Heliophysics Integrated Observatory

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HELIO Frontend
User Manual
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Note: Any notes here.

Introduction

The HELIO Front end (HFE) is a web portal that provides access to all services provided by HELIO. The HFE is intended for novice users that do not want to bother with the internal of the system. Thus the HFE focuses on those use cases that suite a majority of HELIO users. More advanced functionality is offered through the HELIO IDL API, the service specific user interfaces and the HELIO Java API. They are described in separate documents.

The HFE builds on two core approaches: data centricity and task orientation. The data centred approach treats data objects as the main entities in the user interface. The task-oriented approach offers a variety of predefined tasks to solve basic and advanced use cases.

The data-centric approach reflects that users are typically interested in data rather than in functions applied to the data or algorithms. The HFE data objects are accessible through the 'data cart'. The data cart is a GUI element placed at a prominent position right below the main menu. The content of data cart can be compared to the variables in a scripting environment such as IDL. A variable contains a data object. Functions or procedures are applied to this variable in order to process or visualise the data object.

The task-oriented approach hides the complexity of the underlying service calls. A combination of services calls is summarized in a task. Moreover, a task has some knowledge about the data it processes and thus relieves the user from having to learn the insights of the HELIO data model.

The task-oriented approach of the HFE distinguishes it from both normal web applications, which are more workflow-oriented, and traditional scientific systems, which are function-oriented. In a function-oriented approach, input data is feed into a function, processed and new data is generated; this is comparable to a traditional scientific data analysis system, where the users need to know the details of the data, apply a function to it, and exactly know what they can expect back, but where there is no knowledge in the system of the nature of the input data or results.

By contrast, in a task-oriented system, the data processing is done at an abstract level from the user's perspective. This means that for a given data product, the user is presented with a set of tasks that can be applied to this data. These tasks are presented in natural language like: "Get observations for a given time range", "See what instruments covered this period", etc. This task-oriented approach supports the novice users to perform common tasks without having deep knowledge of the detailed science, allowing them to perform many analyses without having to learn the system in depth, while not preventing more advanced users from working with the data. This is supported through the use of simple data management tasks, which retrieve the data, join data tables, and store the data products.

The input data to a task may consist of: 1) manually specified data, 2) data coming from a HELIO service such as the event catalogue or feature catalogue, or 3) data from an external source, such as a VOTable created by some scripting language. Most tasks are mapped to a query or processing service that runs in the HELIO infrastructure.

The output data product generated by the task is either a VOTable document, an image or a FITS file. Parts of VOTable documents may be used as input to further tasks or downloaded to the users' local system for longer-term storage or specialist analysis.

In this document we describe how to user the HELIO frontend. The next section provides the background and the concepts of the HFE. The section after this describes the HFE in a tutorial like style. The two chapters can be read independently.
Next to this manual the HFE provides context sensitive help in several places. Yellow help boxes guide the user through the system. Most dialogs in the HFE come with a "Help" button for additional information. In many GUI elements the user can hover the mouse over the element to see a tooltip with more information. Often this includes a description of the current value in the GUI element.

HELIO Front End core principles

The HFE user interaction pattern

The way of using data and tasks in the HELIO portal follows a generic user interaction pattern.

1. *Select a task to be executed*. Tasks are selected through a pull down menu.
2. *Gather the input parameters required for the selected task*. The input parameters may be entered manually or they may be reused from a previously executed task. Generally, tasks have sensible defaults for most input parameters. The HELIO portal provides customised dialogues for different kinds of input parameters. Commonly used input parameters such as date ranges or instruments are entered through a dedicated dialogue. For other types of input parameters HELIO provides a configurable, generic dialogue. The latter is used for workflow-specific parameters.
3. *Execute the task on the HELIO infrastructure*. Most tasks are connected directly to one or several HELIO web services. The portal shows a busy screen until a result is available.
4. *Visualise the result of the task*. Depending on the data type of the result, different tools are used for visualisation. It is even possible to have different visualisations for a data type; e.g. a table with time series can be represented as a plain HTML table or as a time line plot.
5. *Extract new input parameters from the result*. In many cases a user can extract new input parameters from a result. These parameters can be used as input for a succeeding task or to refine the current task. In a timeline plot a user can select a date range of interest. In a table of instruments the user can look for instruments with similar capabilities.
6. Continue at step 1. The process can be repeated until the original question is sufficiently answered.

In order to support sharing parameters between multiple tasks the portal introduces the concept of a data cart. The data cart is a dedicated area in the web interface, which allows collections of parameter values to persist and be managed. Parameters extracted from a task result will be stored in the data cart. Using the mouse they can be dragged from there and be dropped to the input area of another task.

The data cart is inspired by shopping carts known from web shops. It accentuates the importance of data in scientific applications and thus reflects the astronomer's way of thinking in terms of data rather than procedures. Analysis of data is the main interest of a scientist. How to get to the data, e.g. which task to run, is less interesting.

Figure x and y visualize the user interaction pattern and the data cart. Figure x shows the portal with the task menu at the top, the data cart right below and the parameter input area for a selected task in the bottom part. Figure y shows part of the result of a propagation model task. The icons above the result table allow the user to extract input parameters from the table.

HFE tutorials

These tutorials display several tasks to answer different scientific questions. The tutorials are organised as standalone sections as they can be combined in multiple ways. However, if you follow the tutorials in sequential order they will solve a scientific use case.

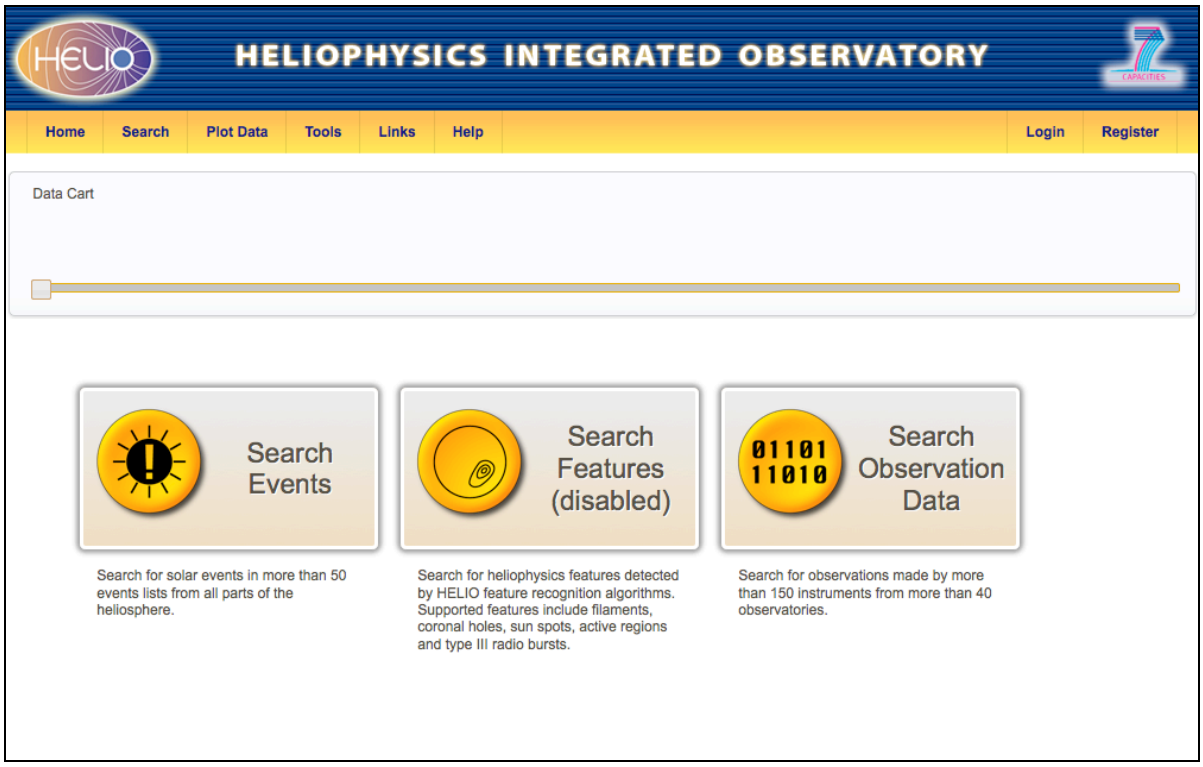

Figure 1 The HFE welcome screen

Tutorial 1: Search for Events

1. Click on “Search Events”

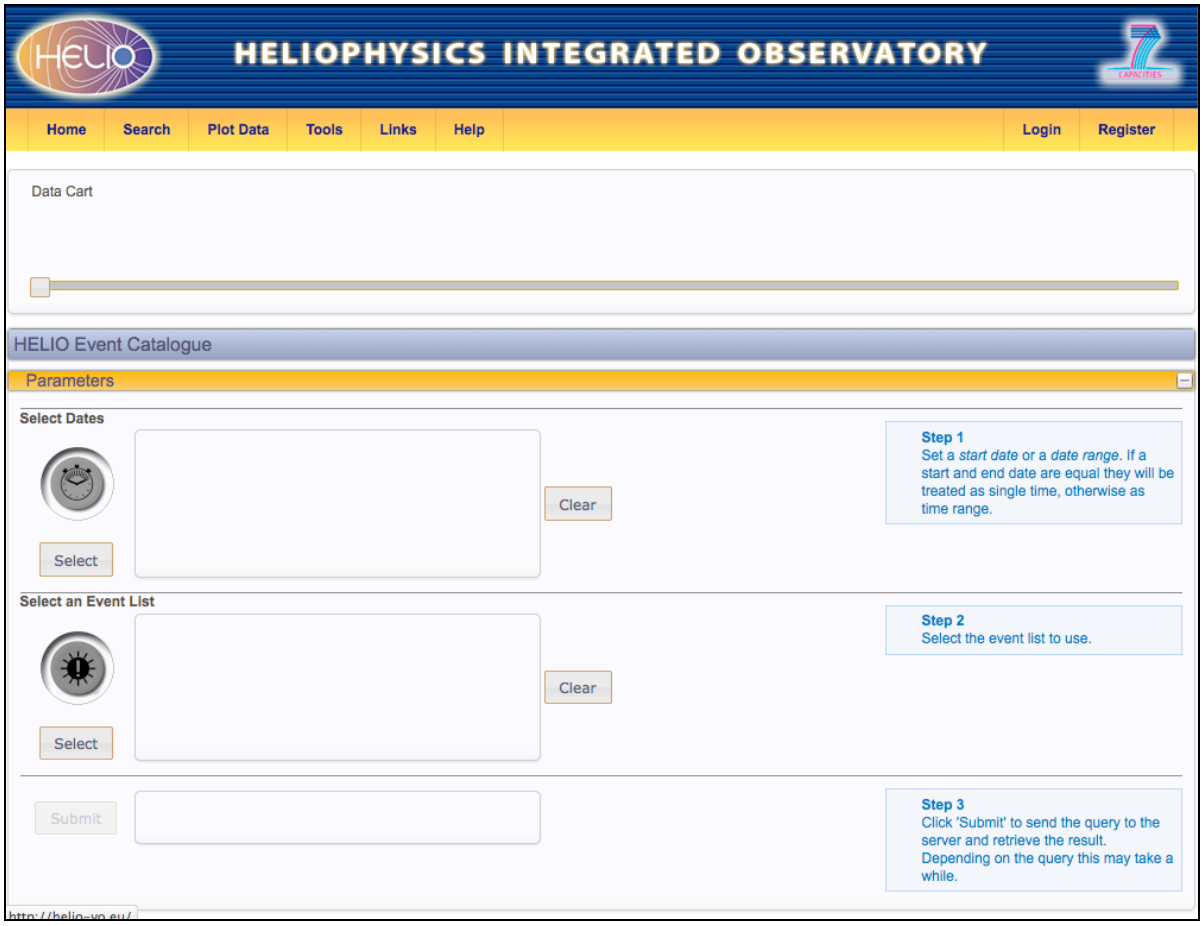

Figure 2 The empty form to search the HELIO event lists

Select time range

2. Click on the -icon or on the "Select" button below or in the white area next to it to select a time range.

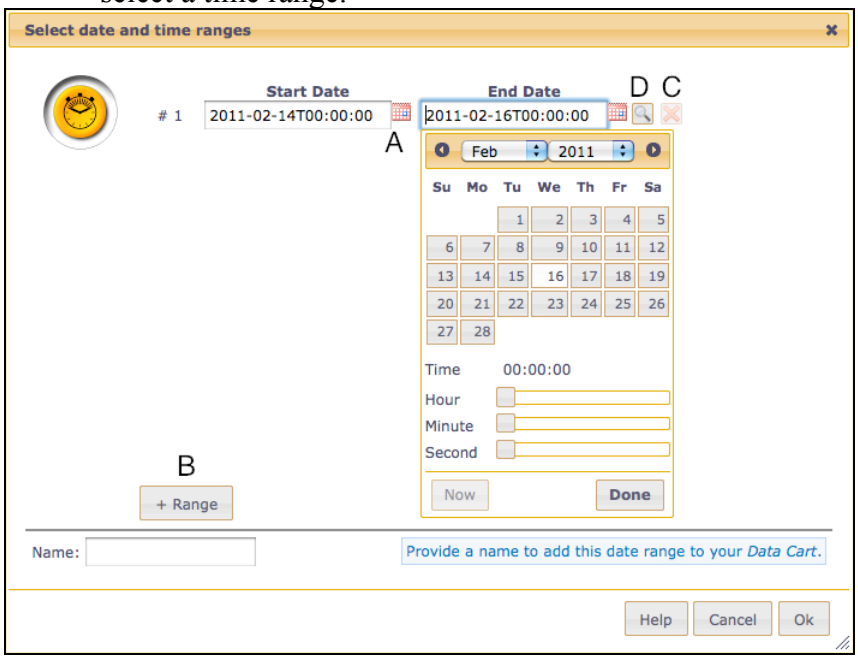

Figure 3 Area to enter date ranges. Depending on the selected task only a start date can be entered. Click on icon 'A' to popup the calendar to enter a date. Button 'B' allows adding another time range,

i.e. to cover multiple events in one query. Icon ‘C’ allows removing a time range and is active only if there is more than one time range. Click on icon ‘D’ to open the date range inspector for the selected data range line. See below for more information.

3. Click the magnifying glass (‘D’) on the right side of a time range. This will open the time range inspector, which provides a collection of tools to qualify and narrow a given time range.
    a. Select one of the tabs. Click on the link to inspect the current time range.

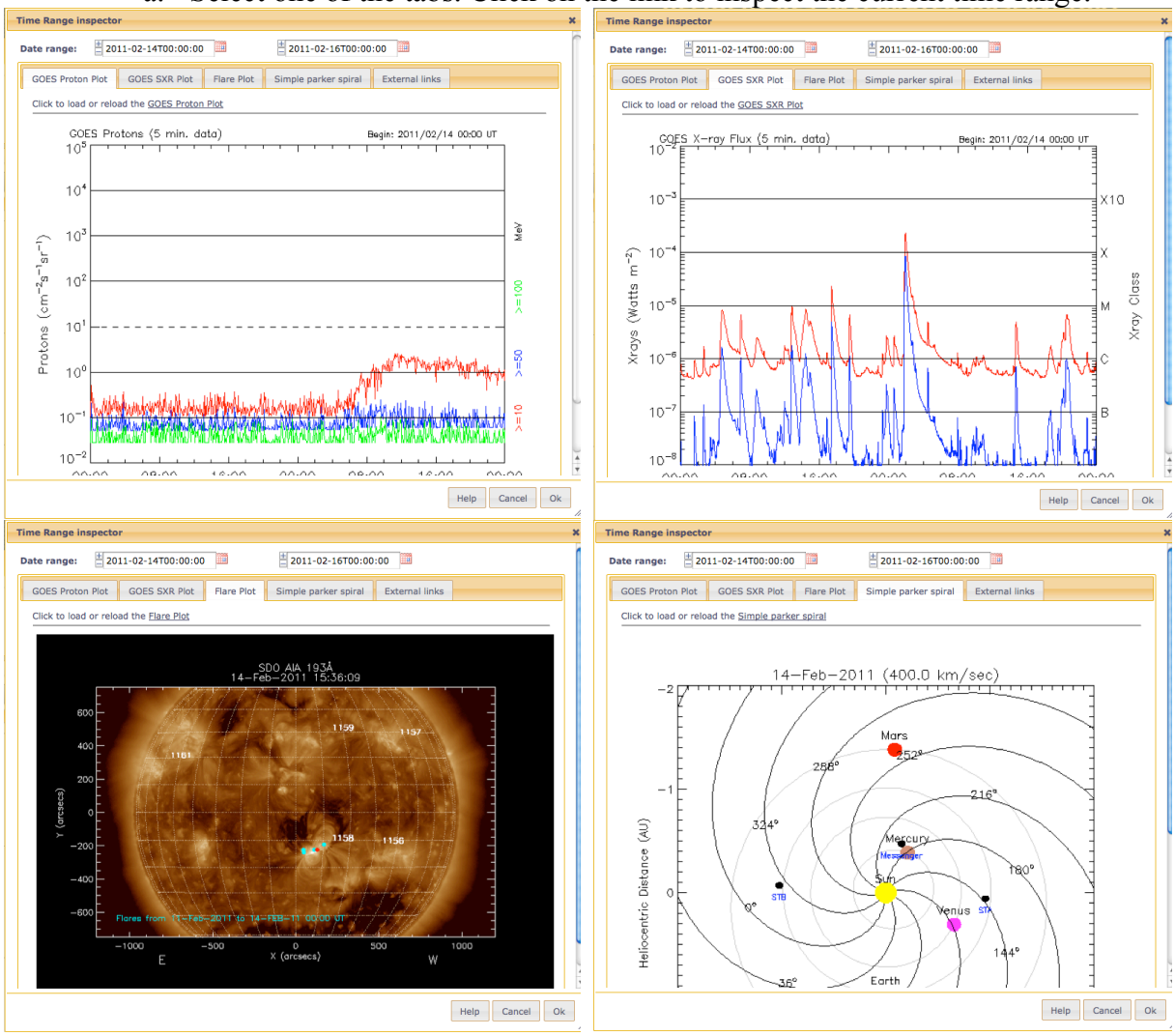

Figure 4 Snapshot of different date inspector tools for the time range analysis

    b. Adjust the time period on the top of the dialog. You can click the small + and – icons to add and remove 6 hours.
    c. Click again on the link to refresh the page
    d. Nearby: you can click on an image to load it in a new window.
4. Click the ‘Ok’ button to accept the adjusted time range in your query dialog. Click ‘cancel’ to keep the original value.

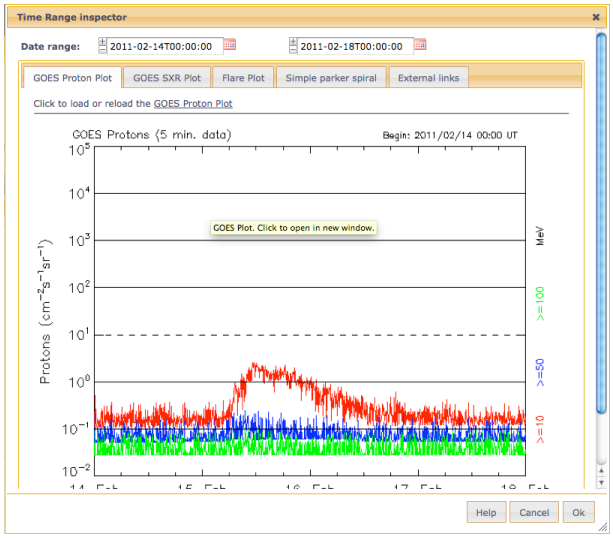

Figure 5 Sample of an adjusted GOES proton plot. (The yellow popup is shown to advertise the HFE-click-on-image™ functionality ☺).

5. Click Ok to close the data range dialog. This will update the summary box on your main screen.

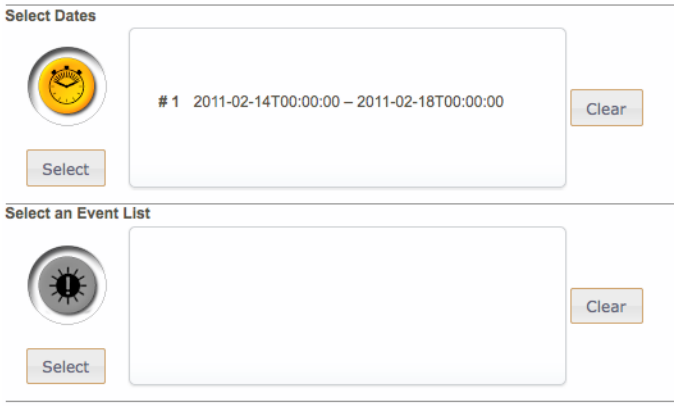

Figure 6 Summary box with the selected date range

Select Event list

6. Now click on the Event list icon, the “Select”-button below or the white rectangle on the right side to open the Event list dialog

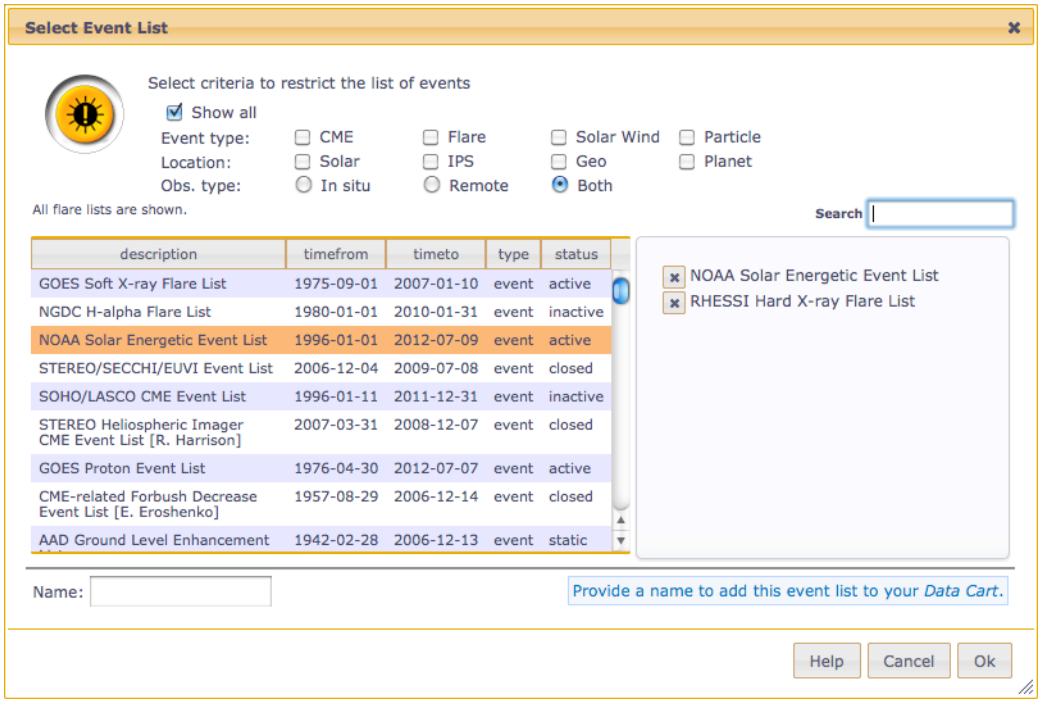

Figure 7 Event list selection dialog. Use the Checkboxes on top to filter the list. Click the list items to select one. Click on the x in the right side panel to remove an item from the current selection.

7. Click “ok” to accept your selection

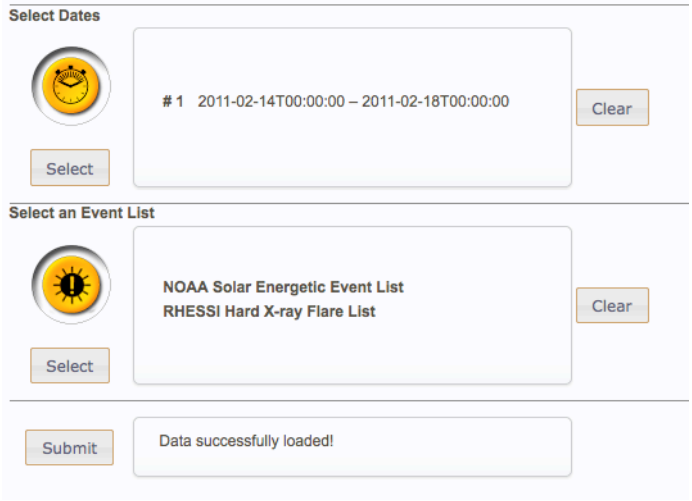

Figure 8 The task is ready to be submitted

8. Click the “Submit”-button. This sends the query to HELIO and waits for the result. The result is a VOTable which is visualised in the HFE.

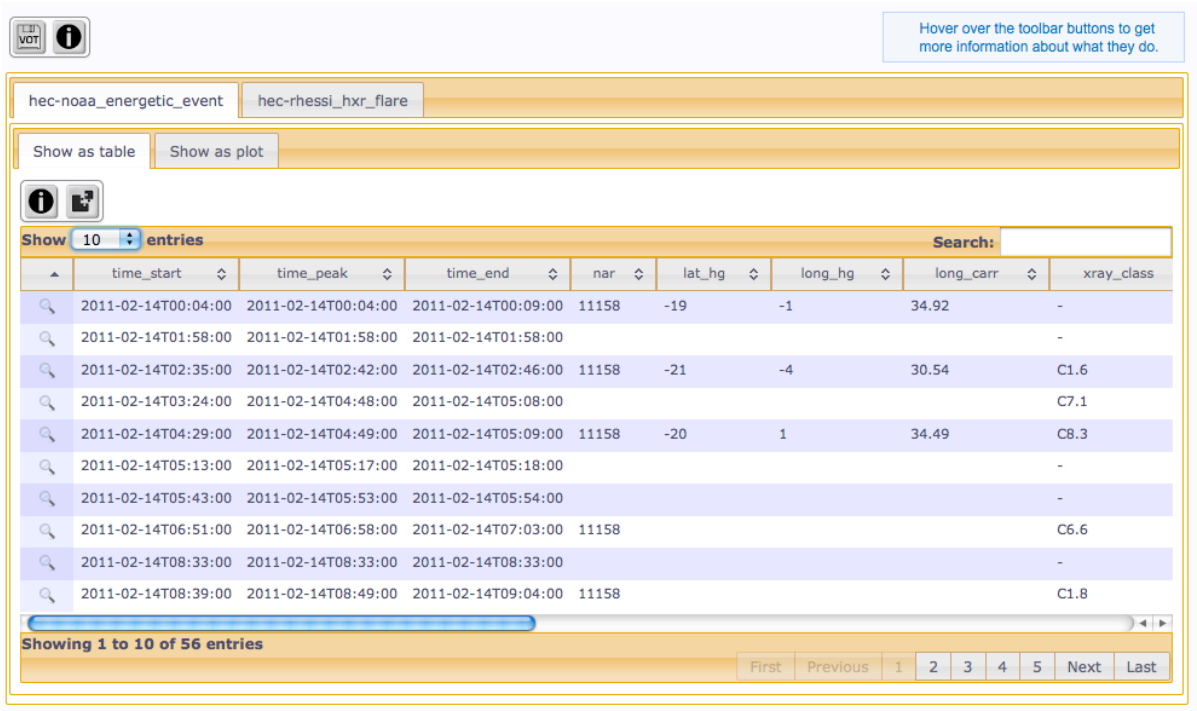

Figure 9 Result from a query to the NOAA Energetic Event list and the RHESSI HXR Flare list

Analyse event list results

9. The result view presents various tools to analyse the retrieved data. The main goal is to extract narrowed time ranges that are of interest.
    a. Click on the table header to sort the data. Clicking twice on “xray_class will first list the X, then the M, the C, the B, the A and finally list the uncategorized flares.
    b. The “Search” box on the top right of the result table allows to filter the table by some text. In the current sample entering ‘X’ will present the only X2.2-Flare in this list.
    c. Clicking on the magnifying glass will bring up the date inspector (see Figure 4). The date range of the event gets automatically expanded by 6 hours on both sides. This is because the time range for most of the lists is too narrow.
10. Once the events of interest are identified they can be selected and the time ranges cab be extracted.

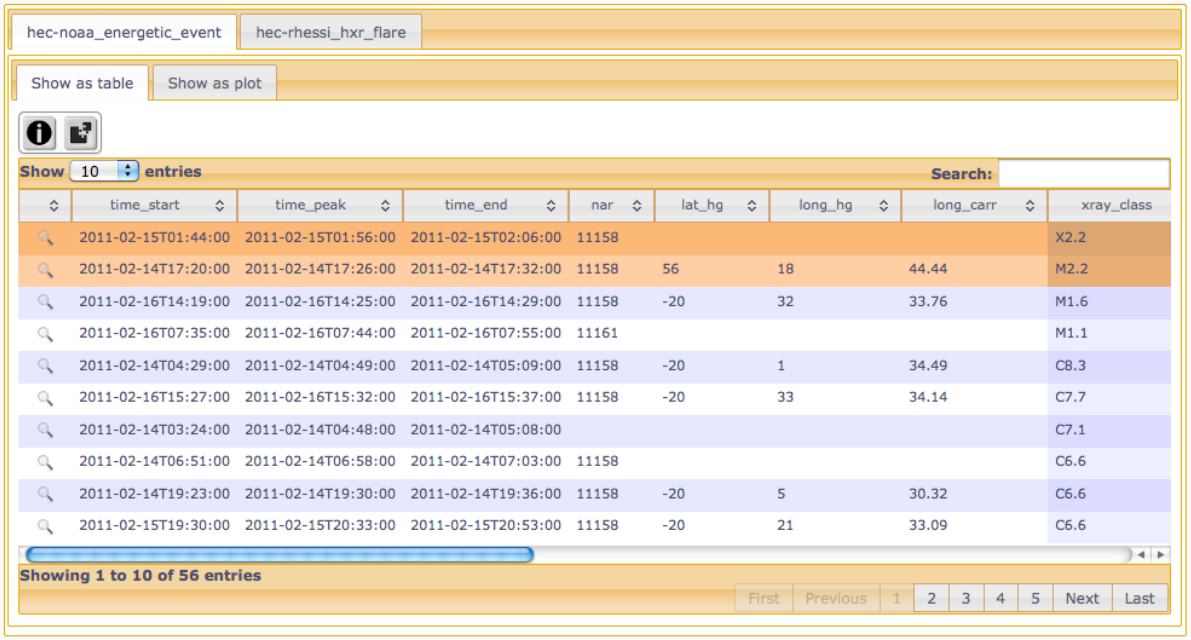

Figure 10 Selected events in the NOAA Energetic Event list. The list is sorted by "xray_class"

11. Click on the extract icon ( ) to add the selected date ranges to the “data cart”. See next section to learn more about the data cart.
12. An alternative to analyse the data is the plotter. Currently it is in prototype status and not any further described here.

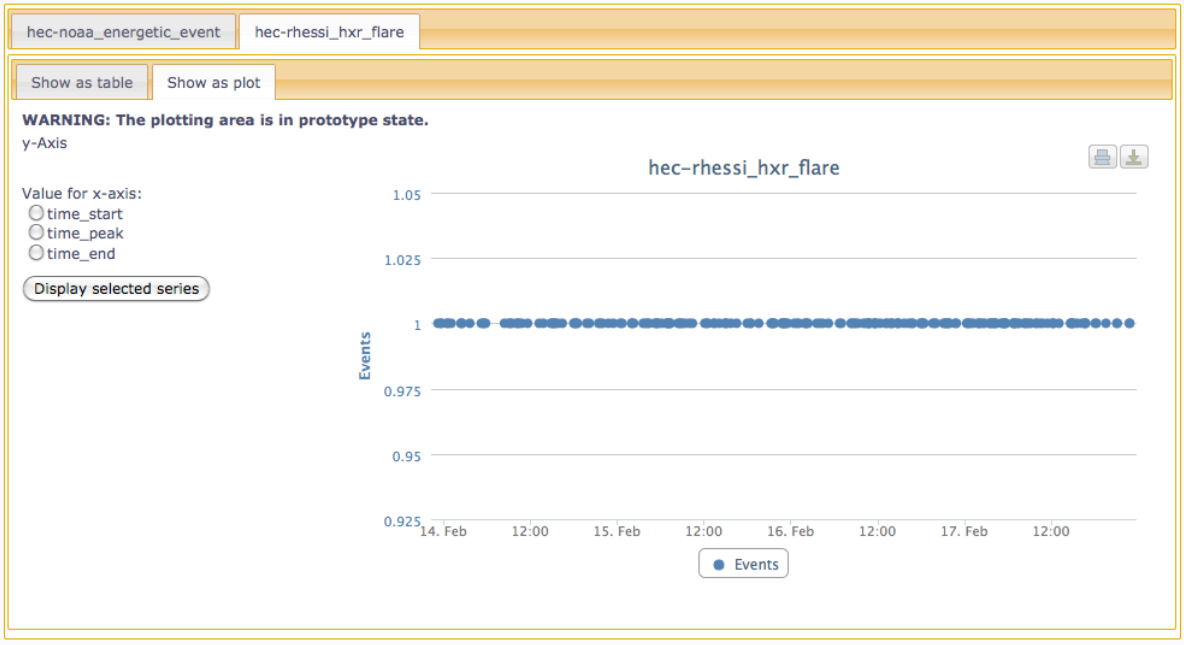

Figure 11 Plot of the results from the RHESSI HXR Flare list

Tutorial 2: Use the data cart

The main purpose of the data cart is to connect multiple tasks together. In this tutorial we explain how data can be added to the data cart, how it can be managed and finally how it is

connected it to other services. The screenshots in this tutorial base on the results of the previous tutorial.

Adding data to the data cart

1. Drag & drop from input area. After entering your data you can drag the yellow circle from the summary box and drop it on the data cart.

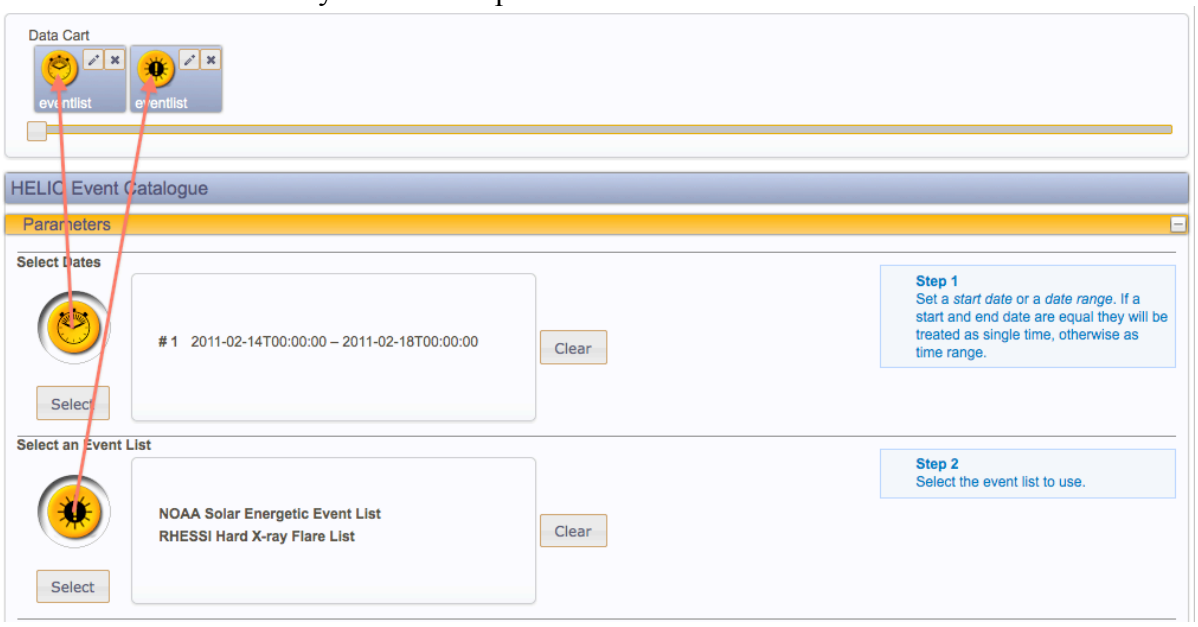

Figure 12 Drag the yellow circle and drop it on the data cart

2. Inspect a row of your result table. Click on the magnifying glass to open the date inspector. Clicking the "Ok"-button will popup a dialog and ask if the date values should be stored to the data cart.
3. The third option is to select on or several rows in a result table and click on the extract icon ( ). This will popup the data extraction dialog. Clicking ok will add the selected dates to the data cart.

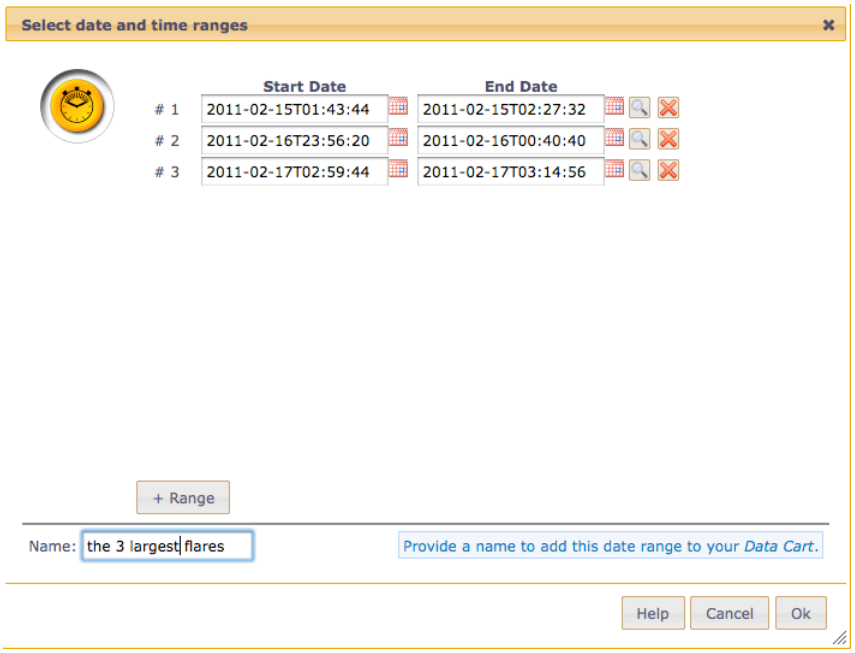

Figure 13 Data extraction dialog. The input box at the bottom allows specifying a name for the data cart item.

Manage the data cart

4. Click on the pencil icon to modify the data cart item. This is mainly useful to rename the item.
5. Click on the cross to remove a data cart item from the data cart.

Figure 14 Two sample items in the data cart, once with the default label ("eventlist") and once with a custom label

Connect a data cart item to a task

6. Select the task you are interested in, e.g. click menu “Search” - “Instruments by Capability”
7. Drop the previously stored time range to the grey circle. Clicking on the yellow circle, the select button or the box will allow you to edit the data **without** affecting the corresponding item in the data cart.

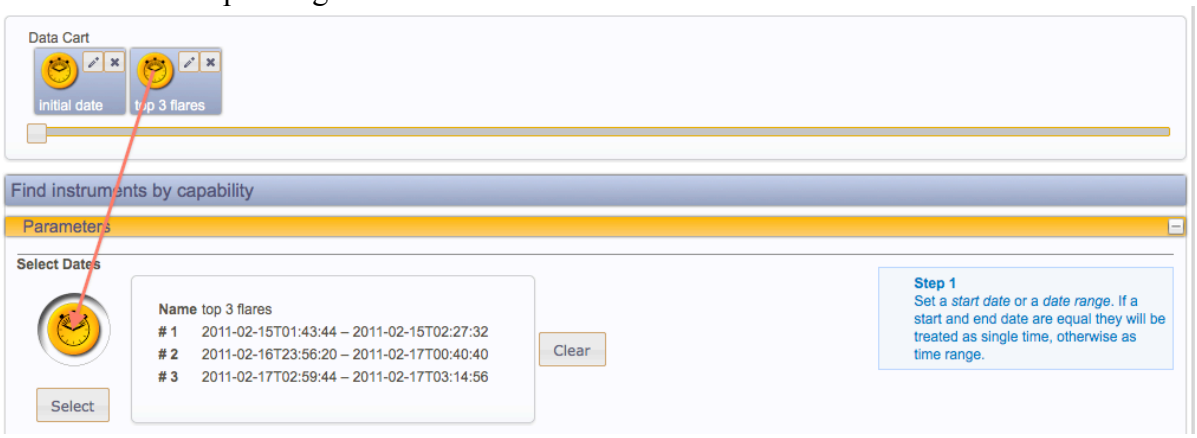

Figure 15 Drag item from data cart to the grey circle in the parameter section. Possible target locations will be highlighted when the item is dragged.

Tutorial 3: Search Instruments by Capability

The next step in the sample workflow is to find out what instruments have been able to see an event.
TBD

Tutorial 4: Search for data

TBD

Tutorial 5: Advanced tools

TBD