line by line*: when pressed, this button is surrounded by a darker background. This causes a change in the behaviour of the *Run* button, which is best shown by an example.

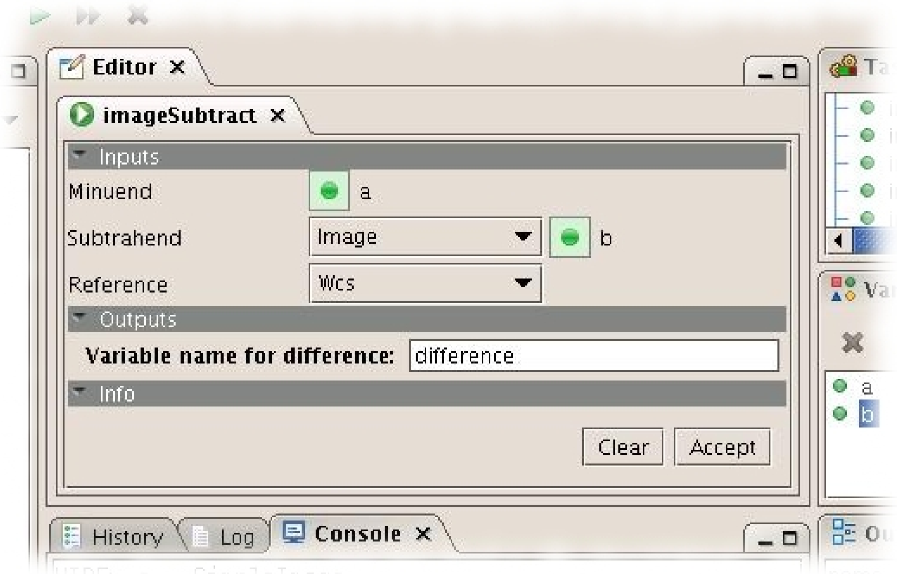
Copy the script shown in Figure 23. Ensure that the *Line by line* button is *not* pressed. Select the two lines saying `print 1` and `print 2` and press the *Run* button. You will get an error message. This is due to the fact that these two lines are within a *code block* (a function in this case). You are trying to execute only part of the block, which confuses the interpreter. If you press the *Line by line* button and try again, the code will run with no errors.

The *Editor* view is used for much more than editing script. For example, it can show detailed information about data products (see Figure 24) and is where the graphical interface of data analysis tasks is shown (see Figure 25 for a typical example).



name	value	unit	description
type	Unknown		Product Type Identification
creator	Unknown		Generator of this product
creationDate	2008-05-29T11:49:14Z		Creation date of this product
description	Unknown		Name of this product
instrument	Unknown		Instrument attached to this product
modelName	Unknown		Model name attached to this product
startDate	2008-05-29T11:49:14Z		Start date of this product
endDate	2008-05-29T11:49:14Z		End date of this product
naxis	2		WCS: Number of Axes
crpix1	29.0		WCS: Reference pixel position axis 1, unit=Scalar
crpix2	29.0		WCS: Reference pixel position axis 2, unit=Scalar
crval1	30.0		WCS: First coordinate of reference pixel
crval2	-22.5		WCS: Second coordinate of reference pixel
naxis1	0		The number of columns

Figure 24. A window shows metadata associated with an image within the Editor view.



Minuend: a

Subtrahend: Image b

Reference: Wcs

Variable name for difference: difference

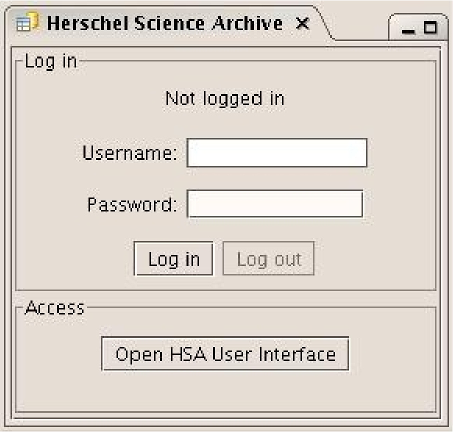
Figure 25. Window showing a task interface within the Editor view.

3.3.4. Export Herschel Data from HIPE

This view allows Herschel data to be exported from the session into a directory structure which is identical to the one found in the tar file of observations received from the Herschel Science Archive.

3.3.5. Herschel Science Archive

In this view you can log into the Herschel Science Archive (HSA) and open its graphical interface. See the *Data Analysis Guide* for more information.



Herschel Science Archive

Log in

Not logged in

Username:

Password:

Access

Figure 26. The Herschel Science Archive interface view.

3.3.6. HIFI pipeline

This view reacts to `HifiTimelineProduct` objects only. Selecting a `HifiTimelineProduct` will show the tasks that can be used on that object.

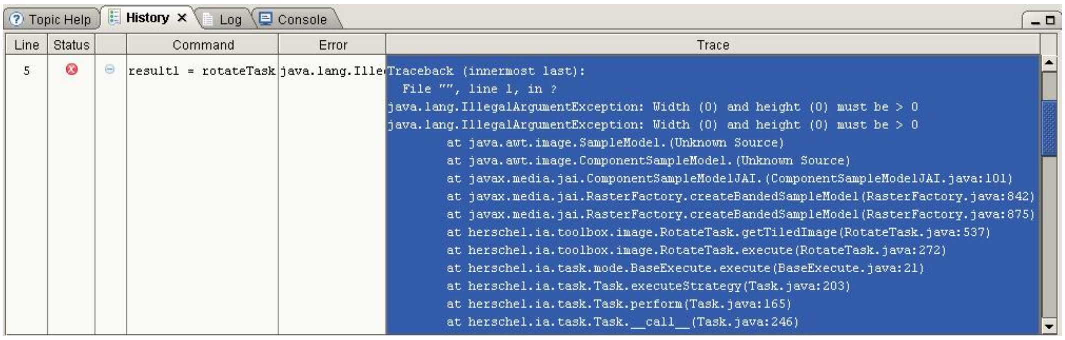
3.3.7. History

The *History* view provides a list of the commands executed at the console and from Jython scripts. This also shows whether the command was successful or not. Pay attention to these icons:

- ☑ The command was successful.

- ⊗ The command caused an error.

- ⊕ This icon appears next to a failed command, and indicates that the row can be expanded to reveal additional information. In particular, the *Trace* column will show a detailed *traceback* of the error (see Figure 27).



Line	Status		Command	Error	Trace
5	⊗	⊖	result1 = rotateTask	java.lang.Ille	Traceback (innermost last): File "", line 1, in ? java.lang.IllegalArgumentException: Width (0) and height (0) must be > 0 java.lang.IllegalArgumentException: Width (0) and height (0) must be > 0 at java.awt.image.SampleModel.(Unknown Source) at java.awt.image.ComponentSampleModel.(Unknown Source) at javax.media.jai.ComponentSampleModelJAI.(ComponentSampleModelJAI.java:101) at javax.media.jai.RasterFactory.createBandedSampleModel(RasterFactory.java:842) at javax.media.jai.RasterFactory.createBandedSampleModel(RasterFactory.java:875) at herschel.ia.toolbox.image.RotateTask.getTiledImage(RotateTask.java:537) at herschel.ia.toolbox.image.RotateTask.execute(RotateTask.java:272) at herschel.ia.task.mode.BaseExecute.execute(BaseExecute.java:21) at herschel.ia.task.Task.executeStrategy(Task.java:203) at herschel.ia.task.Task.perform(Task.java:165) at herschel.ia.task.Task.__call__(Task.java:246)

Figure 27. Traceback of an error from the History view.

You can also copy the commands to the clipboard and save them to file. This is useful if you want to re-run the commands later as a script. To copy or save the command history, follow these steps:

1. Click on the header of the *Command* column to select the entire column. Alternatively, click and drag the mouse pointer within the column to select only a few cells.

2. Right click anywhere in the table. A context menu appears, with the *Copy* and *Save* options.

- If you choose *Copy*, you can then paste the information in a script within the *Editor* view.
- If you choose *Save*, a standard dialogue window for saving to file appears.

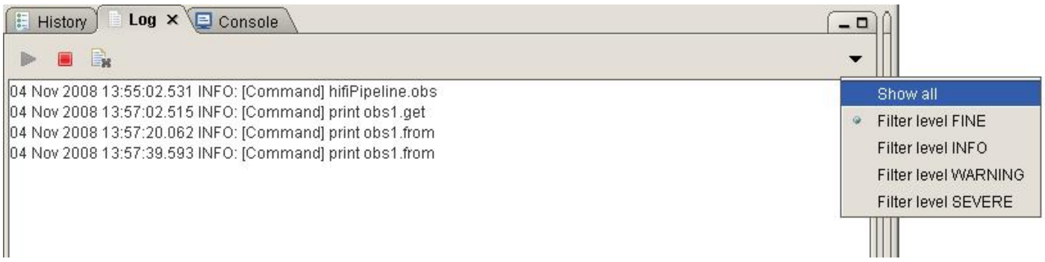
Information in the *Error* and *Trace* columns can be copied and saved in the same way.

3.3.8. Import Herschel data to HIPE

With this view you can import Herschel data into a HIPE session from the tar file of observations retrieved from the Herschel Science Archive.

3.3.9. Log

This view lists all the commands that have been executed, like the *History* view, but also any output and warning generated by the system. You can filter messages according to their severity level: click the arrow at the upper right corner of the view to reveal the menu shown in Figure 28.



```
04 Nov 2008 13:55:02.531 INFO: [Command] hifiPipeline.obs
04 Nov 2008 13:57:02.515 INFO: [Command] print obs1.get
04 Nov 2008 13:57:20.062 INFO: [Command] print obs1.from
04 Nov 2008 13:57:39.593 INFO: [Command] print obs1.from
```

Figure 28. Filtering messages in the Log view.

3.3.10. Navigator

The *Navigator* view provides access to the files and directories on your disk. Right-click on any item to display a context menu with the available actions (see for instance Figure 29). Double-click on an item to open it in HIPE with the default tool.

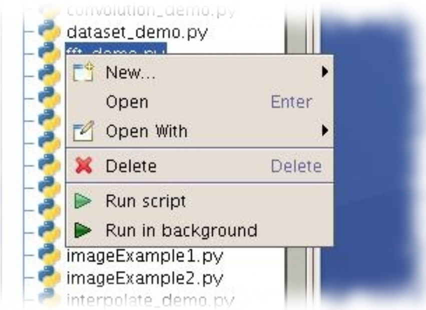
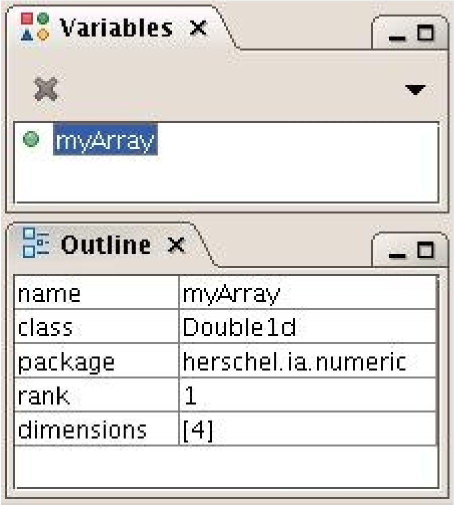


Figure 29. The Navigator view showing the options available for a Jython script.

3.3.11. Outline

This view displays information about the selected variable in the *Variables* view (see Section 3.3.18). If more than one variable is selected, information is displayed about the *first* selected variable. Common information displayed is the variable name, type (*class*) and *package* in which the variable type is defined (see for instance Figure 30).

Note that you cannot edit the contents of this view.



myArray

name	myArray
class	Double1d
package	herschel.ia.numeric
rank	1
dimensions	[4]

Figure 30. Outline of a variable in the Outline view.

3.3.12. PAL Storage Manager

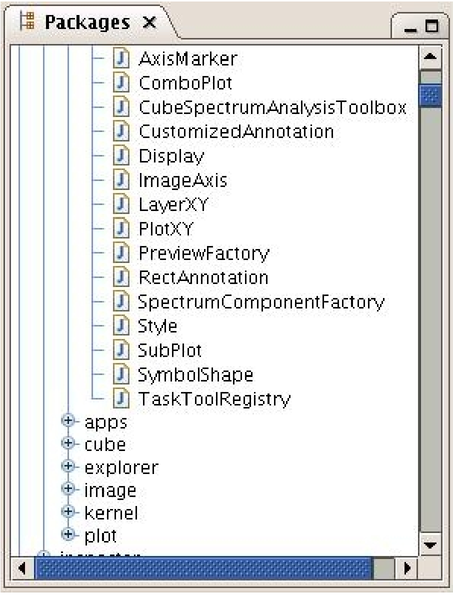
In this view you can manage *pools* and *storages*, which you can use to store, query and retrieve your Herschel data. For more information see the *Data Analysis Guide*.

Note that this view is deprecated. Equivalent functionality will become available in the HIPE *Preferences* window.

3.3.13. Packages

This view shows the *packages* available to the session and the *classes* within each package. (see Figure 31). When you click on an item, some additional information is displayed in the *Outline* view.

Packages and classes are advanced concepts you will only need if you want to develop Jython scripts. For more information, see the Scripting and Data Mining guide.



```
AxisMarker
ComboPlot
CubeSpectrumAnalysisToolbox
CustomizedAnnotation
Display
ImageAxis
LayerXY
PlotXY
PreviewFactory
RectAnnotation
SpectrumComponentFactory
Style
SubPlot
SymbolShape
TaskToolRegistry
apps
cube
explorer
image
kernel
plot
```

Figure 31. The Package view.

3.3.14. Product Browser

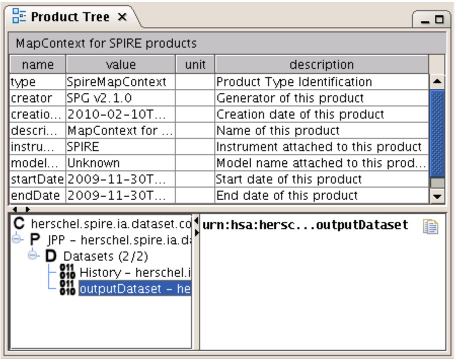
This view is the main component of the *Product Browser* perspective (see Section 3.1.1). It allows you to query and browse products stored locally or remotely.

For more information see the *Data Analysis Guide*: Section 1.3.7.

3.3.15. Product Tree

Like the *Product Browser* view, this view is also part of the *Product Browser* perspective.

When you select a product in the *Variables* view, the *Product Tree* view gives you additional information.



MapContext for SPIRE products

name	value	unit	description
type	SpireMapContext		Product Type Identification
creator	SPG v2.1.0		Generator of this product
creatio...	2010-02-10T...		Creation date of this product
descri...	MapContext for ...		Name of this product
instru...	SPIRE		Instrument attached to this product
model...	Unknown		Model name attached to this prod...
startDate	2009-11-30T...		Start date of this product
endDate	2009-11-30T...		End date of this product

C herschel.spire.ia.dataset.co
P JPP – herschel.spire.ia.da
D Datasets (2/2)
History – herschel.i
outputDataset – he

urn:hsa:hersc...outputDataset

Figure 32. The Product Tree view.

The top pane shows the *metadata* associated with the product. The lower left pane shows a tree structure of all the inner products and datasets contained in the product. This is especially useful for exploring entire observations, which have an "onion" structure made of several layers. The lower right pane shows the unique identifier for any product selected in the lower left pane. This identifier is useful if you want to manage the product via the command line. Click the icon to the right of the identifier to copy the string to the clipboard.

3.3.16. Save Products to Pool

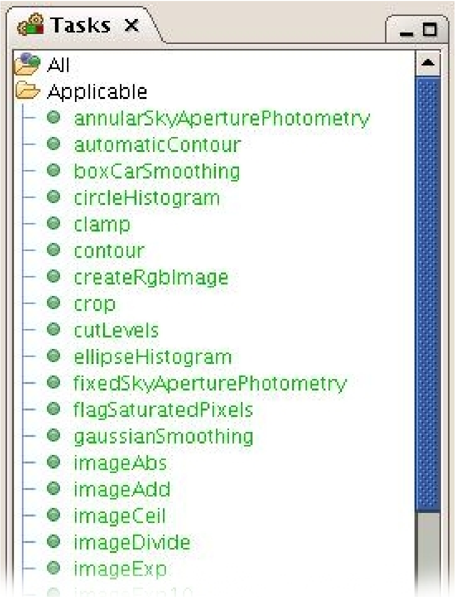
In this view you can save data (Herschel data products) from your session into a *pool*. See the *Data Analysis Guide* for examples: Section 1.3.9.

3.3.17. Tasks

This view lists all the *tasks* (pipeline steps, data analysis routines and other tools) available in HIPE. The tasks are listed under three folders, which you can open and close with a double click:

- **All:** lists all the available tasks.
- **Applicable:** this folder is populated only when you select a variable in the *Variables* view. In this case, it lists all the tasks that can be applied to that variable.
- **By category:** this folder has four subfolders (*General*, *Hifi*, *Pacs* and *Spire*) listing general tasks and tasks relevant to a specific instrument.

Double click on a task to open its dialogue window in the *Editor* view (see Figure 25 for an example).



Tasks ×

- All
- Applicable
  - annularSkyAperturePhotometry
  - automaticContour
  - boxCarSmoothing
  - circleHistogram
  - clamp
  - contour
  - createRgbImage
  - crop
  - cutLevels
  - ellipseHistogram
  - fixedSkyAperturePhotometry
  - flagSaturatedPixels
  - gaussianSmoothing
  - imageAbs
  - imageAdd
  - imageCeil
  - imageDivide
  - imageExp

Figure 33. Tasks view with the tasks applicable to an image.

Right-click on a task to display a context menu with the following entries:

- **Open** and **Open With:** opens the dialogue window of the task.
- **View source:** displays the source code of the task. This is useful if you want to inspect the algorithm used or if you plan to modify the task. Note that, for this entry to work, you must have selected the option to include the source code when you installed HIPE.
- **Help in URM:** opens the help page for the task in the *User Reference Manual*. This entry is not available for all tasks.

3.3.18. Variables

This view shows the variables available in your session. Select a variable to obtain more information in the *Outline* view (see Section 3.3.11). Double click on a variable to display its contents with the default tool. Right click on a variable to display a context menu with the following options:

- **Open:** displays the contents of the variable with the default tool.
- **Open With:** displays a submenu with a list of tools that can be used to display the contents of the variable.
- **Send to:** displays a submenu with entries to save the variable to FITS file or to a *local store* (see the *Data Analysis Guide* for more information on local stores).
- **Show methods:** displays in the *Console* view all the *methods* (routines) applicable to the variable. This is useful if you are working on a script or issuing command-line instructions involving the variable.
- **Rename** and **Delete:** self-explanatory.
- **Help in URM:** displays the help page about the variable type from the *User Reference Manual*. This option may not be available for all variables.
- **Help in DRM:** displays the help page about the variable type from the *Developer Reference Manual*, also known as *API Documentation* or *Javadoc*. This option may not be available for all variables. Note that the DRM contains advanced, developer-oriented information. See the *Scripting and Data Mining* guide for information on how to use the DRM.

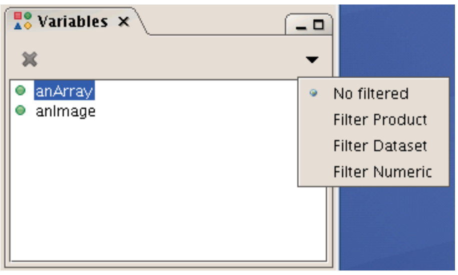


Figure 34. Variables view with filtering menu.

Click the cross below the view title to delete all variables. Click the arrow at the upper right corner of the view to display a menu to filter variables according to their type (see Figure 34).

3.3.19. Welcome

This is the initial *Welcome* window (see Figure 7).

3.4. Viewers in HIPE

A convenient feature of HIPE is that recognises the type of variables held in a session (whether it is a dataset, a spectrum, an image, a cube, a scalar constant and so on). Items appearing in the *Variables* or *Outline* views, *with a green dot to their left*, can potentially be opened. See Section 3.3.18 for how to display the contents of a variable with the default tool or with another available tool.

An example is shown for a `SimpleImage`. A right-click on a variable of this type in the *Variables* view shows there are three viewers (see Figure 35). The *Product Viewer* shows associated metadata and array values; the *Wcs explorer* shows WCS settings; the *Standard Image Viewer* displays the image.

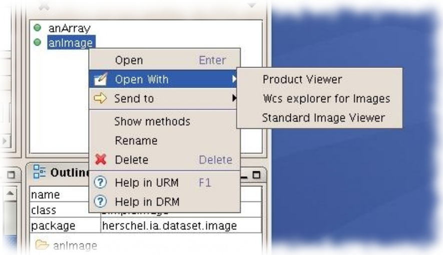


Figure 35. Available viewers are shown with a right-click.

4. IDL to HIPE/Jython command mapping

The following tables contain the HIPE/Jython equivalents of the most common IDL commands and functions.

Table 4. Basic commands

Command	IDL	HIPE/Jython equivalent
Create a variable	a = 5	a = 5
Get info on a variable type	help,a	print a.__class__
Print value of variable	print, a	print a
Create an array	a = [2., 3.]	a = Float1d([2., 3.])
Create a list	-	a = [2., 3.]
Create an automatic array	a=findgen(10)	a=Float1d.range(10)
Get info on array variable	print, a	print a

Command	**IDL**	**HIPE/Jython equivalent**
Get one element of array	print,a(1)	print a[1]
Define new 1D array of 10 elements	a = fltarr(10)	a = Float1d(10)
Assign value inside an array	a(4)=219	a[4] = 219
Define new 2D array of 10,5 elements	a = fltarr(10,5)	a = Float2d(10, 5)
First element index number	0	0

Table 5. Plotting

Command	**IDL**	**HIPE/Jython equivalent**
Open a plotting window	window,retain=2	p=PlotXY()
Plot two numeric arrays a & b	plot,a,b	p=PlotXY(a,b)
Define axis ranges and styles	plot,a,b,[xy]range=[0.,10.], [xy]title="lambda"	PlotXY(a,b,[xy]range=[0.,10.], [xy]title="λ")
Define line style	plot,a,b,linestyle=1	p.style.line=2 (later)
Define plotting symbol	plot,a,b,psym=2	p.style.symbol=5 (later)
Define plot title	plot,a,b,title='title'	PlotXY(a,b,title='title')
Overplot	oplot,a,c	p[1]=LayerXY(a,c)
Make Annotations	xyouts,0.2,0.7,Label'	d.addAnnotation("Label", 0.2, 0.7)
Make postscript hardcopy	set_plot,'ps' device,filename="file.ps" device,/close set_plot,'X'	p.saveAsEPS("file.ps")
Make a JPG hardcopy	-	p.saveAsJPG("file.jpg")
Make a PNG hardcopy	-	p.saveAsPNG("file.png")
Make a PDF hardcopy	-	p.saveAsPDF("file.pdf")
Further customisations	-	(right-click on plot and select Properties)

Table 6. Importing/exporting data

Command	**IDL**	**HIPE/Jython equivalent**
Reading an ascii table	readcol,'file.dat',a,b,c	t = simpleAsciiTableReader(file = "file.dat")
Plot read data	plot,a,b	p=PlotXY(t["c0"].getData(), t["c1"].getData()) or right-click on `t` and choose *Open with TablePlotter*
Read a Comma Separated Table (.csv) ascii table	readcol,'file.csv', DELIMITER=','	t = asciiTableReader(file = "file.csv")
Read a image FITS file	im=mrdfits("image.fits")	im = fitsReader(file = "image.fits")

Command	IDL	HIPE/Jython equivalent
Display image	tvcsl,im	right-click on "im" and Open with "ImageViewer"
Read a cube FITS file	cube=mrdfits("cube.fits")	im = fitsReader(file = "cube.fits")
Display cube	-	right-click on "cube" and Open with "CubeAnalysisToolbox"
Read a spectrum FITS file	sp=mrdfits("spec.fits")	sp = fitsReader(file = "spec.fits")
Display spectrum	plot,wave,flux	right-click on "sp" and Open with "SpectrumExplorer"
Writing to FITS	mwrfits,image,'image.fits'	simpleFitsWriter(product = image, file = "image.fits")
Writing an ascii table (csv by default)	get_lun,u openw,u,'file.csv' printf,u,a,b close,u free_lun,u	asciiTableWriter(table = t, file = "file.csv")

Table 7. Arithmetic

Command	IDL	HIPE/Jython equivalent
Adding	3+4	3+4
Multiply	3. * 4.	3. * 4.
Powers	3^4	3**4
Absolute	abs()	absolute(), fabs()
Arc cosine	acos()	arccos()
Natural logarithm	alog()	log()
10th base logarithm	alog10()	log10()
Arc sine	asin()	arcsin()
Arc tangent	atan()	arctan()
Ceil	ceil()	ceil()
Conjugate	conj()	conjutage()
Cosine	cos()	cos()
Hyperbolic cosine	cosh()	cosh()
Exponential	exp()	exp()
Floor	floor()	floor()
Invert (matrix)	invert()	Matrix (module)
Bit shift operations	ishft()	right_shift(),left_shift()
Sine	sin()	sin()
Hyperbolic sine	sinh()	sinh()
Square root	sqrt()	sqrt()
Tangent	tan()	tan()

Command	**IDL**	**HIPE/Jython equivalent**
Hyperbolic tangent	tanh()	tanh()
Random 0-1 generator	randomu()	random()
Reverse array 'a'	reverse(a)	a[::-1]
Collapse of array	total(a)	sum(a)
Number of elements	n_elements()	len(), size()
Number of parameters	n_params()	len(*args)
Extra parameters	_extra	**kwargs
Size	size()	shape(),arrayvar.type()
Pause time	wait	time.sleep()
Execute script	execute()	exec()

Thse are external resources that you may find useful:

- IDL to Python
- Jython homepage
- Python for astronomers

Note that HIPE is based on Jython 2.1, while the latest Jython version is 2.5. Therefore, examples from these external sites might not always work.