

Euclid Help

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Euclid Data Explorer at IRSA: Overview

The Euclid Data Explorer at IRSA provides an interactive graphical user interface (GUI) for specifying search constraints, submitting queries, and visualizing the results of data released by [Euclid](#) .

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Documentation

A detailed Users Guide about the data available here can be found on the [Euclid Mission Page](#) .

Euclid launched in July 2023 as a European Space Agency (ESA) mission with involvement by the National Aeronautics and Space Administration (NASA). The primary science goals of Euclid are to better understand the composition and evolution of the dark Universe. The Euclid mission will provide space-based imaging and spectroscopy as well as supporting ground-based imaging to achieve these primary goals. These data will be archived in multiple global repositories, including IRSA, where they will support transformational work in many areas of astrophysics.

During its nominal mission duration of 6 years, The Euclid space telescope will conduct (1) a Wide Survey resulting in imaging and spectroscopy over about 14,000 square degrees; and (2) a Deep Survey covering about 50 square degrees that will be ~2 magnitudes deeper. Euclid public data releases will occur approximately annually from 2025 through 2031.

The first release of Euclid data occurred in March 2025 and is known as Euclid Quick Release 1 (Q1). It consists of data in four fields. Although three Euclid Deep Fields are included, the data released in Q1 is at the depth planned for the Wide Field Survey.

Terminology, Hints, and Tips

Telescope & Data Terminology

The Euclid Space Telescope carries two instruments: the VISible instrument (VIS) and the Near-Infrared Spectrometer and Photometer (NISF). The Euclid data set will include data collected with these space-based instruments as well as "external" (EXT) images collected by ground-based telescopes and served alongside the Euclid images.

Euclid data products are processed and produced by different pipeline Processing Functions (PF). This table summarizes these PFs, as they can be useful for understanding the organization and names of the data products. Please see the Users Guide (which can be found on the [Euclid Mission Page](#) ) for more information.

Euclid Processing Function	Brief Description
----------------------------	-------------------

Euclid Processing Function	Brief Description
LE1	Produces Level 1 (raw) images from the VIS and NISP instruments
VIS	Produces calibrated Level 2 images from raw Level 1 VIS images
NIR	Produces calibrated Level 2 images from raw Level 1 NISP images
SIR	Produces calibrated Level 2 spectral images from the raw Level 1 NISP spectral data and extracts 1D spectra from the Level 2 spectral images
MER	Merges all Level 2 information to provide mosaics, catalogs, and photometric redshifts based on photometric and spectroscopic data
EXT	Provides external imaging and spectroscopic data
SPE	Measures spectroscopic redshifts from the Level 2 spectra
PHZ	Computes photometric redshifts from the multiwavelength imaging data
SHE	Measures shapes on the VIS imaging data (not included in Q1)
LE3	Produces Level 3 data products
SIM	Produces simulated data (not included in Q1)

Tool Terminology

The words in blue rectangles at the top are 'tabs.'



This icon in the upper left  pulls open a "drawer" from the left hand side which enables you to [add or remove tabs](#) from this top level (see [below](#)). Most of these tabs allow [searching](#). The side drawer also can allow you to change the [appearance](#) (dark or light mode) (see [below](#)).

When you have [results](#) loaded into the Euclid Data Explorer, your browser window is divided into "panes", like "window panes." The contents of the panes depends on what you are doing with the tool, but could include an image pane, at least one table pane, and/or a plot pane. You can expand any of the window panes by clicking on the expand icon: 

Each of the three main kinds of 'panes' in the display has its own toolbox in its upper right corner which operates on things in that pane, and the basic functionality for each of these panes is covered elsewhere in this document:

- ◇ The [Tables section](#) covers (among other things) the tables toolbox



- ◇ The [Plots section](#) covers (among other things) the plots toolbox



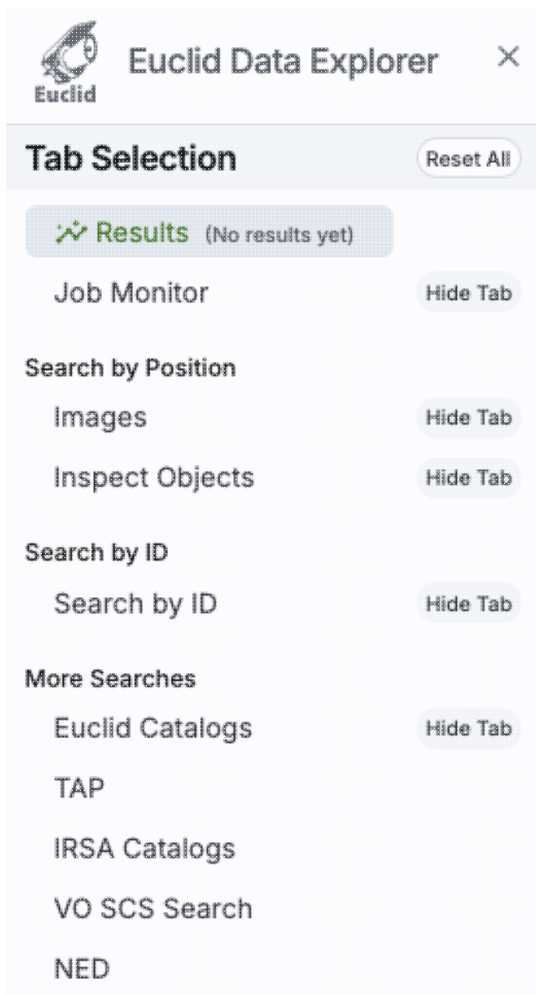
- ◇ The [Visualization section](#) covers (among other things) the images toolbox



In the Euclid Data Explorer at IRSA, you can search by position, or Tile or Object ID. [Searching is in its own section.](#)

Side Menu and Adding to the Tabs Menu

This icon  in the upper left pulls open a "drawer" from the left hand side; the top of it looks like this:



The highlighted bar ("Results" in this example) is the tab you have in the foreground on your main window.

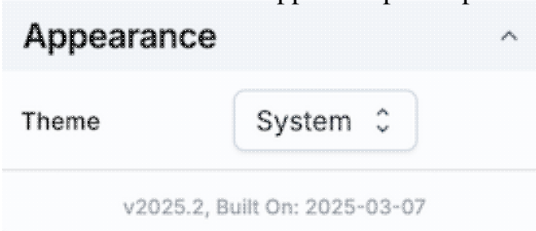
You can use this side menu to add (or remove) blue tabs from the top of your Euclid Data Explorer at IRSA interface. By default, Results, Images, Inspect Objects, Search by ID, and Euclid Catalogs are shown, along with the [Job Monitor](#).

Under "More Searches," you have access to [TAP](#) to search the worldwide Virtual Observatory (VO) for data, [IRSA catalogs](#) to search IRSA catalog holdings, VO SCS to perform a VO simple cone search, and [NED Objects](#).

Click on the "Hide Tab" button to remove that corresponding tab.

Side Menu and Appearance

This icon  in the upper left pulls open a "drawer" from the left hand side; the bottom of it looks like this:



This controls the appearance of the tool in your browser -- do you want it to run as light mode, dark mode, or respect whatever preferences you have set on your system? Try out the different modes; you may have a preference!

User Login

In the far upper right, there is a link to log in. The Euclid Data Explorer at IRSA can remember you when you return. See the [user registration section](#) for more information.

Getting More Help

The "Help" icon  leads you into this online help. There are also context-sensitive help markers throughout the tools (). You can also download a PDF version of this manual; look at the top left of the help window. (The PDF may be easier to search than the web pages; use your PDF reader's search function.)

You can submit questions to the [IRSA Help Desk](#) .

A set of frequently asked questions (FAQs) about the Euclid Data Explorer at IRSA is [here](#).

The [IRSA YouTube channel](#)  has lots of short videos about IRSA tools.

Found a bug? The known bugs and issues in this version of the Euclid Data Explorer at IRSA are listed [here](#) . If you think you have found a bug, before reporting it, please check this list, and read this online Euclid Data Explorer help. It may be a "feature" we already know about. If you have found a new, real bug, then please do contact us via the [IRSA Help Desk](#) . Please include your operating system version and your browser software and version. If you can, please also include any specific error message you may have gotten. (NB: In our testing, copying shortcuts worked on Windows and Linux; the command-C did not always work on Macs, but selecting and clicking the right mouse button often did when command-C did not.)

Euclid Data Explorer at IRSA: Searching

This section is an overview of how to search in the Euclid Data Explorer at IRSA. There are basically four different ways to search. In all cases, after entering your search parameters, click on the blue "Submit" or "Search" button to actually launch the search.

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+[Search by ID](#)

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+[Results](#)

Frequent Searching Options

Several kinds of input or options are common to more than one search option, so we summarize these items here.

Coordinates or Object Name.

You may enter a target name, and have either NED-then-Simbad or Simbad-then-NED resolve the target name into coordinates. Alternatively, you may enter coordinates directly. These coordinates can be in decimal degrees or in hh:mm:ss dd:mm:ss format, or Jhhmmss+ddmmss format. By default, it assumes you are working in J2000 coordinates; you can also specify galactic, ecliptic, or B1950 coordinates as follows:

- ◇ '46.53, -0.251 gal' means 46.53, -0.251 degrees in galactic coordinates
- ◇ '12.7, +4.3 ecl' means 12.7, +4.3 degrees in ecliptic coordinates
- ◇ '19h17m 11d58m b1950' means 19h17m 11d58m in B1950 coordinates
- ◇ a source name like 'J140320.67+542028.6' is parsed as 14h03m20.67s +54d20m28.6s.
- ◇ a source name like 'G102.0360+59.7715' is parsed as 102.0360 +59.7715 in galactic coordinates

Examples are given below the text entry box before you start typing in the box.

As you are completing a valid coordinate entry, the tool echoes back to you what it thinks you are entering. Look right below the box in which you are typing the coordinates to see it dynamically change.

Search Radius

This choice does not always appear. Enter the search radius for a cone search centered on the target you have entered. You can specify arcseconds, arcminutes, or degrees. There are both upper and lower limits to your search radius; the tool will tell you if you request something too big or too small.

Tips and Troubleshooting Pick your units from the drop-down first, and then enter a number; if you enter a number and then select from the drop-down, it will convert your number from the old units to the new units.

Polygon.

You may enter the coordinates of a series of vertices that delineate a polygon, up to 15 vertices. Each point should be in J2000 RA and Dec. Each vertex need not be separated by commas, but for clarity in specifying the vertices, you may wish to do so. Example: both "20.7 21.5, 20.5 20.5, 21.5 20.5, 21.5

21.5" and "20.7 21.5 20.5 20.5 21.5 20.5 21.5 21.5" work just as well, but one is more human-readable.

Search Type (Region Intersection).

This choice does not always appear. You can specify exactly which kind of search type (region intersection) you would like, and the subsequent options change accordingly. (NB: By default, all the searches that do not have this option as a choice include the specified target in the retrieved images.)

◇ *Image contains target* (default)

- You are requesting that the images meeting your search criteria include the target you are requesting. Note that it's possible that your target may be on the extreme edge of some returned tiles.

◇ *Image covers entire search region*

- You are requesting that the images meeting your search criteria cover the entire region you are requesting. Note that if you make the search region very large, you may be left with no images matching your criteria.

◇ *Image is entirely enclosed by the search region*

- You are requesting that the images meeting your search criteria are entirely encompassed by your search region. Note that, because Euclid images are very large, if you specify a small search region, it is very easy to have no image results matching your criteria.

◇ *Any pixel overlaps the search region*

- You are requesting any images that have any pixels that overlap your requested search region at all.

Multi-Object.

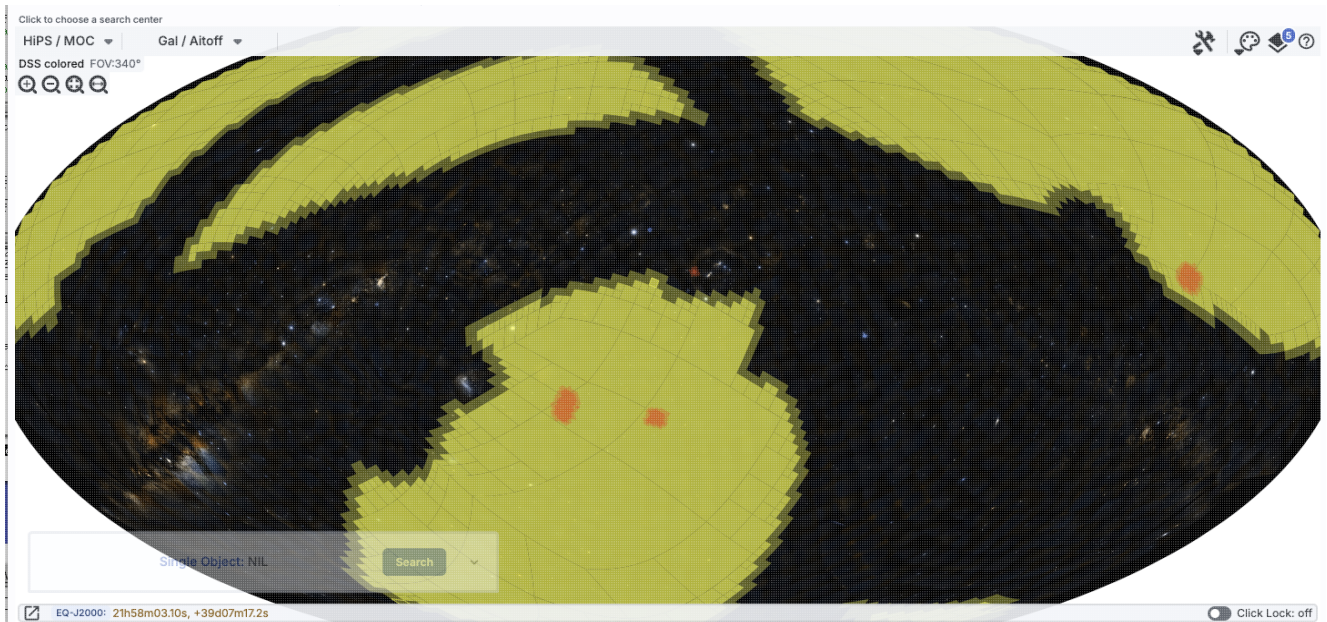
This choice does not always appear. You can submit a list of targets to search. When you select this choice, you may be able to select a table that is already loaded in the tool, you may automatically get a pop-up window asking you to upload a list of targets, or you may have to click on a button to upload a file. The [chapter on uploading](#) covers file formats and syntax. In some cases, you may need to help the tool understand the positions by specifying what the position columns are -- if there are ra/dec columns, it will likely guess those properly.

When you do a multi-object search, it asks for a search radius, and it is doing a cone search on each of your submitted targets, effectively an "any pixel overlaps search region" search. If you require the search center to lie on the image, specify radius=0.

Searching on a HiPS image.

This method appears in two of the most common searches. When you start some searches, you have a [HiPS image](#) loaded that takes up most of the browser area. Overlaid on top of the HiPS image, there are colorful regions. These colored regions represent the regions where there are data (red) or are planned (yellow) to be data (as of March 19, 2025, with multiple updates expected as the survey progresses). As you zoom in, the opacity of these regions change such that it becomes easier to see through them; once your entire field of view is entirely in a region where there are data, the overlay disappears to make it easier to place your target on top of the background. These representations are also called a [multi-order coverage map \(MOC\)](#). Because of the way these are calculated, on HEALPixes, the polygon shapes as shown may be complicated, especially near the edges of the sky coverage.

Euclid Help



You can click, pan, and zoom in the image, and even define a region for certain searches, to select a search location; many of the same visualization tools are available for this image as for any other image in this tool. ([Interacting with images](#) is covered in another chapter.) In order to get a more complete view of the sky, you can collapse or expand the target specification window in the lower left by clicking on the collapse arrow in the upper right of the box.

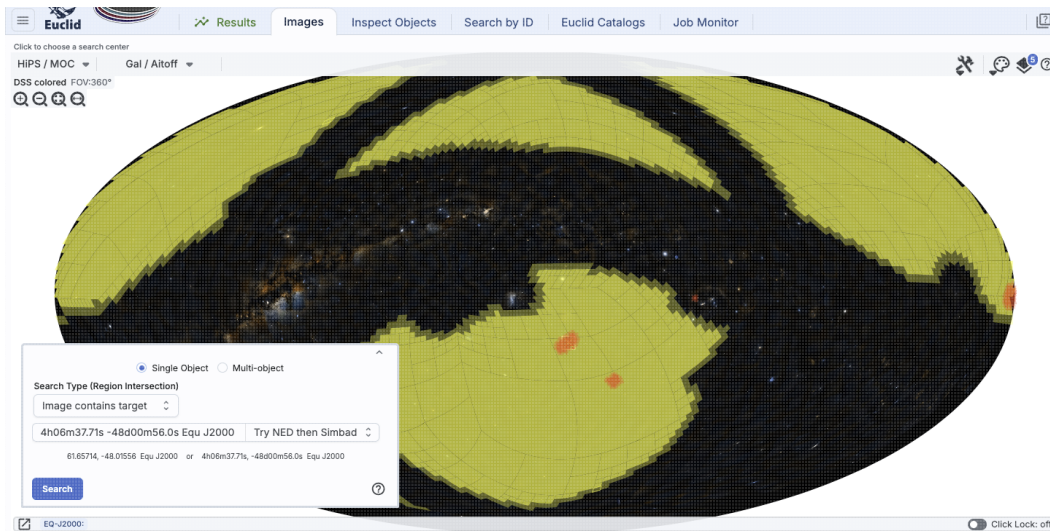
Doing it!

To launch any search, click on the blue "Search" button. All of your results will be collected in the "[Results](#)" tab.

Images

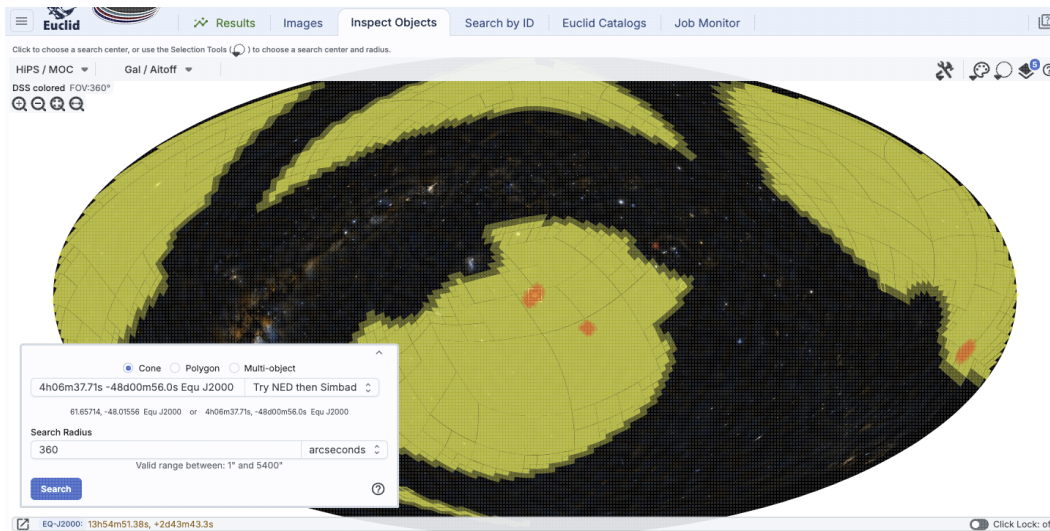
This is what an "Image" search can look like. This search retrieves images from the available data. As mentioned above, this is [searching on a HiPS image](#), the yellow is the planned coverage, and the red is the currently available coverage. As you zoom in, the opacity of these regions change such that it becomes easier to see through them; once your entire field of view is entirely in a region where there are data, the overlay disappears to make it easier to place your target on top of the background. In this case you need to specify whether you want a cone, [polygon](#), or [multiple-target](#) search, and the [relationship you want the specified target to have to the the returned images](#) (see more specifics above).

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Inspect Objects

This is what an "Inspect Objects" search can look like. This search retrieves a list of objects from the MER final catalog. As mentioned above, this is [searching on a HiPS image](#), the yellow is the planned coverage, and the red is the currently available coverage. As you zoom in, the opacity of these regions change such that it becomes easier to see through them; once your entire field of view is entirely in a region where there are data, the overlay disappears to make it easier to place your target on top of the background. In this case you need to specify whether you want a cone, [polygon](#), or [multiple-target](#) search, and, for cone searches, the [radius](#) around the specified position (see more specifics above).



Search by ID

You can search for an individual Tile ID or Object ID, or a list of IDs. At the time of writing, you can request a maximum of 20 IDs at a time, whether the list is manually input or [uploaded](#) via a file.

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The screenshot shows the 'Search by ID' tab in the Euclid Data Explorer. It features a search bar with a placeholder 'ID(s):' and a hint: 'Provide one or more Tile or Object ID(s), Example: 102018211, 102157953 or -583598757512475519, -583908801512544611'. Below the search bar are 'Search' and 'Cancel' buttons. The top navigation bar includes 'Results', 'Images', 'Inspect Objects', 'Search by ID', 'Euclid Catalogs', and 'Job Monitor'.

Euclid Catalogs

You can also use this interface to search all of the Euclid catalogs. This interface is identical to a [TAP search](#), just one that is limited to a search of Euclid tables, so head over to [that section](#) to read more about it.

The screenshot shows the 'Euclid Catalogs' tab. It displays a search for 'euclid' with a dropdown showing 'Tables: euclid_q1_mer_catalogue (rows: 29953430) Euclid Q1 MER Catalog'. Below this, the 'Enter Constraints' section is active, showing 'Spatial' constraints with a radius of 10 arcseconds. The 'Output Column Selection and Constraints' table is visible, showing columns like 'object_id', 'ra', 'dec', and various flux and aperture measurements. The table has 36 of 476 columns selected. At the bottom, there are 'Search', 'Row Limit: 50000', 'Title: euclid_q1_mer_catalog...', and 'Populate and edit ADQL' buttons.

Name char	constraints char	unit char	ucd char	descriptive char
☒ object_id		NA		Euclid unique source id
☒ ra		deg	pos.eq.ra;meta.main	Source barycenter RA
☒ dec		deg	pos.eq.dec;meta.main	Source barycenter DEC
☐ right_ascension_pos		deg		Source RA coordinate
☐ declination_pos_fit		deg		Source DEC coordinate
☐ segmentation_map		NA		Source ID in the association
☐ vis_det		NA		Flag to indicate if the source is detected
☐ flux_vis_1fwhm_ap		uJy		VIS band source aperture
☐ flux_vis_2fwhm_ap		uJy		VIS band source aperture
☐ flux_vis_3fwhm_ap		uJy		VIS band source aperture
☐ flux_vis_4fwhm_ap		uJy		VIS band source aperture
☐ flux_y_1fwhm_aper		uJy		NIR Y band source aperture
☐ flux_y_2fwhm_aper		uJy		NIR Y band source aperture
☐ flux_y_3fwhm_aper		uJy		NIR Y band source aperture
☐ flux_y_4fwhm_aper		uJy		NIR Y band source aperture
☐ flux_j_1fwhm_aper		uJy		NIR J band source aperture

Results

Results are described in detail in [another section](#).

The [Visualization section](#) has much more information about interacting with images.

The [Tables section](#) has much more information about interacting with tables in general. The [Catalogs section](#) has much more information about searching for IRSA catalogs. You can do [many other searches as well](#).

When you load a table, you get an x-y plot displayed as well. See the [Plots section](#) for lots more information.

Euclid Data Explorer at IRSA: Upload

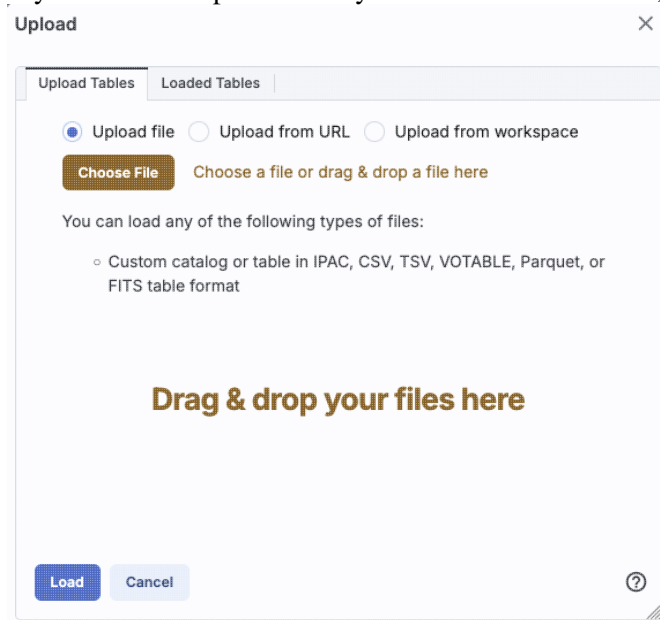
You can upload tables to Euclid Data Explorer in several different contexts. This chapter consolidates all of that information into one place, even though it appears in the application in several entirely different places.

Contents of page/chapter:

- +[Introduction](#)
- +[File Location](#)
- +[Catalogs](#)

Introduction

If you click on "upload" in any of a number of contexts, you'll get something like this:



From here, you can upload new files ("Upload Tables") or work with one of the tables that are already loaded into the tool ("Loaded Tables"). The [tables](#) that are already loaded can be lists of images or lists of sources.

File Location

The file that you are uploading can come from your own disk, the web (type or paste in the URL), or from the [IRSA Workspace](#) . (Note that you need to be [logged in](#) to use the Workspace.)

Catalogs

You may upload a file from disk (you can use the system browser to identify the file, or drag-and-drop them into this window), from the web via a URL, or from the [IRSA Workspace](#) .

The file can be in any of a number of formats, which we now briefly describe.

IPAC table format (*.tbl)

[IPAC table format](#)  is plain text with a particular formatting. IRSA has a [table reformatting and validation service](#)  which may be helpful, or you can download just about any catalog you find through IRSA, and mimic that format.

If you want it recognized as a catalog, your table file **MUST** have RA and Dec values, and unless it is specified, it assumes J2000. (See also "[tips and troubleshooting](#)", below.)

If you are uploading a catalog specifically for overlaying on an image, you can add a "SYMBOL" parameter to change the shape (X, SQUARE, CROSS, EMP_CROSS, DIAMOND, DOT) of catalog marks, e.g.:

```
\SYMBOL = X
```

You can add a "DEFAULT_COLOR" parameter to assign a CSS color name or a HEX value to catalog marks, e.g., either of these two:

```
\DEFAULT_COLOR = lightcyan
\DEFAULT_COLOR = #00FF00
```

You can find the [CSS color code or the CSS color HEX values](#)  online.

Comma-separated values (CSV) format (*.csv)

CSV format is often accepted by spreadsheet programs, and most spreadsheet programs can output CSV. It is plain text, with values for each column separated by commas.

Tab-separated values (TSV) format (*.tsv)

TSV format is sometimes accepted (or generated) by spreadsheet programs, and sometimes in tabular data downloaded from journal articles from the 90s. It is plain text, with values for each column separated by tab characters.

VOTable (*.vot)

Virtual Observatory (VO) tables are a special case of XML tables. (All VO Tables are XML but not all XML are VO Tables.) It is a format developed by the International Virtual Observatory Alliance (more information [here](#) ). XML tables initially look to the human eye like it might be HTML, but they are easier to parse with code. There are packages in *astropy* that handle VO Tables.

Parquet (*.parquet)

[Parquet file format](#)  is a highly efficient, compressed, column-oriented format for tabular data that has been adopted by many recent wide area survey projects. It can enable faster searching for large tables. There are packages in *astropy* that handle parquet files.

FITS files (*.fits)

FITS tables can be loaded into this tool. Note that this tool is flexible enough to handle multiple header data units (HDUs), so that you can upload a FITS file that has both images and tables. You can specify which HDU you would like to load, although note that this tool only accepts catalogs in this fashion.

Tips and Troubleshooting: If you have multiple HDUs in a FITS file, you can load a catalog plane; it will ignore any image planes you try to load in this context.

Nearly every file you load will result in a preview of the file you have uploaded. Here are some example previews of catalog uploads:

Uploading a CSV file:

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☒ Upload file
 ☐ Upload from URL
 ☐ Upload from workspace

Replace File **ngc1333bigcatalog.csv** or drag & drop another file

Table: CSVFormat (68 cols x 6882 rows)

Format: CSV Size: 3.7M ngc1333bigcatalog.csv

No other detail about this file

name	type	unit	desc
Name	null		
ra	null		
dec	null		
lJ	null		
Jmag	null		
Jmerr	null		
IH	null		
Hmag	null		
Hmerr	null		
IK	null		
Kmag	null		
Kmerr	null		
I1	null		
i1mag	null		
i1merr	null		
I2	null		
i2mag	null		
i2merr	null		
I3	null		
i3mag	null		
i3merr	null		
I4	null		
i4mag	null		
i4merr	null		
Im1	null		
m1mag	null		
m1merr	null		
m2mag	null		
m2merr	null		
SpTy	null		
r_SpTy	null		
Teff	null		
alpha1	null		

Uploading an IPAC table file:

☒ Upload file
 ☐ Upload from URL
 ☐ Upload from workspace

Replace File **wilkingcatalog.tbl** or drag & drop another file

Table: IPAC Table (28 cols x 320 rows)

Format: IPACTABLE Size: 159K wilkingcatalog.tbl

No other detail about this file

Table Meta			
name	type	unit	desc
ra	doubl		
dec	doubl		
JMAG	doubl		
JMERR	doubl		
HMAG	doubl		
HMERR	doubl		
KMAG	doubl		
KMERR	doubl		
TMQUAL	char		
SR49_NUM	char		
WSB87_NUM	char		
VSSG75_NUM	char		
GY92_NUM	char		
WMR05_NUM	char		
ISO_NUM	char		
ALLEN_NUM	char		
OTHER_NUM	char		
XRAY1_NUM	char		
XRAY2_NUM	char		
SPTYOPT	char		
SPTYOPTSRC	char		
SPTYIR	char		
SPTYIRSRC	char		
MEMBNOTES	char		
BINFLAG	char		
BINSRC	char		
EMBEDDED	int		
BD	int		

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Uploading an xml file:

☒ Upload file ☐ Upload from URL ☐ Upload from workspace

Replace File

multiTables_Ned.xml

 or drag & drop another file

Clear File

Format: VO_TABLE Size: 9.5M multiTables_Ned.xml Parts: 826

☐	Index	Type	Description
☒	0	Table	Main Information Table for NED objects within 1.000 arcmin of obje
☐	1	Table	Table of all names in NED for MESSIER 031 (2 cols x 49 rows)
☐	2	Table	Table of Position Data in NED for MESSIER 031 (35 cols x 1 rows)
☐	3	Table	Table of Derived Values in NED for MESSIER 031 (91 cols x 1 rows)
☐	4	Table	Table of Basic Data in NED for MESSIER 031 (30 cols x 1 rows)
☐	5	Table	Table of External Links for the MESSIER 031 (3 cols x 23 rows)
☐	6	Table	Table of all names in NED for MESSIER 031* (2 cols x 1 rows)
☐	7	Table	Table of Position Data in NED for MESSIER 031* (35 cols x 1 rows)
☐	8	Table	Table of Derived Values in NED for MESSIER 031* (91 cols x 1 rows)
☐	9	Table	Table of Basic Data in NED for MESSIER 031* (30 cols x 1 rows)
☐	10	Table	Table of External Links for the MESSIER 031* (3 cols x 12 rows)
☐	11	Table	Table of all names in NED for SSTSL2 J004244.42+411608.3 (2 col
☐	12	Table	Table of Position Data in NED for SSTSL2 J004244.42+411608.3 (3
☐	13	Table	Table of Derived Values in NED for SSTSL2 J004244.42+411608.3
☐	14	Table	Table of Basic Data in NED for SSTSL2 J004244.42+411608.3 (30
☐	15	Table	Table of External Links for the SSTSL2 J004244.42+411608.3 (3 co
☐	16	Table	Table of all names in NED for MESSIER 031 N2004-09b (2 cols x 7
☐	17	Table	Table of Position Data in NED for MESSIER 031 N2004-09b (35 col
☐	18	Table	Table of Derived Values in NED for MESSIER 031 N2004-09b (91 co
☐	19	Table	Table of Basic Data in NED for MESSIER 031 N2004-09b (30 cols x
☐	20	Table	Table of External Links for the MESSIER 031 N2004-09b (3 cols x 1
☐	21	Table	Table of all names in NED for CXO J004244.3+411607 (2 cols x 1 rc
☐	22	Table	Table of Position Data in NED for CXO J004244.3+411607 (35 cols
☐	23	Table	Table of Derived Values in NED for CXO J004244.3+411607 (91 col
☐	24	Table	Table of Basic Data in NED for CXO J004244.3+411607 (30 cols x 1
☐	25	Table	Table of External Links for the CXO J004244.3+411607 (3 cols x 12
☐	26	Table	Table of all names in NED for CXO J004244.4+411607 (2 cols x 1 rc

☐ Attempt to interpret tables as spectra

Load Table

Table Meta

Table Params

name	type	unit	
No.	int		A sequential object number
Object Name	char		NED preferred name for the
RA(deg)	double	degrees	Right Ascension in degrees
DEC(deg)	double	degrees	Declination in degrees (Equ
Type	char		NED's Preferred Object Type
Velocity	double	km/sec	Velocity in km/sec, based o
Redshift	double		Heliocentric redshift for the
Redshift Flag	char		Quality flag for known helio
Magnitude and Filter	char		NED's Basic Data magnitud
Distance (arcmin)	double	arcmin	Distance of the source from
References	int		Number of literature referer
Notes	int		Number of catalog notes in l
Photometry Points	int		Number of photometric dat
Positions	int		Number of position data po
Redshift Points	int		Number of redshift data po
Diameter Points	int		Number of diameter data p
Associations	int		Number of NED association

The [tables](#) are then shown and, if [catalogs](#), interacted with in the same way as the other catalogs described here.

Tips and Troubleshooting

- If you would like to have your catalog overlaid on an image, it needs to have RA and Dec columns. If the tool doesn't seem to recognize your RA and Dec columns, check your formatting, or try headers of "ra" instead of "RA" and "dec" instead of "DEC" or "Dec". Make sure those columns are being interpreted as numbers. If you have columns like "_RA2000" and "_DE2000", or it thinks those columns are strings (which it might, if there are NaN or null entries), it's going to be confused.
- Unless specified, the tool assumes any coordinates you give it are J2000.
- If there are no discernible positions in the uploaded file, it will still let you plot columns from the file after you've loaded it; it just can't overlay things on images in that case.
- This interface looks a lot like the file upload window that is available in other tools such as [IRSA Viewer](#) , but if you try to upload things that aren't catalogs here, it will give you an error.

Euclid Data Explorer at IRSA: Search Results

All of the search results for a Euclid search appear in a blue "Results" tab. Results of a search in the Euclid Data Explorer at IRSA appear in two different window panes, each of which could have several individual tabs.

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- +[Terminology](#)
 - +[General Layout Information](#)
 - +[Image Results](#)
 - +[Inspect Object Results](#)
 - +[Multi-Object Results](#) (multiple targets)
 - +[ID Results](#)
 - +[Euclid Catalog Results](#)
 - +[Putting It All Together](#)
 - +[Downloading Data](#)
-

Terminology

Panes

The search results appear in two "panes" (like "window panes"). You can grab and drag the division between the two panes to change their relative sizes. The left is usually tables of search results and the right is usually images (or lists of images, or stuff about images, or plots).

Image tiles

The Euclid sky is broken up into [tiles](#), and each tile (especially the extragalactic ones) may have additional ground-based data accompanying the space-based data. The tool can automatically pull all of this associated data.

Tips and Troubleshooting

- Note that each new [search](#) ADDS TO the results in the results tab -- that is, a second search doesn't *replace* things in the results tab; it *adds to* the contents of the results tab. This is different than some other IRSA tools.
 - The Euclid tiles are *big*. It's pretty easy to wander far away from your initial search position -- see more below.
 - Spectra are now available in this tool -- they come along with an "Inspect Objects" search!
-

General Layout Information

The left pane of the search results contains lists of observations that met your criteria. The right pane of the search results contains more details of the observations (sometimes actual data). The right pane changes depending on what row you have selected (clicked on) in the left pane.

Left pane

In general, the left pane has one tab for each of the [searches](#) you have executed -- images, objects, catalogs, etc.

Euclid Help

Each table behaves in the same way that tables throughout IRSA tools with this look and feel. See the [Tables](#) section for more details, but in summary you can change the width of the columns, sort by columns, filter by column values, hide columns, create columns, etc.

The corresponding data can be downloaded by checking the box at the start of each row (or the box at the top of the column of boxes to select all) and clicking "Generate Download Script". (See the section on [downloads](#) for more information.)

Right pane

The right pane of the search results contains four tabs that enable exploration of the data returned by your search. Click on a row in the left pane and the contents of the right pane change.

Cutouts tab

The "Cutouts" tab displays cutouts from the FITS file corresponding to the row you have selected on the left, centered on the position given on the row on the left. You can interact with this FITS file using the [visualization tools](#), and you can change the size of the cutouts by selecting the cutout icon in the upper left of the window (see [here](#) in the visualization tools chapter).

Spectra tab

The "Spectra" tab shows any available spectra corresponding to the row selected on the left; not every source has a spectrum, and not every spectrum is high quality. If you select a different row in the table, a different spectrum is shown. See the [spectra section](#).

Coverage tab

The "Coverage" tab shows footprints of all the returned observations, with retrieved catalogs overlaid. The currently selected observation or catalog row is highlighted a different color than the ensemble of observations. If you select a different row in the table, a different polygon is highlighted in the image, and vice versa. Because this is likely a large region of sky, the coverage image is a HiPS image; see the [visualization section](#).

Details

The "Details" tab is a table of metadata about the corresponding row you have selected in the table on the left hand side. It behaves like [any other table](#).

Active Chart tab

The "Active Chart" tab plots values from the table in the foreground on the left. By default, it grabs what it thinks is the best possible position to represent the data it has retrieved, which is most often RA and Dec. If there is only one row in the table on the left, this plot is very boring. You can change what is plotted, please see the [plots section](#).

About Images

Interacting with images is covered in the [visualization section](#); there are many sophisticated capabilities available.

About Tables

Interacting with images is covered in the [tables section](#). You can manipulate columns and create new columns.

About Plots (or Charts)

Interacting with plots (sometimes called charts) is covered in the [plots section](#). You can make some sophisticated plots.

About Spectra

Interacting with spectra is covered in the [spectra section](#). You have different options when interacting with plotted spectra than you do with generic plots, and you can also interact with spectra in table form.

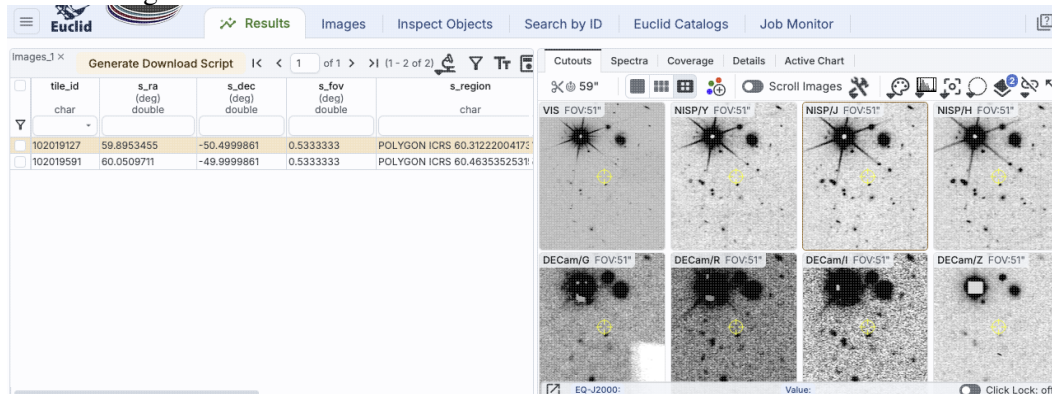
About Catalogs

If you load a [catalog](#) into the tool, you will create a table and a plot and overlay the catalog on the images. If it is a large catalog, which Euclid catalogs often are, the catalog will be shown as hierarchical

cells; [see here](#) for more information.

Image Results

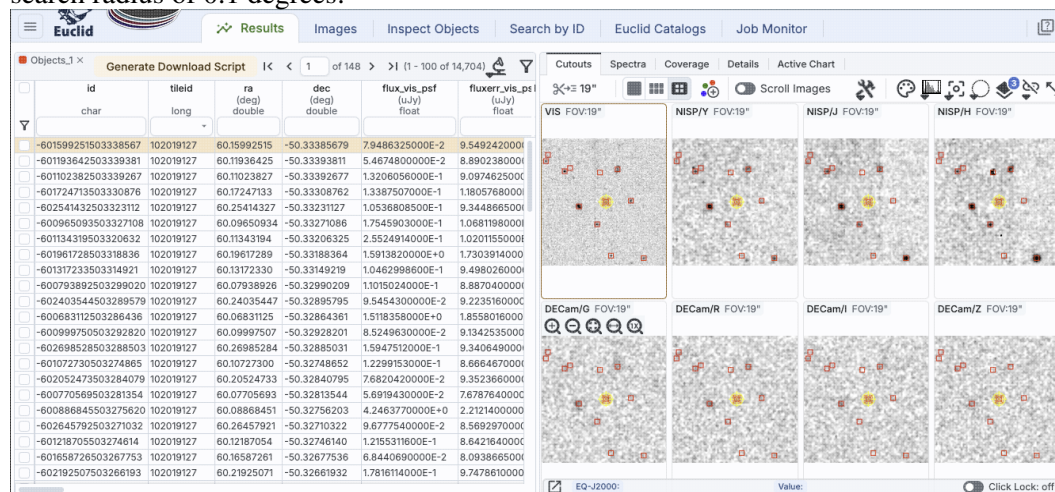
Here is an example of an Images search; I searched on 4h00m41.68s, -50d15m23.4s, and I asked for "image contains target":



On the left is a list of the tiles that met my criteria -- two tiles overlap my requested position. On the right, the 'Cutouts' tab is in the foreground, with sections of sky from each of 8 bands -- the top row is space-based (from Euclid itself) and the bottom row is ground-based (from the Euclid project), and in this case, they are all from DECam. To learn more about how to interact with these images (including changing the size of the cutouts), see the [visualization section](#). (The 'Spectra' tab is exceptionally boring because there are no spectra returned.) The 'Coverage' tab gives me an idea of where my results fit within the tile and on the sky. The 'Details' tab is another view of the table row on the left, and the 'Active Chart' tab is a plot of the data shown on the left - in this particular case, it is boring, because there is only one row on the left.

Inspect Object Results

Here is an example of an Inspect Object search; I searched on 270.28127434 67.42604673, and I asked for a search radius of 0.1 degrees:

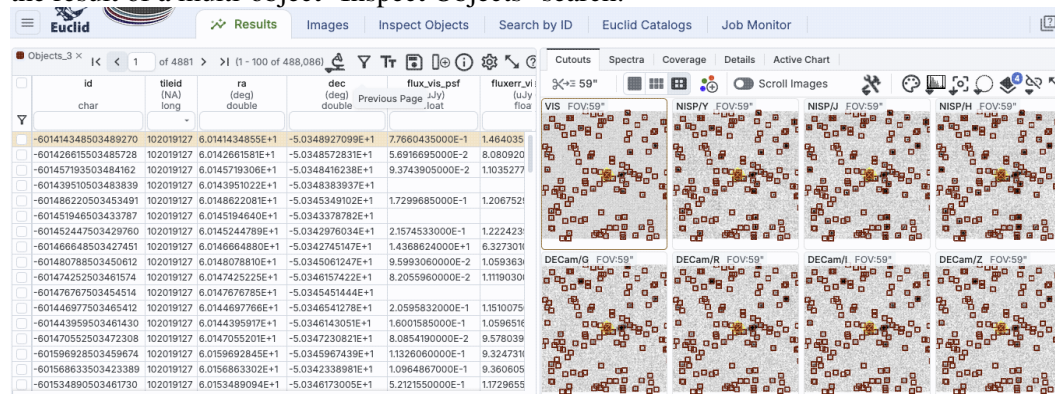


On the left is a list of the sources from the Euclid MER catalog that met my criteria -- 14,000+ sources. On the right, the 'Cutouts' tab is in the foreground, with sections of sky from each of 8 bands -- the top row is

space-based (from Euclid itself) and the bottom row is ground-based (from the Euclid project), and in this case, they are all from DECam. The MER catalog in the left pane is overlaid on the cutouts. To learn more about how to interact with these images (including changing the size of the cutouts), see the [visualization section](#). The **'Spectra'** tab shows any spectra corresponding to the row selected on the left. The **'Coverage'** tab gives me an idea of where my results fit within the tile and on the sky. The **'Details'** tab is another view of the table row on the left, and the **'Active Chart'** tab is a plot of the data shown on the left - by default, it gives me a plot of ra/dec, but [there are a lot more plotting options](#).

Multi-Object Results

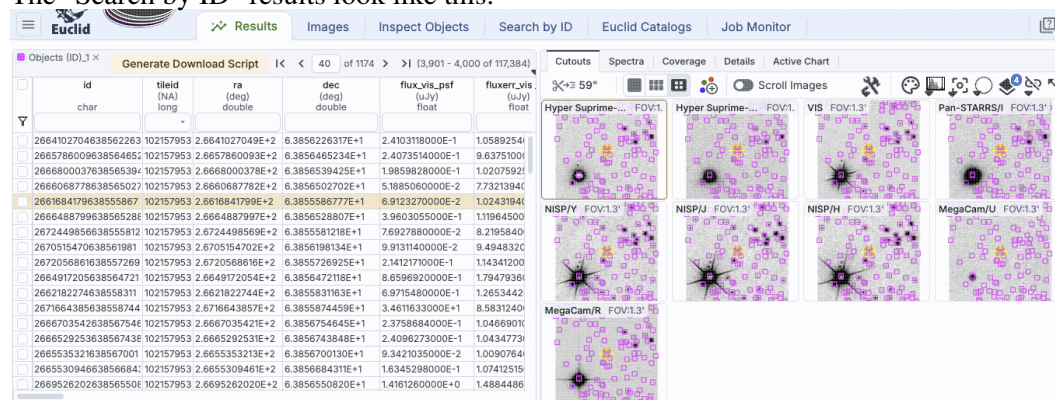
Both the "Images" and "Inspect Objects" searches can also take as input a list of targets that you [upload](#). This is the result of a multi-object "Inspect Objects" search:



The results are essentially identical to the single-target search.

ID Results

The "Search by ID" results look like this:

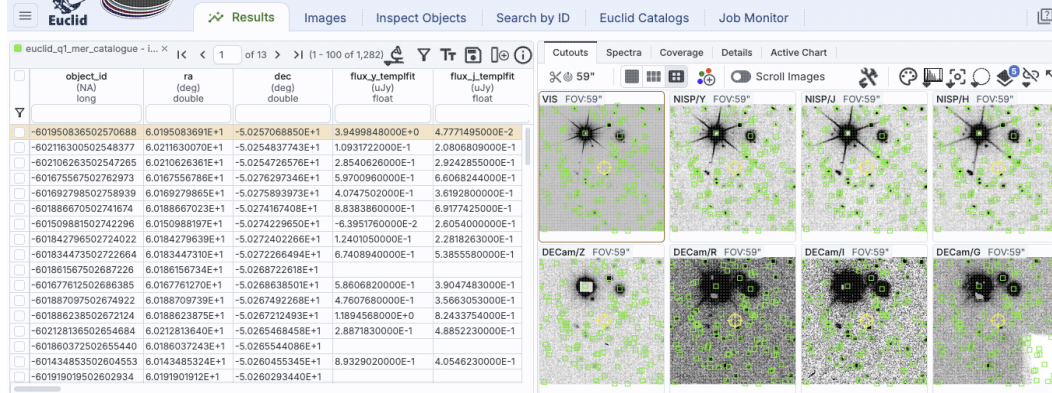


The results are essentially identical to the single-target searches -- here, I searched on a tile ID, and requested objects results, so it returned all of the sources ("objects") in that tile. You can pick whether you want Images results or Inspect Objects results, and then your results look just like those kinds of searches.

Tips and Troubleshooting: It is smart enough to guess whether you have entered a tile id (which look like 102018211, 102157953) or an object id (which look like -583598757512475519, -583908801512544611).

Euclid Catalog Results

This is the result of a "Euclid Catalog" search; I searched on 4h00m41.76s -50d15m23.4s, and I asked for a search radius of 100 arcsec:

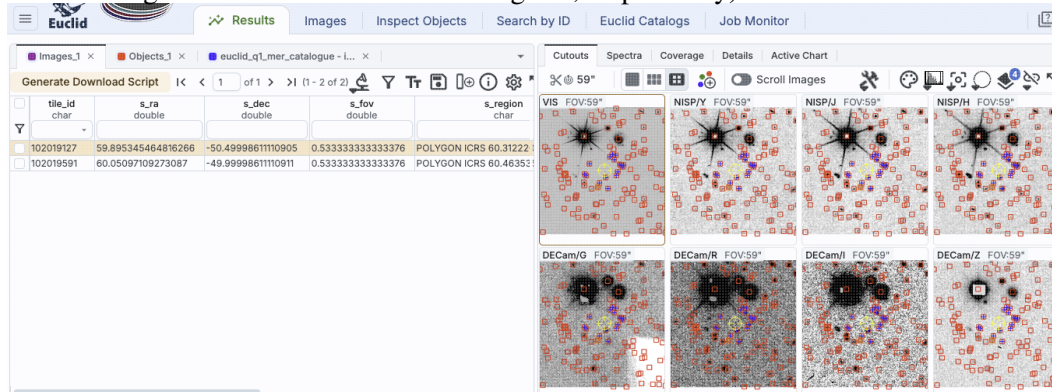


It looks very similar to the other results!

Putting It All Together

This section might also be called **Tips and Troubleshooting** because it includes a common apparent hiccup!

This is the result of doing an Images, Inspect Objects, and Euclid Catalogs search at the same time. For Images and Inspect Objects, I did the same searches as above (searching on 4h03m29.94s -47d33m40.8s for "image contains target" and with a radius of 0.1 degrees, respectively).

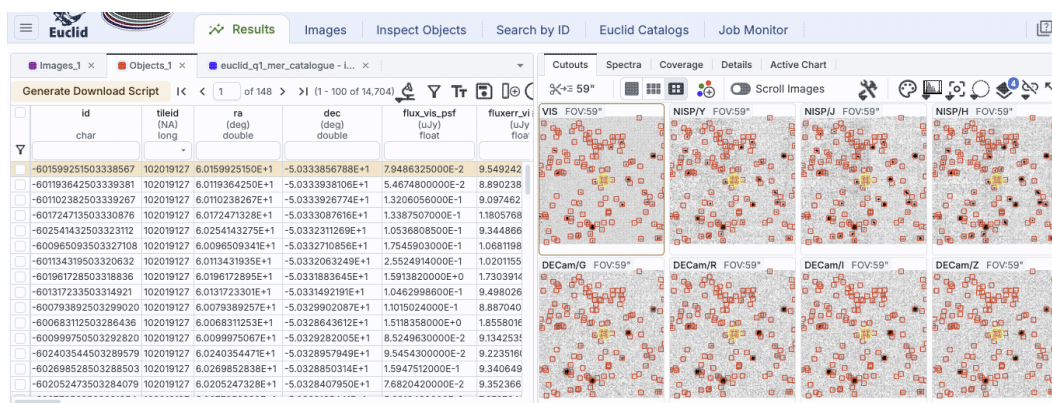


Let's explore these results a bit, because the tool is doing what it should be doing, but it can be confusing.

In the screenshot above, the Images results tab is in the foreground on the left, and so the cutouts on the right are centered on the position on which I searched, 4h03m29.94s -47d33m40.8s, which is the yellow reticle. The red boxes are the objects that were returned by the Inspect Objects search. The blue crosses are the sources returned by the Euclid Catalogs search -- I also asked for that to be centered on 4h03m29.94s -47d33m40.8s. Note that the cutouts are 59 arcseconds here (see the notation in the upper left of the cutouts tab).

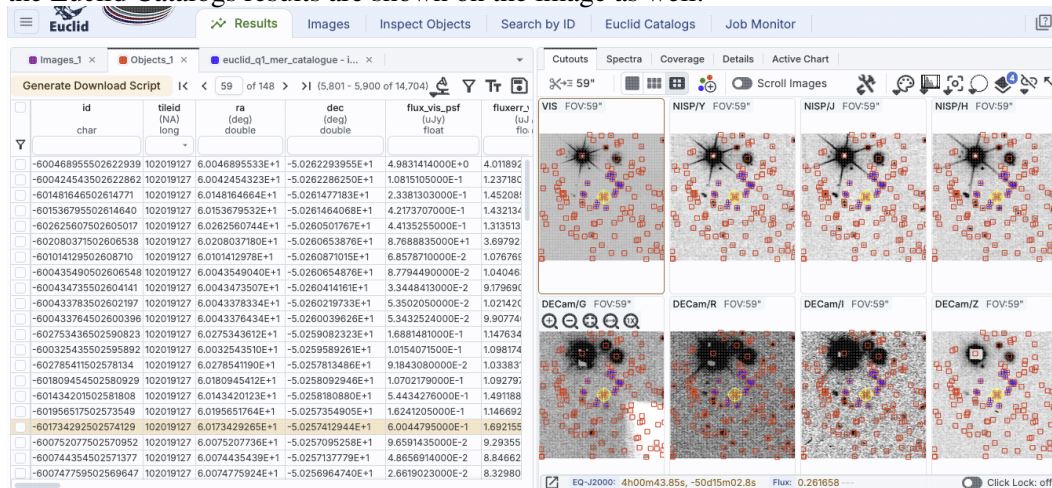
When I change to the objects tab on the left, at first it looks like not a lot has changed:

Euclid Help



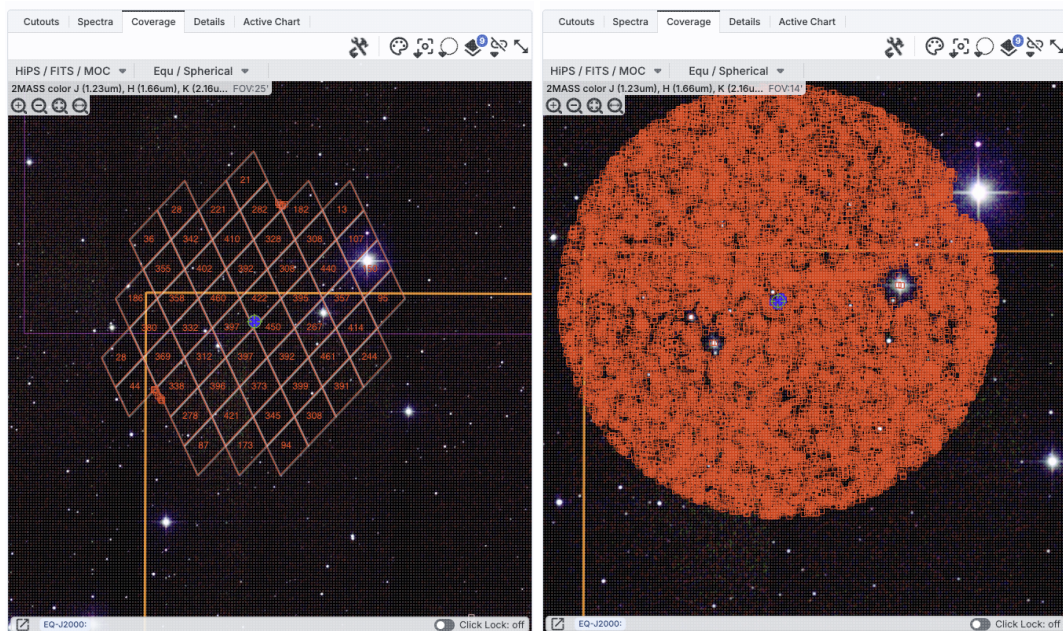
Tips and Troubleshooting ... But closer inspection seems initially confusing -- the blue crosses are entirely gone! What has happened is that the cutouts have completely changed -- look at the icons in between the scissors and the "59 arcseconds" in the upper left of the images. When the "Inspect Objects" results are in the foreground, the cutouts are now centered on the row that is selected on the left, which is the first row from the retrieved catalog. The tool is behaving as designed -- if I change the highlighted row on the left, the cutouts change on the right. The catalog I requested from the "Inspect Objects" search is far larger than the cutout size, and also far larger than the search radius I used for the "Euclid Catalogs" search, so the cutout tile that is shown for the first row of the Objects results is nowhere near the center of the requested tile or the sources from the Euclid Catalogs search.

To make the catalogs appear in the same place, go back to the Images results tab, click near the center of the cutouts image to select the objects near the center, then return to the Objects results tab. Now the corresponding object row is highlighted in the Objects results tab, and the corresponding cutouts are shown on the right, and the Euclid Catalogs results are shown on the image as well.



To resolve this apparent confusion, I could have also greatly enlarged the size of the cutouts; see the [visualization section on cutouts](#). Alternatively, if I go to the coverage image, I also see how far away I am with the first object in the Objects_1 tab and the blue Euclid catalog overlay -- you can also see the two large polygons that are the two Euclid tiles. On the left, the zoom is such that the larger Objects_1 catalog is still shown as a [hierarchical catalog](#), and on the right is zoomed a bit closer such that the entire catalog is shown. In both cases, the first source in the Objects_1 catalog is the orange square (particularly hard to see on the right although it is really there), and the Euclid Catalog query is the small blue clump. It's immediately obvious how much more space the red Objects_1 catalog covers in comparison to the blue Euclid Catalog query, and therefore why a small cutout centered on any given source from Objects_1 might not necessarily show the same part of the sky where the blue Euclid Catalog query overlaps.

Euclid Help



Downloading Data

Downloading is covered in [separate section](#).

Euclid Data Explorer at IRSA: Visualization

In your search [results](#), if you performed a search that resulted in cutout images, those images meeting your search criteria are shown on the right. Clicking on different rows on the left changes what is shown on the right. The colored circle-with-crosshairs (a reticle) that is overlaid by default on your images is the center position for the cutout, which could be the position you searched on, or it could be the object's position that you've selected on the left. The coverage image puts all of your search results in context with each other. You can add and overlay catalogs and add other layers to your image. (See [the catalogs section](#) for more on catalogs.) The Euclid images as shown are [FITS \(Flexible image transport system\)](#)  and the images used for the coverage image [HiPS \(hierarchical progressive surveys\)](#)  format.

All of the interactive image visualization tools work the same basic way, and here we describe these basic options, in roughly the order in which you might encounter them in the window.

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- +[Image Information](#)
- +[Breaking Out of the Pane \(and Going Back\)](#)
- +[FITS Image Navigation in the Cutouts Tab](#)
- +[Image Toolbar](#)
- +[Color Stretches](#)
- +[Image Layers: Viewing/Changing the Layers on the Image](#)
- +[World Coordinate System \(WCS\) Alignment](#)
- +[Extraction Tools](#)
- +[Region Selection](#)
- +[Footprints](#)
- +[HiPS Images: General Information](#)
- +[Coverage Image](#)
- +[Upper Left HiPS menus](#)

FITS/HiPS Image Viewer

You can interactively explore both FITS and HiPS images with the mouse. Move your mouse over any image that is loaded into the viewer. Details about the image, specifically, the pixel beneath your mouse cursor, appear along the bottom left of the image window. Some information is updated in real time (coordinates); some information (pixel value) is updated when you stop moving your mouse for a second or two. The image can be interactively investigated in this fashion.



 EQ-J2000: 14h03m13.92s, +54d20m44.9s Flux: 1.115584 MJy/sr

You can change the units of what is being read out, in terms of coordinates or pixel values.

Choose readout coordinates ✕

Readout Options: ☒ Equatorial J2000 HMS
☐ Equatorial J2000 Decimal
☐ Equatorial B1950 HMS
☐ Equatorial B1950 Decimal
☐ Galactic
☐ Super Galactic
☐ Ecliptic J2000
☐ Ecliptic B1950
☐ FITS Image Pixel
☐ Zero based Image Pixel

Copy Options: ☒ Readout values verbatim
☐ [Python] AstroPy SkyCoord

Close ?

If you click on the label of the coordinates, "EQ-J2000" in the screenshot example above, you get this pop-up, from which you can choose the coordinates from among:

- Equatorial (RA/Dec) J2000 in hh:mm:ss ddd:mm:ss format
- Equatorial (RA/Dec) J2000 in decimal degrees
- Galactic in decimal degrees
- Equatorial B1950
- Ecliptic J2000
- Ecliptic B1950
- FITS Image Pixel
- Zero-based Image Pixel

If you click on the "click lock" toggle, the coordinates stop dynamically updating when you move your mouse, and they update only when you click on the image. When you do that, little clip boards appear next to each coordinate readout; clicking on those copy the position to your clipboard. From this pop-up window here as shown, you can control the format of the coordinates that are copied to your clipboard -- they can be as shown in the readout, or in the format that Python is expecting (for easy pasting into code).

Choose pixel readout radix ✕

Integer data readout radix: ☒ Decimal
☐ Hexadecimal

Floating Point data readout radix: ☒ Decimal
☐ Hexadecimal

Choosing hexadecimal display will suppress all application of rescaling corrections (i.e. BZERO and BSCALE).

Hexadecimal will show the raw number in the file.

Close ?

If you have a FITS image loaded, you have an additional readout. Click on the label of the readout, "Flux" in the tiny snippet of a screenshot example above, and you get this pop-up, from which you can choose the pixel readout from among:

- Integer data readout in decimal
- Integer data readout in hexadecimal
- Floating point data readout in decimal
- Floating point data readout in hexadecimal

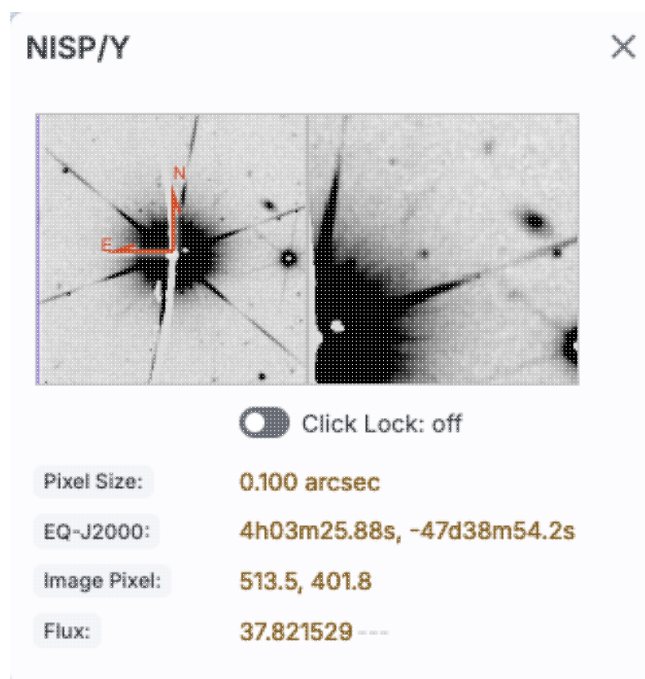
If you choose the hexadecimal options, it will suppress all rescaling

corrections found in the header, like BZERO or BSCALE. It will just show you the raw binary number in the file. (For example, if the value in decimals is 5.13795757, the binary value in the file is 0x40a46a26; [here](#) is a conversion tool between decimal and hex.)

In the lower left of the images, if you click on this:



, you get this pop-up. If you have a FITS image loaded, at the top of this pop-up, it shows the whole image; the orientation of the image is given with a compass rose. There is also a zoom-in of the image at the location under your cursor. Underneath that in the pop-up, whether you have a FITS or HiPS image loaded, you can get a readout of the pixel size, a readout of location on the image in two different coordinate systems, and a readout of the pixel value. You can change the units of those values by clicking on the name of the field: "Pixel Size", "EQ-J2000", "Image Pixel", and "Value". Each results in a pop-up, as above.



You can make the cursor 'stick' on a particular place on the image -- flip the "Click Lock: off" switch to "on" (either in the pop-up or in the lower right of the image window), and then click on the image at your desired location. When this is clicked, small "clipboards" appear near the position readout. Click on that icon to copy that position to your clipboard.

EQ-J2000: 14h03m12.63s, +54d20m59.6s Flux: 4.655877 MJy/sr

Image Information

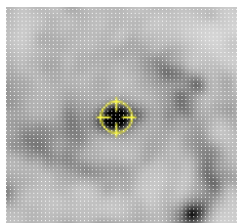
The upper left corner of the loaded image has a label that tells you basic things about the image you are viewing. The telescope and/or instrument and/or channel and/or data release is first, in black. The field of view follows, in a paler font; this corresponds to the (horizontal) width of the image window. The currently selected image is outlined in brown; other images are outlined in grey.

NISP/Y FOV:5.9' VIS FOV:59' Here are two examples of image labels. The former is a NISP/Y image, and the field of view shown in the tool at the time this screenshot was taken is 5.9 arcmin. The latter is a VIS image, and the field of view is 59 arcsec.

Euclid Help

For HiPS images, the FOV is the angular size of the width of the HiPS viewer. Even if the image as displayed is smaller than the window, the FOV readout is the width of the window, not the image. If you shrink your browser screen, the FOV can get smaller because the viewer gets smaller. If you load more than one image, the FOV can get smaller because two viewers must fit in the same pane. As a result, the HiPS FOV requested in the search panel is approximate.

For FITS images, the FOV label on FITS images works analogously to the FOV label on HiPS images. If you zoom out, the FOV will increase even when the FITS image is entirely within the viewer. That's because the FOV is what the viewer can show you based on the pixel size. If you drag the image so that it is only partially seen through the viewer, the FOV will not change. For FITS images, the cutout size is not the same as the FOV.



The target on which you searched is overlaid on the main image with a cross-hair marker, sometimes called a "reticle." You can remove this (or change its color) from the layers pop-up, described below.

Breaking Out of the Pane (and Going Back)

Panes: The search results screen is broken up into panes - the left is a list of items (images or sources for loaded catalogs), and the right is images. If you have more than one image loaded in, the image pane is further subdivided.

Make it big! For some purposes, it is useful to individually view just the table, or the images, or the plots, as large as possible. In any pane, this icon  appears in the upper right of the pane. Clicking on it will expand the pane into a larger window, as big as possible given your browser size.

Go back the way it was:  The large "Close" arrow at the upper left is always available in the expanded views, and enables you to return back to the pane view.

Also see the next section on image navigation. You have different image navigation options when you are in expanded view (as compared with the default view in a pane).

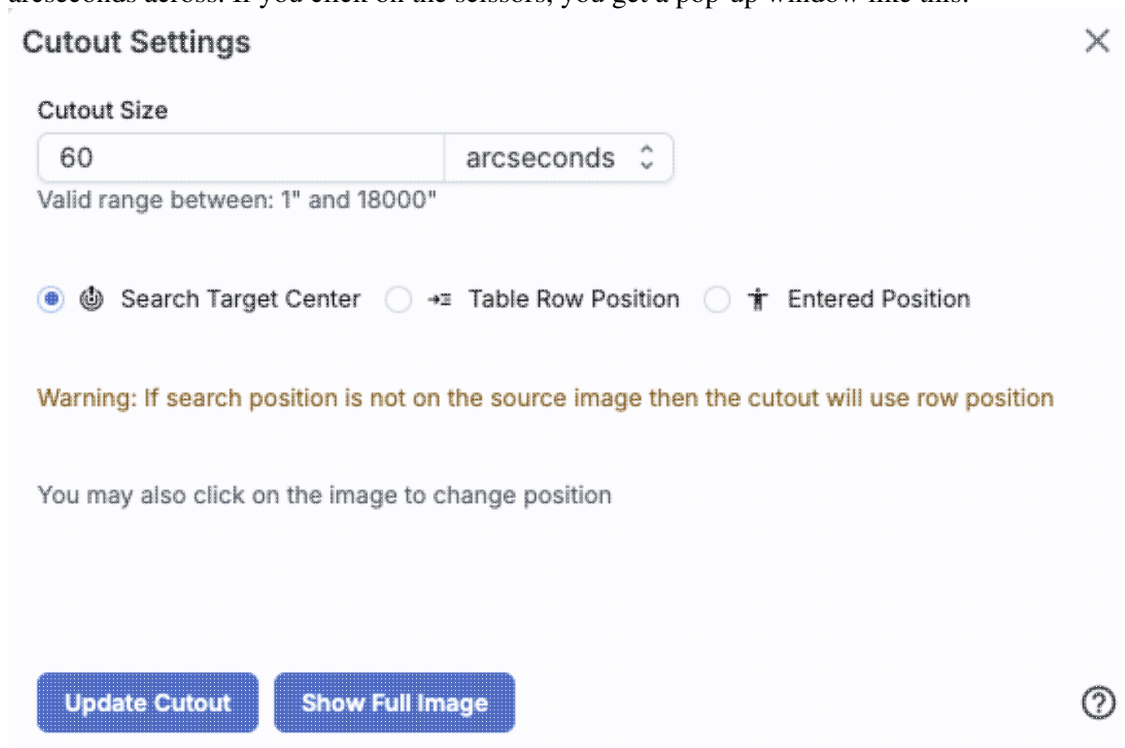
FITS Image Navigation in the Cutouts Tab

There are several icons for navigating the FITS images that appear in the Cutouts tab on the right.

Euclid has data for up to 8 bands for each observed tile. If all 8 bands are available, the Euclid Data Explorer will show all 8, but if fewer bands are available, it will only show the available bands.



These cutout icons tell you that you are viewing cutouts, centered on the search target center, that are 60 arcseconds across. If you click on the scissors, you get a pop-up window like this:



From here, you can control the size of the cutouts, and where the cutouts are centered. If you pick different cutout centers, then the icons in the upper left of the cutouts window change to remind you how the cutouts are centered.

Tips and Troubleshooting:

- ◇ If you request large cutouts or the full image, it will take a long time to load, especially if you have many targets, but it will make it easier to find the same sources across the same image.
- ◇ The default for Image search results is "search target center" but the default for Inspect Objects search results is "table row position". This can result in some unexpected behavior -- see example [here](#).



Single or Tiled Images

In the upper left of the images window pane, you have these icons:



The first icon means "show images one at a time in this pane." You can change which band you are seeing by using the "more" pulldown menu to the upper right of the image:



The second icon means "show all the images I have loaded for the *currently selected band* in groups of up to 8 at a time" (see below -- "Paging through single image views" -- for more on this, because it is powerful but complicated).



The third icon, selected in this screenshot, means "show me just the up to 8 images related to the selected image's tiles." This is the default view.

Tips and Troubleshooting: When doing an "Images" search, you can have just one line on the left but up to 8 images on the right. That's because you are searching for tiles in an Images search, and it's

giving you all possible images for that tile on the right.

Paging through single image views

This is a powerful feature, but may be initially disconcerting. Do an "Inspect Objects" search that yields

many targets on the left. On the right, from the view generated by the third icon () , select one of

the bandpasses -- say, NISP/J. Now click the second icon () . Now, all of the NISP/J images for all of the targets on the left are shown in order on the right. You can page through them given the

|< < 21 of 23 > >| (161 - 168 of 180)

navigation aids at the top:

In this example, the tool is on page 21 of 23, where images 161-168 out of 180 images are shown. Use the arrows to navigate through the 23 'pages' of 8 images each.

You can change which band you are seeing by using the "more" pulldown menu to the upper right of

the image:

More ▾



3-color images

When in the 'image set' view, this icon () also appears in this part of the window. This is a toggle to create a 3-color image. Clicking on this icon generates a pop-up window:

Choose Color Bands

Red

VIS

Green

NISP/Y

Blue

NISP/J

Show Three Color

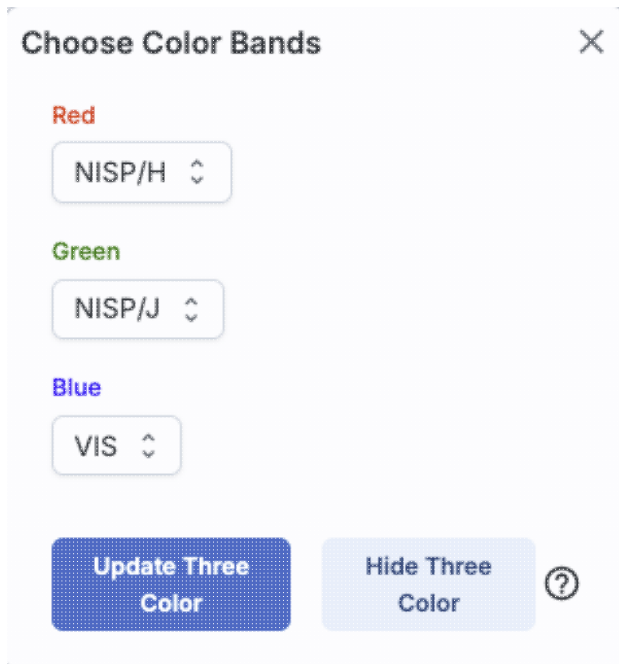
?

From this, you can select which band is used for which color plane, and then a three color image is generated from your selection. The planes as shown here are the default values.

If you click on the same icon after you have already generated a three-color image, you get different options. This way, you can change what is used for each color plane, or hide the three-color image you have already generated.

Tips and Troubleshooting:

- ◇ Note that you can choose to assign the same band to more than one color plane (e.g., reuse a band), or disable a color plane.



◇ You can change the [color stretch](#) for each plane separately.

Expanded views

As noted [above](#), if you click on this icon , it makes the images pane take up the entire browser window. When you do that, you have different image navigation options:



The first icon (the big square) denotes "show one image at a time." The second icon (the cluster of four squares) denotes "show smaller images of all the images I have loaded at once," e.g., tiled images. The third icon brings up a pop-up window with a list of the images you have loaded.

If you have more than one image loaded and you switch to viewing one image at a time, you get



additional choices for navigating through the list of images: the arrows take you forward and backward; the dots tell you where in the list you are. The "Auto play" tickbox scrolls through the list automatically.

When viewing many images at once, you get a "scroll images" switch. If you toggle this on, then each image tile becomes bigger, and you can use your mouse to scroll up and down through the collection of images. If you are on a Mac, your scrollbar may be hidden until you try to scroll.

When viewing the list of images that are loaded in, the table behaves like [any other table in this tool](#) -- that is, it is searchable, sortable, etc. However, as of this writing, the wavelength column is not correctly populated.

Tips and Troubleshooting

- ◇ When going from the 'window pane' view to the 'expanded' view, the images pane will only show you the images that you can see in the window pane view. That is, if you are looking at one image in the images window pane when you hit 'expand', it will only give you access to one image in the expanded view (even if you have more than one loaded into the tool). If you are looking at 8 images (out of many thousand) in the images window pane when you hit 'expand', it will only give you access to those 8 images image in the expanded view.

- ◇ When you are in the 'scroll images' view, and you try to scroll, if your mouse is in a currently active (selected) image (that is, highlighted in brown), then your image will zoom rather than scroll. Just move your mouse over to another image, and then your window will scroll rather than zoom. Or, find your scrollbar.

Image Toolbar (FITS and HiPS)

The image toolbox is always present as a row of tools associated with the images you have loaded, or that are loaded on your behalf. They're generally located above the images you have loaded, with most of them on the upper right. Letting your mouse hover over any of these icons will result in a "tool tip" that appears in order to remind you what the icon does. Most items apply equally to FITS and HiPS images, but some only apply to FITS images.

This is the image toolbox when you have clicked on a FITS image you have loaded:



And, this is the image toolbox when you have clicked on a HiPS image used for searching or coverage images:



The two toolbars are different, but if the same icon appears, it has the same effect on the image. Many of the icons have a downward pointing black triangle, which means that there are additional options in a drop-down menu that appear when you click on the icon.

We now discuss each icon in the order in which they appear.



Tools drop down

The choices here look like this:



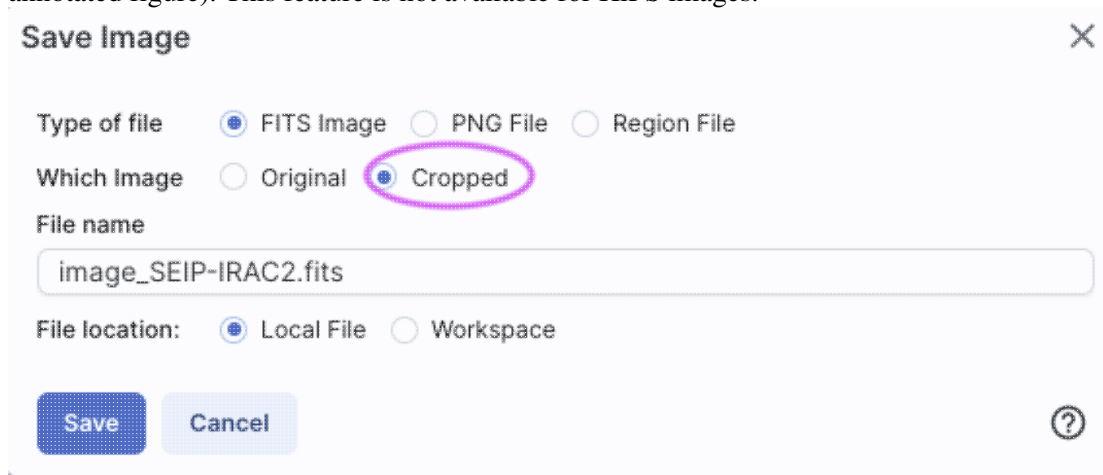
Saving the image

The diskette icon will allow you to save the current image. You can save files to your local disk or to the [IRSA Workspace](#). Note that **you** control where the file is saved on your disk through your browser; your browser may be configured to store all downloads in a particular

location on your disk.

If the current image is a FITS file, you can save it as a FITS or PNG or regions file to your local disk. If it is a HiPS file, your only choices are PNG or regions file. Saved FITS images will not save the color stretches or overlays; it will just save the underlying FITS image. Saved PNG files WILL include any overlays or annotations you have placed on the image, but will not include the underlying FITS image. Saved regions files will not save the underlying image, but will just save the overlays as a DS9 Regions file. See the [DS9 website](#)  for more information on the syntax of these DS9 region files.

Note that you can save the original or a cropped version of a FITS file; see the "select region" icon below to crop, then click on the save icon. Be sure to save the cropped FITS image (see annotated figure). This feature is not available for HiPS images.



The "Save Image" dialog box has a title bar with a close button (X). It contains three sections: "Type of file" with radio buttons for "FITS Image" (selected), "PNG File", and "Region File"; "Which Image" with radio buttons for "Original" and "Cropped" (the "Cropped" button is circled in purple); and "File name" with a text input field containing "image_SEIP-IRAC2.fits". Below these is a "File location:" section with radio buttons for "Local File" (selected) and "Workspace". At the bottom are "Save" and "Cancel" buttons, and a help icon (?) on the right.

Note that if you [overlay a large catalog](#) on an image, then turn around and save a regions file from the catalog overlay, the full catalog may not be saved to the regions file. If you have >5,000 sources, it's entirely likely that not every source will be overlaid on the image (because of [hierarchical catalogs display](#)), and thus will not be in the regions file. If you want to save your entire catalog as a regions file, **save the catalog from the [table pane](#)**.

The saved PNG is the same size as it is on your screen. If you want a big version, make the desired image big on your screen (view one-at-a-time; see [here](#)) before saving the PNG.

You can't save HiPS images from within this tool. To download your own copy, you will have to track down the original source of the image.



Restoring everything to the defaults

If you've played around a lot with the image, you may want to undo everything you've done. Click this button to restore everything to their original default values. Some layers may persist; remove them via the layers icon.



Viewing the image header

This icon displays a pop-up window with information about the image. If a FITS image is selected, it will show the FITS header of the image; if a HiPS image is selected, it will show the HiPS properties of the image. These are Firefly tables like all the other [tables](#) in this tool, so they are sortable and filterable, etc. If you click on the columns in the pop-up, it will sort the keywords alphabetically by that column. This is useful for finding individual keywords in

Euclid Help

particularly densely populated FITS headers. Click the header again to sort in reverse-alphabetical order, and a third time to return to the default order. Below are examples of an original and sorted FITS header. To make this window go away, click on the 'x' in the upper right of the pop-up, or click "close" on the bottom left.

FITS Header : VIS

#	Keyword	Value	Comments
1	SIMPLE	T	conforms to FITS standard
2	BITPIX	-32	array data type
3	NAXIS	2	number of array dimensions
4	NAXIS1	601	
5	NAXIS2	601	
6	EQUINOX	2000.00000000	Mean equinox
7	RADESYS	ICRS	Astrometric system
8	CTYPE1	RA---TAN	WCS projection type for this axis
9	CUNIT1	deg	Axis unit
10	CRVAL1	5.994758290000E+01	World coordinate on this axis
11	CRPIX1	3.267000000000000E+01	Reference pixel on this axis
12	CD1_1	-2.777777777778E-05	Linear projection matrix
13	CD1_2	0.000000000000E+00	Linear projection matrix
14	CTYPE2	DEC--TAN	WCS projection type for this axis
15	CUNIT2	deg	Axis unit
16	CRVAL2	-4.800000000000E+01	World coordinate on this axis
17	CRPIX2	6.271000000000000E+01	Reference pixel on this axis
18	CD2_1	0.000000000000E+00	Linear projection matrix
19	CD2_2	2.777777777778E-05	Linear projection matrix
20	COMMENT		
21	SOFTWARE	CT_Swarp	The software that processed those data
22	SOFTVERS	10.2	Version of the software
23	SOFTDATE	2024-03-18	Release date of the software
24	SOFTAUTH	2020-2024 Euclid Cons	Maintainer of the software

Close

FITS Header : VIS

#	Keyword	Value	Comments
27	AUTHOR	lal	Who ran the software
2	BITPIX	-32	array data type
12	CD1_1	-2.777777777778E-05	Linear projection matrix
13	CD1_2	0.000000000000E+00	Linear projection matrix
18	CD2_1	0.000000000000E+00	Linear projection matrix
19	CD2_2	2.777777777778E-05	Linear projection matrix
36	CENTERT1	ALL	CENTER_TYPE config parameter
39	CENTERT2	ALL	CENTER_TYPE config parameter
30	COMBINET	MEDIAN	COMBINE_TYPE config parameter for CT_Swarp
20	COMMENT		
26	COMMENT		
31	COMMENT		
32	COMMENT		Propagated FITS keywords
33	COMMENT		
34	COMMENT		Axis-dependent config parameters
11	CRPIX1	3.267000000000000E+01	Reference pixel on this axis
17	CRPIX2	6.271000000000000E+01	Reference pixel on this axis
10	CRVAL1	5.994758290000E+01	World coordinate on this axis
16	CRVAL2	-4.800000000000E+01	World coordinate on this axis
8	CTYPE1	RA---TAN	WCS projection type for this axis
14	CTYPE2	DEC--TAN	WCS projection type for this axis
9	CUNIT1	deg	Axis unit
15	CUNIT2	deg	Axis unit
44	DATASETR	Q1_R1	pipeline DATASETRELEASE

Close

For comparison, an example of a HiPS properties window is here:

HiPS Properties : AllWISE color Red (W4) , Green (W2... X

Property	
hips_service_url	https://irsatest.ipac.caltech.edu/data/hips
creator_did	ivo://CDS/P/allWISE/color
obs_collection	The Wide-field Infrared Survey Explorer
obs_title	AllWISE color Red (W4) , Green (W2) , Blu
obs_description	NASA's Wide-field Infrared Survey Explor
obs_ack	This Progressive Survey distribution maki
obs_copyright	IPAC/NASA
obs_copyright_url	http://wise2.ipac.caltech.edu/docs/releas
client_application	AladinLite
client_category	Image/Infrared/WISE
client_sort_key	04-003-00
hips_creation_date	2014-04-15T08:59Z
hips_release_date	2019-05-20T08:30Z
hips_builder	Aladin/HipsGen v10.125
hips_creator	Thomas Bach [CDS]

Close



Rotating the image so that North is up

Images retrieved in the Euclid Data Explorer are frequently already very close to North-up.

However, you could find yourself in a situation where North is not necessarily up. Clicking this

icon will orient the selected image so that North is up.



Flipping the image on the y-axis

Clicking on this icon flips the image on the y-axis. (This option is only available for FITS, not HiPS, images.)



Add a compass rose

When you click this icon, arrows appear on the image showing which direction is North and which is East. Clicking on this icon a second time removes this compass rose. (You can also remove this layer via the layers icon, described below.)



Add a coordinate grid

Click on this icon to overlay a coordinate grid on the image. Click it again to remove it.

Customize the units of the grid (to, e.g., Galactic coordinates) via the "layers" icon (described below). (Also see information on HiPS grid in the [WCS section](#).)



Measuring a distance

When you click this icon, at first, nothing seems to happen. However, you can now click and drag to draw a line on the image, and the length of the line is displayed (in the middle of the line). The units for the measured distance (and the color of the overlay) can be changed from the "layers" icon (described below). You can calculate the difference in RA and Dec separately via the layers icon as well; find the layer associated with the distance measurement and tick the "offset calculation" box. When it displays the offset calculation, it will give you the angle in degrees in one corner, and the length of the line segment in the RA and Dec directions, in the units you have specified. When you are done with the distance tool, you can click on the

End Distance

that appears next to the image toolbar, or click on this icon a second time to remove the distance tool. (You can also remove this layer via the layers icon.)



Read in a DS9 Regions file

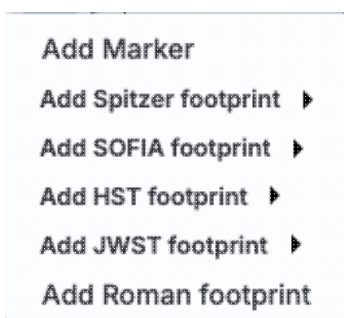
When you click this icon, you get a pop-up window from which you can read in a DS9 regions file from your local disk. See the [DS9 website](#)  for more information on the syntax of these DS9 region files. The supported regions are text, circle, box, polygon, line, and annulus. To make this window go away without doing anything, click on the 'x' in the upper right of the pop-up.

Tips and Troubleshooting: If you overlay a list of sources you created in ds9 regions format from your disk, it will only be overlaid on the current image, not all of the images you have loaded. If you want to have it overlaid on all the images you have loaded, create a catalog from your source list and overlay it as a [catalog](#). Then it will appear on all of the images you have loaded, provided that the positions overlap on the sky.



Put a marker on the image

When you click this icon, a drop-down menu appears with several possible options:



The first overlay choice (simply called 'marker') is a red circle. Initially, it appears in the center of the images, and is meant to be moved to wherever you first click in the image. It looks like this:



The dash-dot line around it means that it is 'active', so you can move (click and drag the marker) or resize it (click and drag the dash-dot boundary). You can change the color of the marker (and change the label) via the "layers" icon (described below). You can also remove this layer via the layers icon. There are several additional options in the drop-down, enough that they have their own [section below](#).



Drill down through the image

If your FITS image has multiple planes or HDUs, especially if each plane or HDU represents a different wavelength, it can be useful to "drill" down through the image cube at a given position on the sky. (You are unlikely to find this kind of file in the WISE archive.) This tool allows you to do just that. When activated, this tool extracts the data at the place your mouse clicks down through the cube. For more information on saving the information, see the [extraction section below](#).



Draw a line in the image

When this tool is activated, you can draw a line in your FITS image with your mouse, and it will extract for you the pixel values along that line. If you have more than one image loaded and visible, you can shift-click in another image to see the same line in another image. For more information on saving the information, see the [extraction section below](#).



Make points in the image

When this tool is activated, you can click in your FITS image with your mouse, and it will extract for you the pixel values at the location of your click, creating a catalog for you as you click. If you have more than one image loaded and visible, you can shift-click in another image to extract points from another image. For more information on saving the information, see the [extraction section below](#).



Zoom

When your mouse is in an image, these options appear in the upper left of the image.



Zooming in or out

Clicking on these magnifying glass icons zooms in or out of the image. The readout of the net effect of your zooming on the displayed field of view (FOV) appears at the top left of each image.

If you click zoom in or out rapidly, a pop-up window appears to allow you to more rapidly select the zoom level (field of view) you want. Select the desired level, or click on the 'x' in the

upper right to make the window go away. Here is an example:

Choose Field of View ×	
3.8°	1.8'
1.9°	1.5'
57'	1.3'
28'	1.1'
14'	53"
12'	45"
10'	37"
8.5'	31"
7.2'	26"
6.0'	22"
<u>5.1' : Current</u>	18"
4.3'	15"
3.6'	13"
3.0'	11"
2.5'	9.5"
2.1'	8.0"
	6.7"

You can alternatively zoom using the mouse wheel (or drag forward and backward on a touchpad or magic mouse).

Note that there is a maximum (or minimum) allowed zoom level, and they are different for FITS and HiPS images. A notification will appear when you have reached the maximum (or minimum) allowed zoom level for a given image. To enlarge images more (or less) than that, please repeat your search to obtain new images with smaller (or larger) spatial extent. HiPS images are specifically designed for large areas, so if you need a big area, use HiPS. If you want to zoom in close enough to see individual original pixels, your best choice is FITS.

See also the section below on [changing coverage images](#), specifically that on automatic transitions while zooming.



Fit image to screen or fill screen

These two icons are designed to maximize the available space in your browser window. The first one automatically picks a zoom level such that the image entirely fits within the available space (which could be your whole browser window, or just the portion of it where that image is loaded). The second one automatically picks a zoom level such that the image fills as much of the available space as possible (e.g., it is zoomed such that short axis of the window is filled with the image, whether that short axis is left-right or up-down).

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By default, the images that are returned are frequently but not always centered on your search target. Clicking on these icons let you see the whole image that is returned, whether or not it is centered on your target.

This is available for both FITS and HiPS images, though note that FITS images retrieved from IRSA using this tool are typically square, and HiPS images cover the sky, so fitting the image to the screen might not be what you want to do.



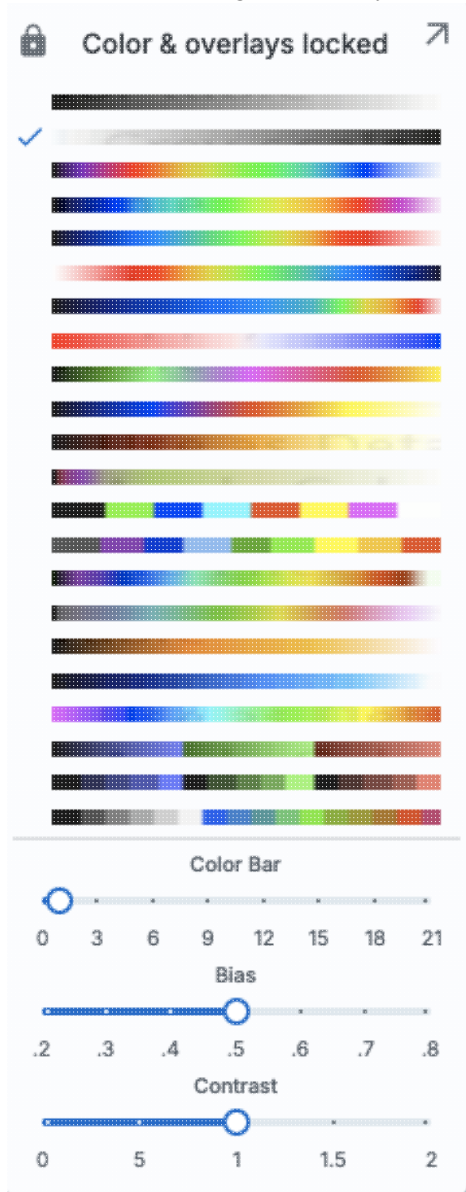
Zooming to a 1-to-1 size

Clicking this icon will zoom the image such that one pixel in the image is one pixel on your screen. This option is only available with FITS images; HiPS images by their nature have pixels of varying sizes, so this button would have no meaning in this case.



Color table drop down

This icon enables you to change the color table of the displayed image. (This option is available for FITS and HiPS images.) When you click the button, a drop-down menu appears.



- ◇ The top of the menu either says "Color and overlays locked" or "Color and overlays unlocked" -- by default, all of the (FITS) images that you have loaded are locked together for color and overlays. What that means is if you change the color table (via this menu), then the color table for all the (FITS) images are changed. (Or, if you add a layer to one image, then the layer is added to all the images; see below.) If you don't want this to happen, select "Color and overlays locked" to unlock it. Select the text again to lock it again.
- ◇ The arrow in the upper right creates a pop-up window out of this drop-down menu so that you can leave the choices up while settling on the best option.
- ◇ The next portion of the menu has a wide variety of color table choices. Select your new color table from the options shown.
- ◇ Alternatively, you can use the "color bar" slider to move among the color tables by number. These numbers correspond to the color bar number used in the Python implementation of the Firefly tools.
- ◇ Below the color bar slider, there are sliders controlling the bias and contrast. Click or drag the slider to change the image display.

*Color stretch drop down*

This icon enables you to change the color stretch of the displayed image. (This option is only available for FITS, not HiPS, images.) Because this is complicated, for much more information, please [see below](#).

*Re-center the image drop down*

Clicking this icon produces a drop-down menu:

By default, "Pan by table row" is turned on (checked), but, depending on how you have loaded your images, or whether you have catalogs loaded, it may not seem to do very much. However, if you have a catalog loaded and are zoomed in on your images, as you scroll through your catalog, the FITS image underneath will move as needed when you have selected an observation in a different part of the sky than was originally shown.

Other choices are to center on the target of the observation, center the image in the window, or center on a target of your choice. For the last of those, you can simply center on that target, or center and leave a marker on the image at that location.

*Selecting a region drop down*

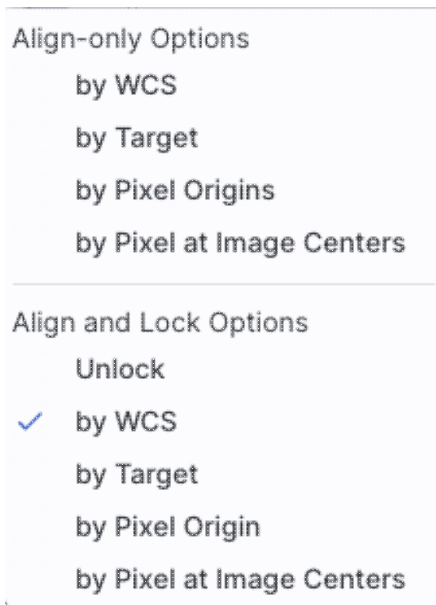
When you click this icon, you can select a region of the image for further actions. Because this is complicated, for much more information, please [see below](#).

*Image Layers: Viewing/Changing the Layers on the Image*

Every time you add something new to the image, you add a 'layer' to the image. This is complex, so please [see below](#) for much more information.

*Lock/unlock images*

You may have this "lock images" icon appear in your toolbar; it will appear as the first icon if they are locked and the second icon if they are unlocked. The main purpose of this icon is to lock all the images you have loaded for zooming, scrolling, etc. You need to specify how it locks and for how long. Clicking it produces this drop-down menu:



The first set of options aligns the images only once, temporarily; the second set of options makes the alignment persist ("lock") when you move the images (that is, when you move one, they all move). You can align by the images' WCS (e.g., RA and Dec), by the target, by the pixels according to the origin of the coordinate system in the image header, or by the pixel at the image center. The most common choice is likely the WCS align and lock. This is discussed in more detail in the [WCS section](#).



Getting help

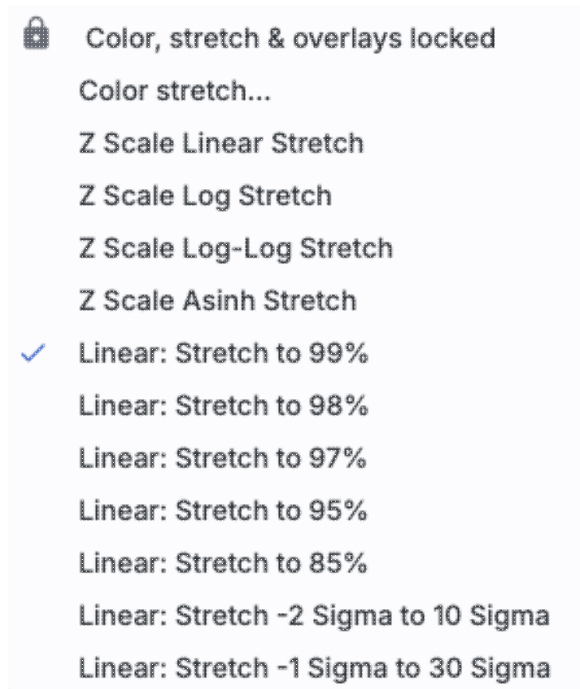
Clicking on this icon takes you to this help page.

Color Stretches

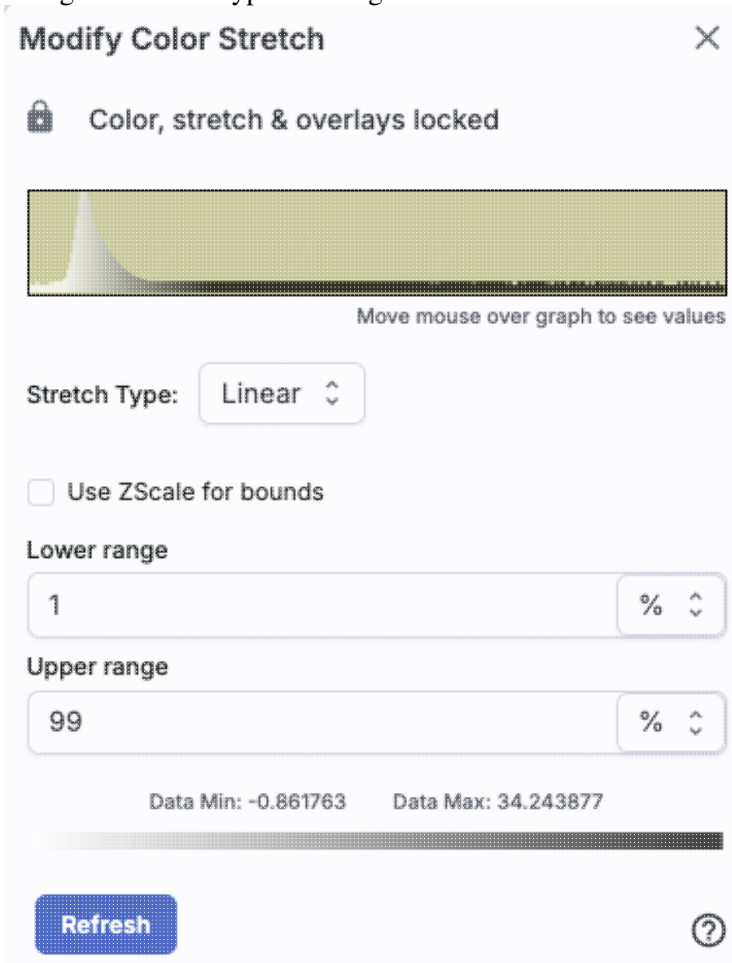


This icon enables you to change the color stretch of the displayed image. (This option is only available for FITS, not HiPS, images.) When you click the button, a drop-down menu appears with a variety of choices.

The top of the menu either says "Color and overlays locked" or "Color and overlays unlocked" -- by default, all of the (FITS) images that you have loaded are locked together for color and overlays. What that means is if you change the color stretch (via this menu), then the color stretch for all the (FITS) images are changed. (Or, if you add a layer to one image, or change the color table of one image, then the change is made to all the images; see other sections of this chapter.) If you don't want this to happen, select "Color and overlays locked" to unlock it. Select the text again to lock it again.



Below that, you can choose from a set of pre-selected options. If you pick the first one, "color stretch", you can customize the stretch. A pop-up window appears with a histogram of the values in the image, and you can change the stretch type and range.

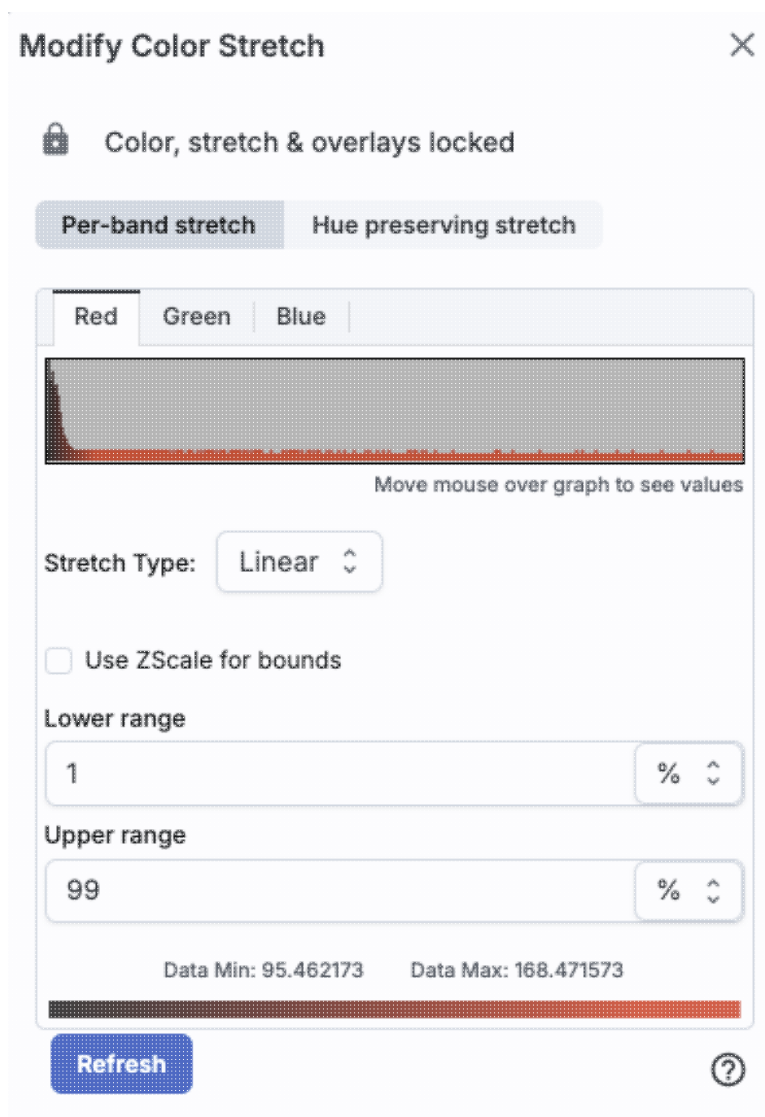


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If you pick a color stretch from the pre-defined options, the pop-up window reflects this change. If you change the color stretch in the pop-up window, the drop-down menu changes correspondingly.

Example: Display the pop-up for color stretch. From the main drop-down, pick 'Linear stretch to 99%'. Go back to the color stretch pop-up. Note that it has filled out the stretch type and ranges to reflect the current choice. Then -- either with the pop-up window still up or not -- go back and pick a different pre-defined stretch from the standard options. Note that the values in the pop-up change to reflect this current choice. From the pop-up, pick a different stretch type -- try "histogram equalization." Select "refresh" to update the images. Go back to the drop-down menu. The last 7 items have changed to be based on histogram equalization, as opposed to the "linear" default.

If you have a 3-color image, you can change the stretch in each color plane separately; select the tab at the top accordingly for red, green, or blue. By default, it stretches each band independently, and you can set the parameters in the stretch pop-up accordingly.



Modify Color Stretch

Color, stretch & overlays locked

Per-band stretch Hue preserving stretch

Red Green Blue

Move mouse over graph to see values

Stretch Type: Linear

☐ Use ZScale for bounds

Lower range

1 %

Upper range

99 %

Data Min: 95.462173 Data Max: 168.471573

Refresh

As described in [Lupton et al. \(2004\)](#), a different algorithm may be useful for creating 3-band color images. Select "Hue preserving stretch" to invoke this option. This stretch should be a brightness-independent color-preserving asinh stretch, though in practical terms, it seems to work best for optical images.

Modify Color Stretch

✕

🔒 Color, stretch & overlays locked

Per-band stretch

Hue preserving stretch

Brightness-independent color-preserving asinh stretch;
images must be free of background artifacts

Scaling coefficients

^

Red: 1.00

-10.699

-0.301

0

Green: 1.00

-10.699

-0.301

0

Blue: 1.00

-10.699

-0.301

0

☐ Use ZScale for bounds

Q=0 for linear stretch;
increase Q to make brighter features visible

Q: 0.0

0

5

10

15

20

Pedestals (black point values)

^

Red pedestal:

1

%

⬆

⬇

Green pedestal:

1

%

⬆

⬇

Blue pedestal:

1

%

⬆

⬇

Refresh

?

It may be useful to scale individual channels; sliders allow you to do so. The Q parameter has another slider. For a linear stretch, $Q=0$; increase Q to change what features are emphasized. Pedestal values can also be set to

allow the level assigned to "black" to change.

Viewing/changing the layers on the image

Every time you add something new to the image, you add a 'layer' to the image. You can have an image with a lot of annotations on it.



The number that appears circled in blue over the layers icon tells you at any given time how many layers you have on the currently selected image (the image outlined in brown).

If you click this layers icon, you will get a pop-up window with a list of all the layers you have on top of the image. Here (on the right) is an example of a well-populated layers pop-up; in real life, this is scrollable to see several more layers). From this pop-up, you can:

- turn layers off and on (click on the switch on the left of the corresponding row);
- remove layers entirely (click on the 'x' on the right of the corresponding row);
- change colors of overlays (see below);
- change symbol shapes and sizes (for [overlaid catalogs](#)), including [hierarchical catalog settings](#);
- change annotations (for markers);
- or change units (for the coordinate grid or the [distance tool](#)).

To add entirely new layers, though, you need to go to other options within the toolbar.

You can "show all" or "hide all" with the buttons on the lower left of the pop-up window. To make this pop-up window go away, click on the 'x' in the upper right of the pop-up.

Note the target

description:  Image Search: 61.345123, -46.931068 Equ J2000  
This reminds you of the target on which you searched -- here, it was 61.345123, -46.931068 in J2000. The two icons next in that row indicate, respectively, "copy this location to the clipboard" and "center image on this position."

Layers- DECam/R

☒ Image (FITS)

☒ Image Search: 61.345123, -46.931068 Equ J2000  

☒ Objects_1

Grouping: Healpix Grid  Min Group: 40 

☒ North Arrow - EQ. J2000

☒ Coordinate Grid

Equatorial J2000 HMS 

☒ Marker #1

Label: Marker #1 Corner: SE  Add marker

Click the marker and drag to move, click corner and drag to resize

☒ Distance Tool

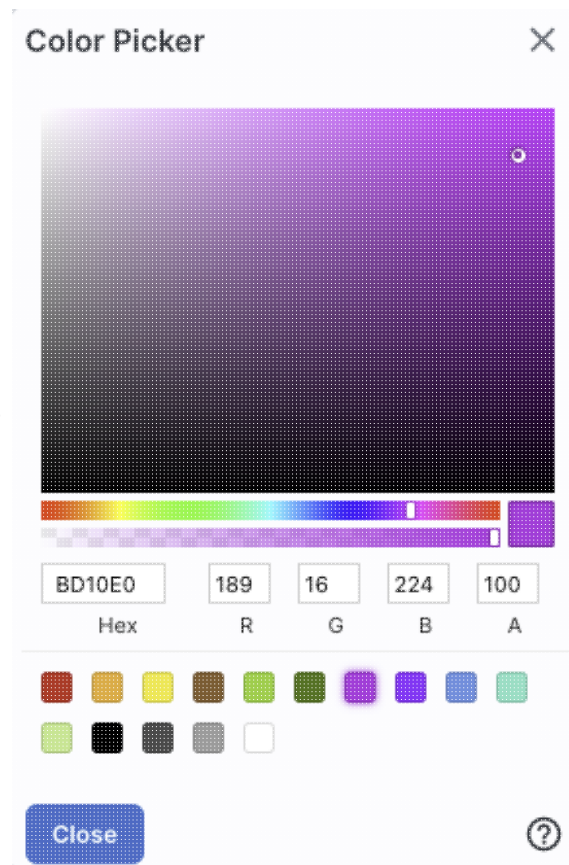
☐ Offset Calculation

Show All Hide All

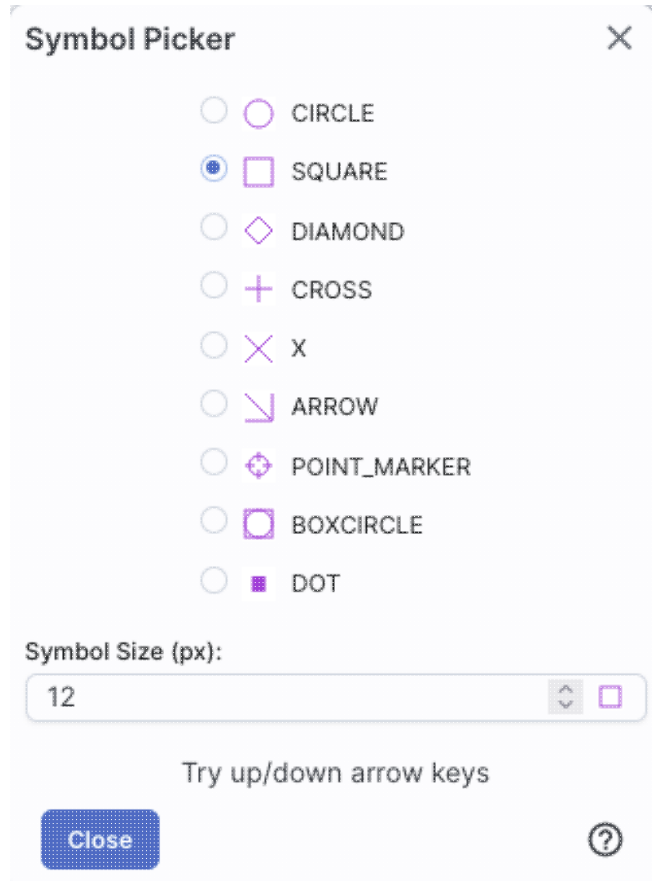
Where it's possible to change colors of a layer, click on the 'colors' link to be taken to a new pop-up from which you can select a new color.

From here, you can click on your desired color in the top colorful box. Immediately below that box, you can change the color and saturation of the top box so that you can select from a different range of colors. Below that, you can enter numerical hex codes or RGBA values (where the value for RGB is between 0 and 255, and A is in units of percent, e.g., 50 = 50%). Finally, you can also select from a pre-defined set of 15 colors by clicking on any of the small boxes. Note that the numerical codes update as you select different colors. Your choices are implemented as soon as you select them. Click 'Close' to close the window, or click 'x' in the upper right.

If you have a [catalog](#) loaded into the tool, you can also obtain this pop-up by clicking on the color swatch in the heading of the catalog tab.



For catalogs or the search target, you can also select the symbol shape and size. To adjust the size, type in the symbol size in pixels or use the up/down arrow keys to change the size by one pixel at a time. Your choices are implemented as soon as you select them. Click 'Close' to close the window, or click 'x' in the upper right.





For a HiPS image, you also have a layers icon (), from which you have new, HiPS-specific choices in the layers:

Layers- AllWISE color Red (W4) , Green (W2) , Blue (W1) from raw Atlas Images
X

☒ Image (HiPS)

☒ HiPS Search: 30 Dor NED  
Symbol Color

☒ North Arrow - EQ. J2000
Color X

☐ HEALPix (HiPS) Grid
Color X

☒ Auto
☐ Grid Match Image Depth
☐ Grid Level Lock

☐ MOC - AllWISE color Red (W4) , Green (W2) , Blue (W1) from r...
Color X

Outline Fill MOC Tile Outline

Show All Hide All
?

HEALPix (HiPS) Grid

To turn on these choices, toggle the switch to the left of "HEALPix (HiPS) Grid". (See [below](#) for more information on HiPS images in general.)

Auto: This option overlays a position grid, with the tile numbers marked in the center of each box. As you continue to zoom in, when smaller tiles are needed, they are drawn, with the new tile numbers marked. You may not zoom beyond HiPS Norder level 14 tiles. The numbers after the "/" is in the "NESTED" (as opposed to RING or NUNIQ) numbering system; see [the IVOA standards document](#)  for more information.

Grid Match Image Depth: If you select this option, the grid will adjust to a new level when you zoom in and a new level of HiPS image both exists and is used for the display.

Grid Level Lock: Selecting this option yields an additional numerical drop-down menu. The higher number you pick, the smaller the grid boxes are that are drawn. When this option is selected, the boxes stay the same size regardless of how zoomed-in on the image you are.

HiPS MOC

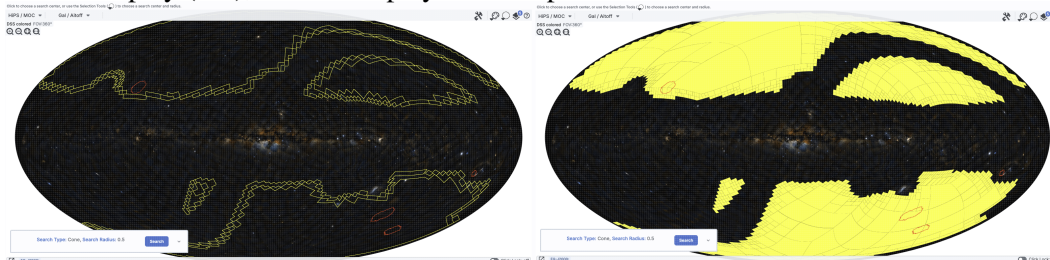
To turn on these choices, toggle the switch to the left of "MOC".

A MOC tells you via a simple boolean yes/no, is there sky coverage from this data set in this region. The choices here are:

Euclid Help

- ◇ Outline - an attempt to outline the entire region covered by the data; it still sometimes struggles near the edges of coverage, so zoom in to get a better sense of the coverage edges.
- ◇ Fill - filled regions, where you can control the opacity of the overlay by going to the [color picker](#); you control the opacity by changing the number above the "A".
- ◇ MOC Tile Outline - individual tile outlines, where the tiles are set by the MOC tiles themselves (as opposed to tiles created by the mosaic tiles that make up the data set).

Because the planned Euclid coverage extends over such a large fraction of the sky, it is sometimes hard to distinguish, given the default MOC display, what is "on" and what is "off" for planned coverage. You may wish to explicitly change the MOC display to "fill" in order to make this more clear. Here is an example of the default display (left), and the display with the planned MOC shown with "fill" rather than "outline" (right):



Tips and Troubleshooting:

- The entire concept of a MOC is built upon the "tiles" that are inherent to the HiPS concept. As a result, those tiles are imprinted on how the MOC is rendered, especially near edges or corners of coverage. Strange behavior may result; you can always zoom in to get a better sense of the coverage. For authoritative information, download the actual data for the region you are concerned about.
- For the "fill" option for a MOC, depending on how you display a MOC, you may see two shades of color in the MOC. It is important to note, though, that the information it is displaying does not include depth of coverage, merely boolean "is there data there or not." Why is it displaying shading? Well, it's rounding. For example, a given Euclid MOC might be generated at order 13. At this order, there are 805,306,368 HEALPixes on the sky, and they are about 26 arcseconds across. When zoomed out far, there is no point in trying to show each of these pixels, so the application "rounds up" the MOC to an order in which there are roughly 100-200 displayed HEALPixel polygons horizontally across the image. When it does this, it flags the rounded up polygons with the paler color. So the boundaries of a coverage region in the MOC all get a paler color. If you zoom in far enough on a MOC, the two-tone colors go away.
- You might be here in the documentation looking for more information on [hierarchical catalog settings](#); this is also related to HEALPix.

World Coordinate System (WCS) Alignment

As described above, there is a way to lock/unlock images to each other   for position matching. This section describes the image locking in more detail.

When aligning images, you can specify how the images align and for how long. Clicking the lock images icon produces this drop-down menu:

Align-only Options

- by WCS
- by Target
- by Pixel Origins
- by Pixel at Image Centers

Align and Lock Options

- Unlock
- ✓ by WCS
- by Target
- by Pixel Origin
- by Pixel at Image Centers

The first set of options aligns the images only once; the second set of options makes the alignment persist ("lock") when you move (zoom, etc.) the images.

You can align by the images' WCS (world coordinate system, e.g., RA and Dec), by the target (align by target on the screen, regardless of position in the sky), by the pixels according to the origin of the coordinate system in the image header, or by the pixel at the image center. The most common choice is likely the WCS align and lock.

Note that aligning by WCS puts North up, and aligned so that each image has the same angular scale.

Tips and Troubleshooting

- When you have both FITS and HiPS images loaded (as you should when you run the Euclid tool, because the coverage image is a HiPS image), if you select a HiPS image to be active when you select "lock by WCS", the HiPS will not lock to the FITS image unless the image is either J2000 or galactic north up. If you want the HiPS image to align to the FITS image, select the FITS image first and then select "lock by WCS"

Extraction Tools

Several tools allow you to extract information from images or image planes, but only for FITS (not HiPS) files. Within the Euclid tool, you are very unlikely to encounter data for which the drill can be used.

-  -- Extract down through image planes
-  -- Extract a line from the image
-  -- Extract points from the image

All three of these follow the same basic structure --

1. Initiate extraction mode
2. Set aperture
3. Try extraction; repeat if desired
4. Pin (retain) extraction if desired
5. Download (as table or chart) if desired
6. Repeat if desired
7. Click on "end extraction" to finish the process.

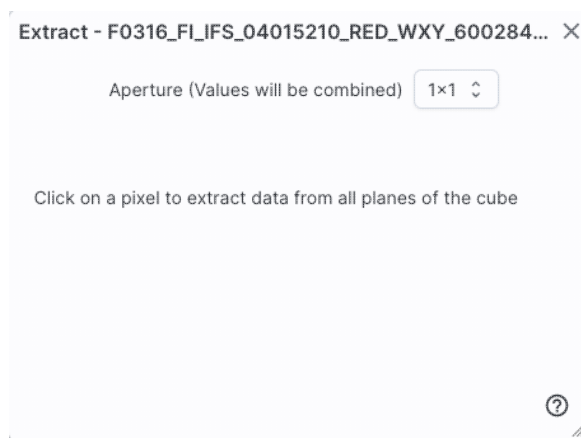
The drill pokes down through multiple planes (which you are unlikely to encounter in the Euclid Data Explorer), the line moves across pixels in a plane, and the points extracts points from a plane.

Here, we cover the basic approach, with specifics of each tool integrated as we go along.

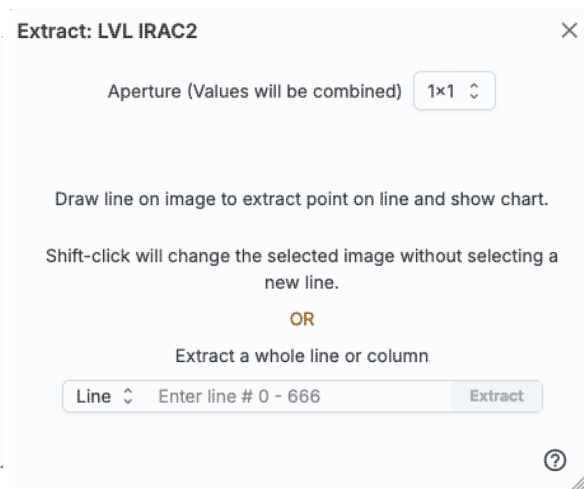
Initiate extraction mode. When you click on one of these icons, you enter into the extraction mode. Text appears next to the image toolbar to remind you that you are in this mode: **End Extraction** When you are done, to end this mode, click on this "end extraction."

When starting out, the pop-up window that you get depends on the tool you pick.

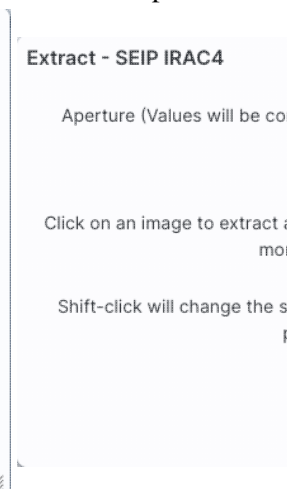
For the drill:



for the line:



and for the points:



Set aperture. In all three cases, the top center of the extract pop-up window has a drop-down from which you can select the aperture value. For the drill and points, you can choose, in pixels, 1x1, 3x3, 5x5, or 7x7. Values can be summed or averaged. For the line, it's a little different. The apertures are 1x1, 1x3, 1x5, or 1x7, and you control whether the points are summed or averaged. You can have it extract along a line that you draw with your mouse on the image (useful for examining brightness profiles, e.g., across spiral arms of a galaxy), or you can have it extract an entire line or column of the image that you specify (useful in the cases where the 'image' is a file where the first row is an extracted spectrum, the second row is the error, the third row is a mask, etc.).

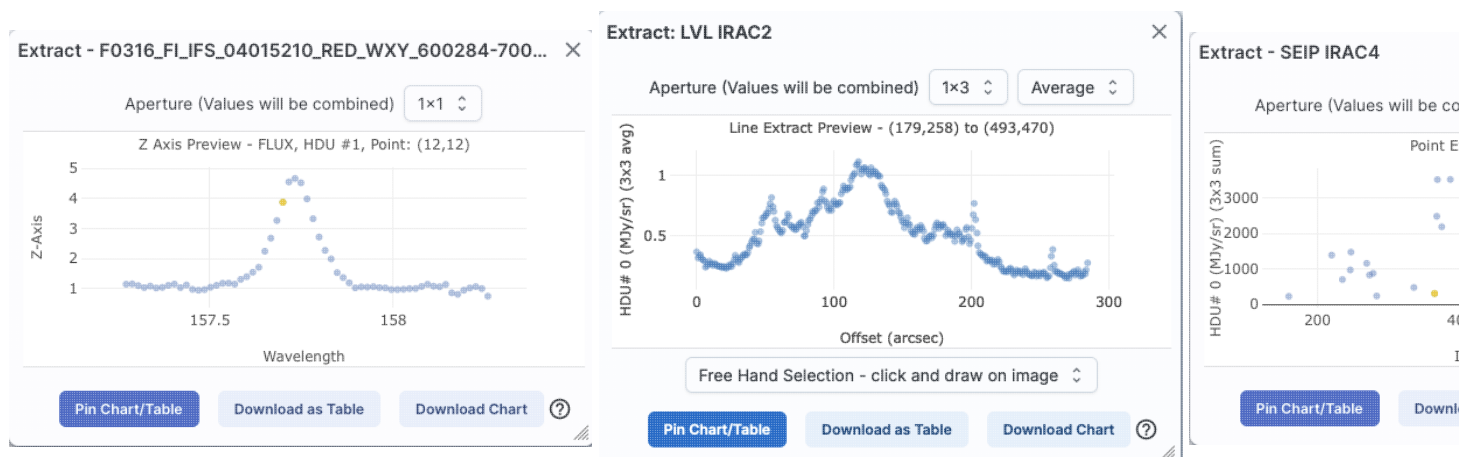
Try extraction. From this point, you can click on your image, or click and drag for the line tool. The pop-up then contains a plot of your extraction.

For the drill:

for the line:

and for the points:

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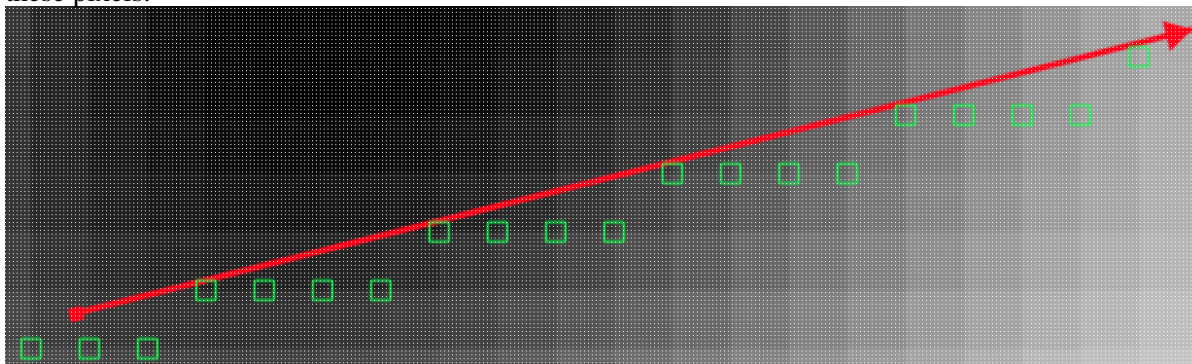
In each of these cases, it does the best that it can to label the axes accordingly. The cube that is used for the drill example here follows the spectral data model so that it is recognized as a spectrum, and it plots against wavelength. The line extraction is a 1x3 average and plots the offset in arcseconds from the initial mouse click, given the WCS information in the header of the image. The point extraction is a 3x3 sum, and plotted in image x coordinates, but can be changed to show image y coordinates.

Note that for the line, if you have more than one image loaded and visible, you can shift-click on a new image to see the same line on a new image. Similarly, for the points, you can shift-click to change images without extracting points.

For the line extraction, if you want to change at this point to extract along a line or column, use the drop-down menu at the bottom of the pop-up. It's shown here as "free hand selection", but the other choices are line or column selection; you click on the image to select a line or a column, which is particularly useful for quick looks at semi-extracted spectral images.

Pin extraction. Once you have an extraction that you like, you can retain the extraction for further analysis. "Pin chart/table" extracts the information as a [table](#), just like any of the other tables in this tool, with an accompanying [plot](#). You can then manipulate the table/plot just like any other table or plot in this tool. If the tool recognizes the extraction as a spectrum, you may have additional capabilities.

Once you pin or save your extraction, the tool leaves a "footprint" of your extraction on the image so that you can remember what the extraction was. **NOTE THAT it is not interpolating** across fractional pixels here. It is averaging if you have asked it to average, but particularly if your pixels are large, if you draw a line that is diagonally across pixels, it will be immediately obvious that it's not interpolating. This line gets rendered as these pixels:



The point appears on the image at the lower left corner of the relevant pixel.

You can pin as many different extractions as you want.

From the line extraction pop-up, when you click on "Pin Chart/Table", you get another pop-up:

From this pop-up, you can choose to do a line extraction from just the currently selected image (most likely where you drew your line); all the images and putting all of the extracted lines into one big table (and tab); or all the images and putting all of the extracted lines into individual tables (and tabs). When you do this, the question naturally arises as to how the tool should specify which column (or tab) goes with which image. Some of the images have long, sometimes cryptic titles. You can choose to have the tool use the full image titles in the column headers or tab titles, or abbreviations.

If you choose to have the tool generate one table for each image you have loaded, you may suddenly have a lot of new tabs at the bottom of the screen. There are navigation aids within the [tables section](#) that may help.

Download extraction. You can download the extraction as a table or plot without pinning it. *Download as Table* saves the table to your local disk -- first, you have the same options as immediately above, where you can choose to do a line extraction from just the currently selected image; all the images and putting all of the extracted lines into one big table; or all the images and putting all of the extracted lines into individual tables. Then you have [all the same save options as a regular table](#). *Download Chart* saves the plot as shown, as a png file.

After pinning an extraction, you also have the extraction appearing as a table in the tables section of your window and as a plot in the plots section of your window. As with [any table](#) in this tool, you can save the table by clicking on the diskette icon in the table. You can choose from a variety of formats; [see the tables chapter for more information](#). Similarly, as with [any plot](#) in this tool, you can save the plot by clicking on the diskette icon in the plot. See the [plots chapter](#) for more information.

Repeat extraction. As long as the extraction pop-up is still open, you can continue to click points or draw lines to make additional extractions.

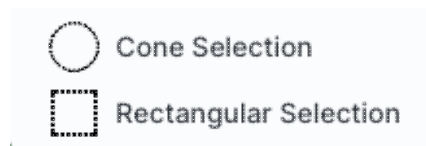
End extraction mode. **End Extraction** When you are done, to end the extraction, click on "end extraction" to end the extraction. Alternatively, just click on the 'x' in the upper right corner of the extraction pop-up.

Region Selection



When you click this icon, you can select a region of the image, from which then you can do a whole host of things to the image and to the catalog you may have overlaid upon it.

First, from the drop-down, you are given a choice of a rectangular selection or an elliptical selection:



After you make that choice, you can click and drag in the image, selecting a box or a circle on the image. For the circle, your click is the center of the circle and the drag is the radius of the circle; for the box, your first click is one corner of the rectangle, and the drag is the opposite corner of the rectangle. This region can be resized by grabbing and dragging the corners of the box or the pixels delineating the corners of a box around your code. If you need to move the image underneath, you can hold the shift key and click and drag.

When you have selected a region of the image, additional icons appear above the image, and exactly which icons you see is a function of whether you are working on a FITS or HiPS image, and whether or not you have a

catalog overlaid:



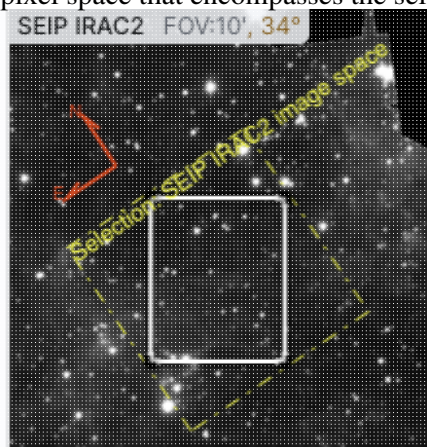
These icons allow you to do several things:



Crop the image

(FITS only) Crop the image to the selected region. Then you can save the cropped FITS image via the save icon described above.

Note that, if you have a rotated FITS image such that a crop would have to bisect pixels, it will show you the region that encompasses your selection. If you crop at that point, then, it will crop in image space (such that pixels are not bisected). See the figure below -- in the original image, north is up. This has been rotated 45 degrees. The selected region is in white. The yellow dash-dot line is the crop in pixel space that encompasses the selected region.



Select sources (and cancel selection)

(Only if a catalog is overlaid) Select the catalog sources overlaid on the image within the region.

Selecting highlights the sources in the list and plot with a different color row or symbol. Once there are selections made, the second icon appears to give you an option to cancel the selection.



Filter sources

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(Only if a catalog is overlaid) Filter the overlaid catalog down to the sources within the enclosed area. When you choose to impose a filter via this selection mechanism; the filters icon changes above the

catalog to indicate that there is a filter applied (). To clear the filters, click on the cancel filters

icon (which also appears after you impose filters):  . There is much more on [filters](#) in the Tables section.



Zoom the image

Zoom the image to fit the selected area into your field of view.



Recenter the image

Recenter the image on the selected area.



Obtain statistics

(FITS only) Obtain statistics from the image on the region. The statistics option results in a pop-up that looks something like this:

SEIP IRAC3

Mean Flux: 2.2315879 MJy/sr

Standard Deviation: 2.8049787 MJy/sr

Integrated Flux: 6.2911929e-7 MJy

	Position	Value
Minimum Flux	RA: 5h36m16.64s DEC: -69d12m15.2s	8.0767411e-1 MJy/sr
Maximum Flux	RA: 5h36m06.53s DEC: -69d13m31.3s	180.6117249 MJy/sr
Aperture Centroid	RA: 5h36m08.67s DEC: -69d13m28.0s	
Flux Weighted Centroid	RA: 5h36m06.33s DEC: -69d13m34.4s	

Close

?

Note that it calculates the location of the minimum and maximum fluxes, and the aperture and flux-weighted centroids; the flux values given are in the same units as the FITS file. If you put your mouse over the row of the table in the pop-up, that location appears as an 'x' on the image.



Search

This tool implements a new search, an "action", on the region you have selected. It results in this drop-down (right). where this example is based on a 4-cornered polygon. (You can also use the region tool to define a cone; this example happens to be a rectangle.) From this drop-down, you can

Polygon Actions

Search (cone) using NED with radius of 0.0025 degrees

Search (cone) using Simbad with radius of 0.0025 degrees

Go to Simbad and search (cone) with radius of 0.0025 degrees

Refine search region

launch:

- ◇ A NED cone search at this position with a radius attempting to correspond to this polygon ([more information about NED searches](#)); results loaded into this tool.
- ◇ A Simbad cone search at this position with a radius attempting to correspond to this polygon; results loaded into this tool.
- ◇ A Simbad cone search at this position with a radius attempting to correspond to this polygon, but launch another browser window or tab at Simbad with the results.
- ◇ Refine the search region.

The last option brings up another pop-up window (similar to [this](#)) that allows you to refine the search region iteratively by choosing a cone or polygon, setting the center, and setting the cone size or polygon vertices.

From here, you can change the kind of search, refine the positions, launch searches from your refined position (blue button on lower left), and select from the image again (drop-down on the lower right).

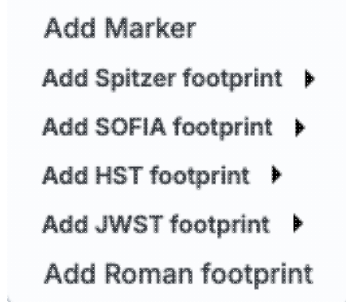
When you are working with the selection tool, this: **End Select** appears next to the image toolbar to remind you that you are in that mode. If you are refining positions for a search, it will be **End Search Marker**. Either way, when you are done with the selection tool, if your other actions don't turn off the selection tool, click on that text to turn it off.

Tips and Troubleshooting

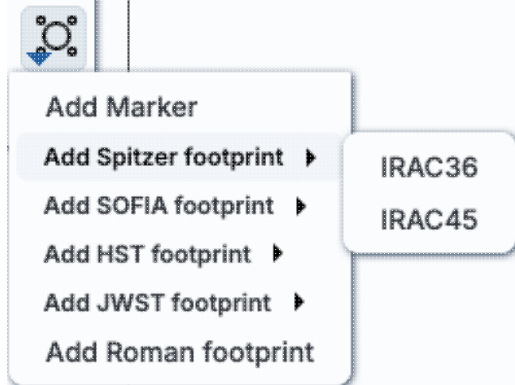
- The "region selection" tool also appears in the slightly different context of [interactive target refinement](#) in several other places in this tool, where it works in a a very similar fashion.

Footprints

The marker icon () has a drop-down menu with several possible options:



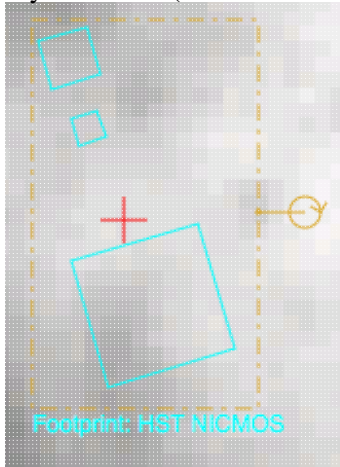
Any of the options with an arrow on the right can expand to additional subsidiary choices, e.g.,:



We now describe these various footprints here.

For each of these choices, the markers appear initially in the center of the loaded images. The first mouse click you make in any of the images will move the marker to that location.

Each of these marker choices, when overlaid and/or selected as 'active', has a dot-dash square around it. If it is asymmetrical (most of them are), it has an additional "appendage" and a red plus at the center of the footprint:



These so-called "handles" allow you to resize and/or rotate the marker, depending on the nature of the marker. These handles only appear when the marker is selected as active; if you wait a few seconds, they vanish.

Tips and Troubleshooting

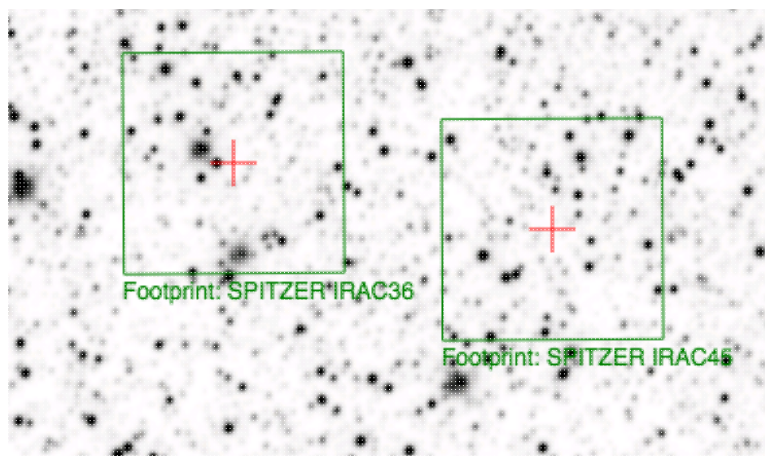
Euclid Help

- Some of these footprints are *large*. If you have a small image, some of these footprints will be larger than your image. Zoom out to see it, or find a larger image to use. If you overlay, say, a Nancy Grace Roman Space Telescope (formerly WFIRST) footprint on a 2MASS Atlas FITS image, you may need to zoom out a considerable amount before you can see the Roman footprint. You will see the center indicator of the marker before you will see the Roman footprint itself.
- You can add multiple copies of the same marker using the [layers pop-up](#) (described generally above). From the layers pop-up, there is a link right under the 'angle' option that says "Add another [marker type]" -- click on that to get an additional marker of the same type. You can also add a label to the marker from the layers pop-up, or change its color.
- If you have many footprints on the same image, you may have trouble grabbing and moving footprints lower in the stack of layers on the image. For example, overlay footprint 1, then footprint 2, and you might have a hard time grabbing and rotating footprint 1 after footprint 2 has been added. The only workaround here is to use the layers pop-up (described generally above) to temporarily hide footprint 2, then move footprint 1, then restore footprint 2.
- If you have images of very different resolutions loaded (e.g., IRAS and really anything else), sometimes it struggles to render the marker on each image. You may need to place markers on one image at a time. (Unclick the "lock color & overlays" option to place markers one image at a time.)



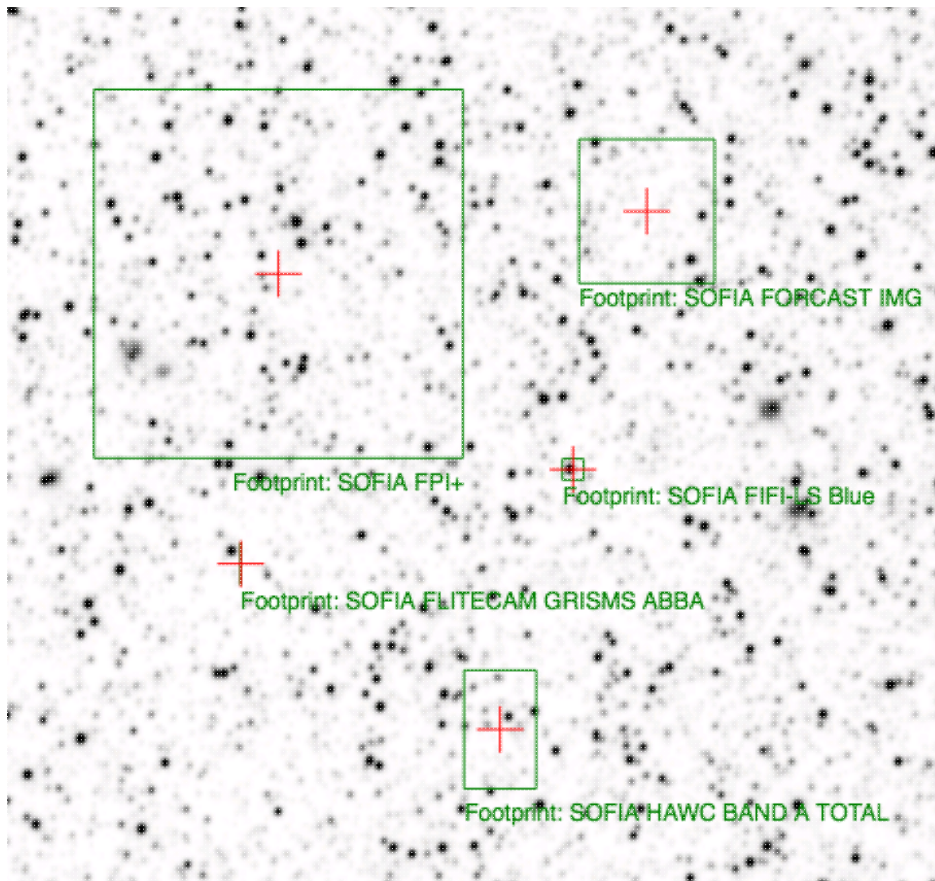
The first overlay choice (simply called 'marker') is a red circle.

The remaining markers are all footprints from various telescopes: Spitzer, SOFIA, HST, JWST, and Roman. HST, JWST and Roman are derived from information provided via MAST (see <http://gsss.stsci.edu/webservices/footprints/help.html> ) For Roman in particular, they are pre-launch values.



Spitzer/IRAC 3.6 and 4.5 micron footprints.

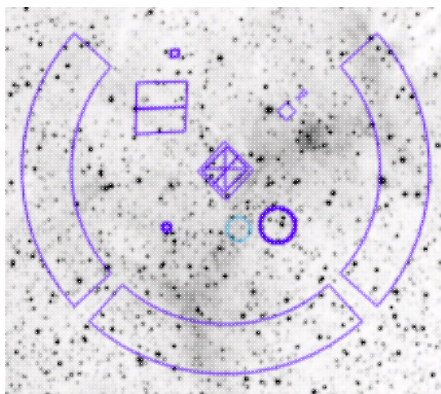
These two footprints are placed separately from each other. The footprint can be moved or rotated. Click and drag the center of the footprint. A circle appears with four small circles ("handles") around it. Grab and drag the small circles to rotate it, or drag the big circle to move it. Change the color, delete, or add more copies of the IRAC footprints from the layers pop-up.



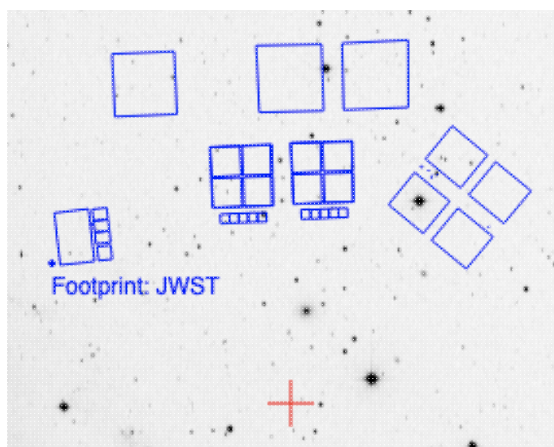
SOFIA footprints. Several different SOFIA footprints are available; the graphic here shows a selection of them. The available footprints (all of which are placed separately) are:

- FIFI-LS
 - ◆ Blue (50-120 microns)
 - ◆ Red (110-200 microns)
- FLITECAM
 - ◆ Imaging
 - ◆ Grism ABBA
 - ◆ Grism AB
- FORCAST
 - ◆ Imaging
 - ◆ Grism a
 - ◆ Grism b
- FPI+
- HAWC+
 - ◆ 53 microns (Band A), Total Intensity
 - ◆ 53 microns (Band A), Polarization
 - ◆ 89 microns (Band C), Total Intensity
 - ◆ 89 microns (Band C), Polarization
 - ◆ 154 microns (Band D), Total Intensity
 - ◆ 154 microns (Band D), Polarization
 - ◆ 214 microns (Band E), Total Intensity
 - ◆ 214 microns (Band E), Polarization

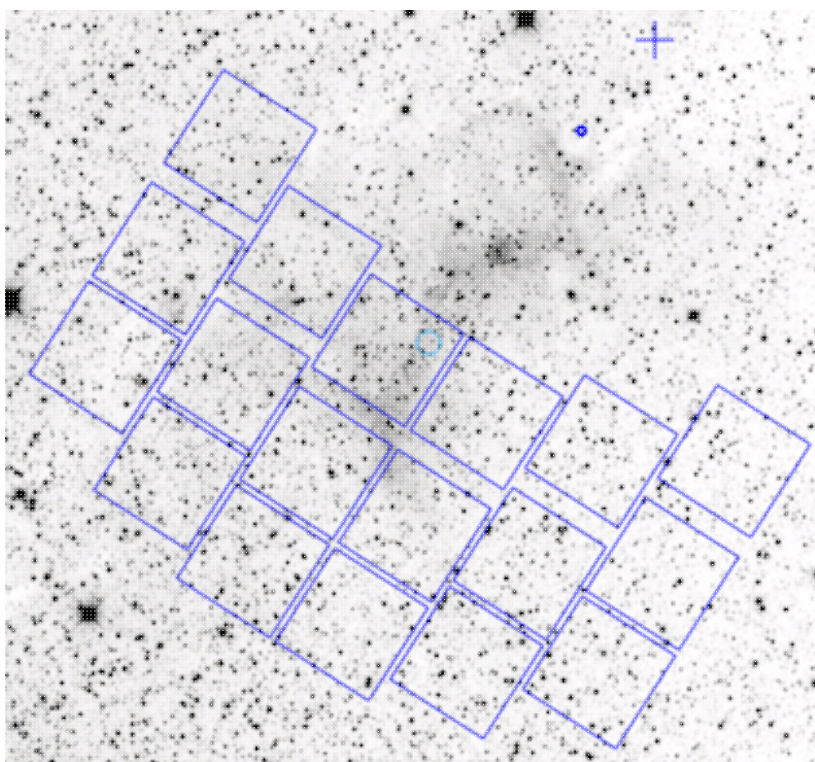
Change the color, delete, or add more copies of the SOFIA footprints from the layers pop-up.



HST footprints. You can overlay the whole focal plane footprint, shown here, or individual instrument footprints (NICMOS, WFPC2, ACS/WFC, ACS/HRC, ACS/SBC, WFC3/UVIS, and WFC3/IR). Consult the [HST documentation](#)  for specifics on which apertures are which. The footprint can be moved or rotated. Click and drag the center of the footprint. A circle appears with four small circles ("handles") around it. Grab and drag the small circles to rotate it, or drag the big circle to move it. **Note that** if you overlay the footprint on a very small image, nothing will appear to have happened. You need at least a 45 arcmin image to comfortably see the footprint. Change the color, delete, or add more copies of the HST footprints from the layers pop-up.



JWST footprints. You can overlay the whole focal plane footprint, shown here, or individual instrument footprints (FGS, MIRI, NIRCAM, NIS, and NIRSPEC). **Note that** if you overlay the footprint on a very small image, nothing will appear to have happened. You need at least a 30 arcmin image to comfortably see the entire JWST focal plane. Please consult the [JWST documentation](#)  for details about the footprints. In all cases, if the footprint is 'active', a circle near the middle of the footprint will appear with four small circles ("handles") around it. Grab and drag the small circles to rotate it, or drag the big circle to move it. Change the color, delete, or add more copies of the footprints from the layers pop-up.



Nancy Grace Roman Space Telescope

focal plane footprint. As above, the footprint can be moved or rotated. Click and drag the boresight (the cross hairs), which appears by default to the upper right of the array of squares. A circle appears, centered on the boresight, with four small circles ("handles") around it. Grab and drag the small circles to rotate it, or drag the big circle to move it. **Note that** if you overlay the footprint on a very small image, nothing will appear to have happened. You need at least a 60 arcmin image to comfortably see the footprint, and even then you will probably have to click and drag to see the entire footprint. Consult the [Roman documentation](#)  for specifics on the apertures. Change the color, delete, or add more copies of the Roman footprint from the layers pop-up.

HiPS Images: General Information & Definitions

[HiPS](#)  stands for hierarchical progressive surveys, and these kinds of images are multi-resolution [HEALPix](#)  images (where HEALPix stands for Hierarchical Equal Area isoLatitude Pixelation). (Also see [IVOA docs on HiPS](#) .) In practice, what this means is that you can interact with images of a very large chunk of sky, and as you zoom, the pixel size changes dynamically. HiPS images are fundamentally different than FITS images, and as such, what you can do with the HiPS images are different than what you can do with the FITS images.

The whole point of HiPS images is to provide on-demand resolution changes. Zoom out, and it loads large pixels. Zoom in, and it loads smaller pixels. HiPS images are designed to cover large areas of sky efficiently. If you need to visualize many degrees, this is the image type to use. This is why HiPS images are used in this tool for [coverage images](#).

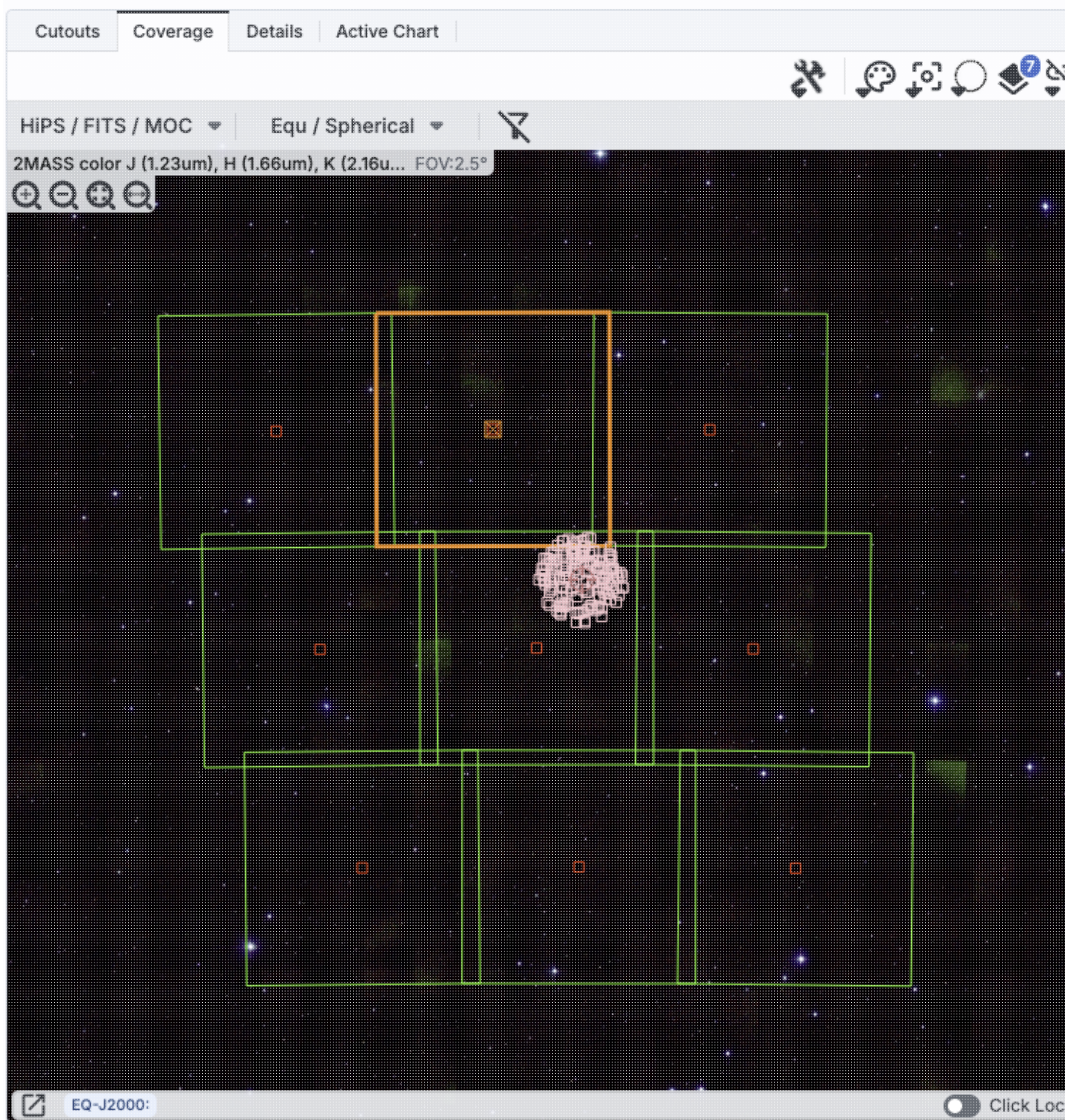
HiPS images typically have the color and stretch set by the person who originally made them. The color table can be remapped within this tool. But, you cannot, in general, change the stretch of HiPS images with as much flexibility as you can with FITS images. This is why there may be multiple versions of some data sets available.

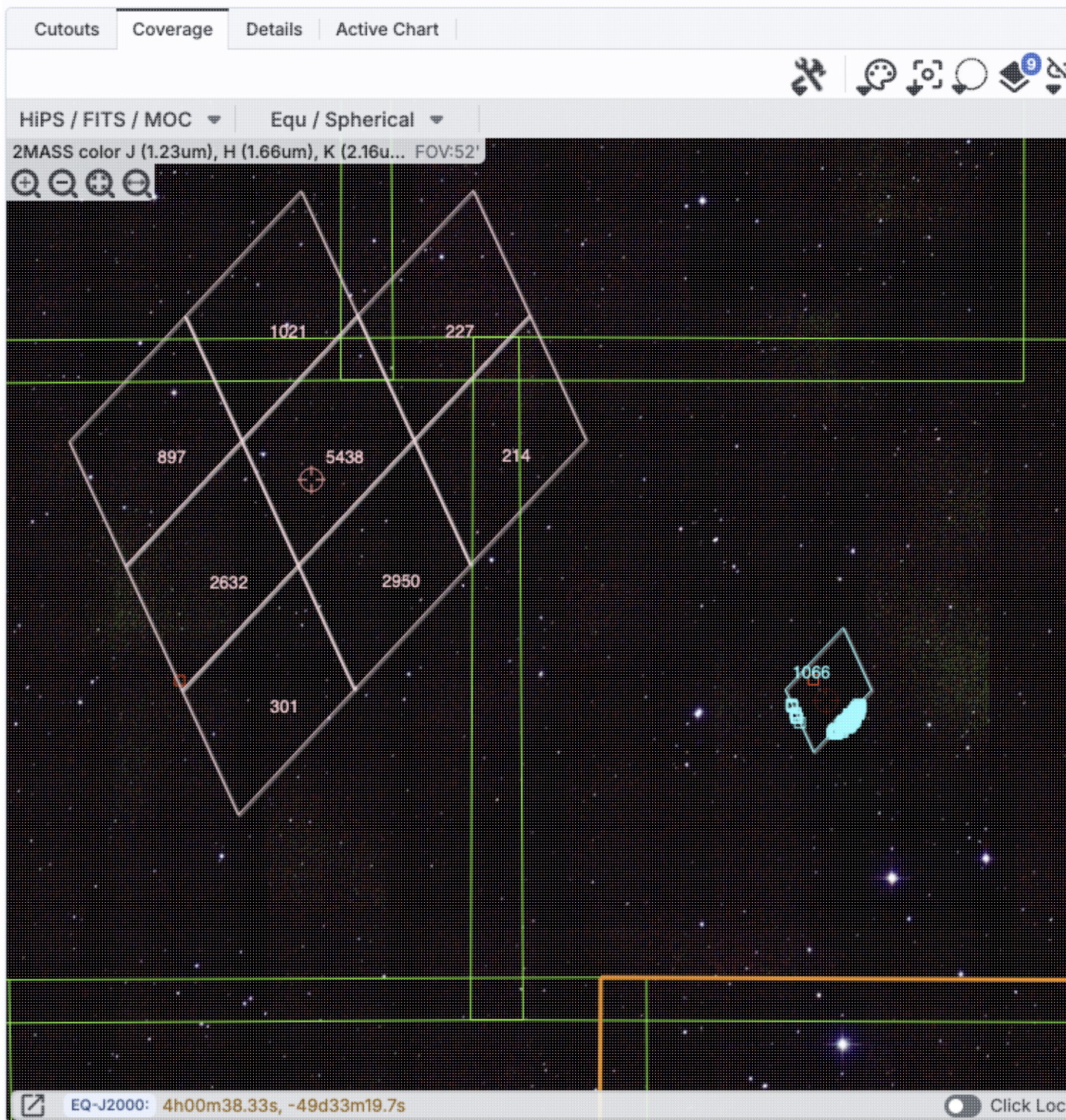
HiPS maps typically come with a **Multi-Order Coverage map (MOC)**. A [MOC](#)  is a format developed by the International Virtual Observatory Alliance to specify sky regions. In this context, a MOC tells you via a

simple boolean yes/no, is there sky coverage from this data set in this region. You can overlay a MOC from one data set onto a completely different data set's HiPS image. The Euclid Data Explorer uses MOCs to show you the planned coverage and the released data on the two main search screens. You can also use MOCs to, say, overlay the MOC from an entirely different survey onto the Euclid MOC to see if there are data from it that overlap with Euclid.

Coverage Image

When the Euclid Data Explorer returns search [results](#), one of the tabs it returns on the right hand side is a "coverage image", which is basically a way for it (and you) to keep track of where you are working on the sky, and to show you an overview of the results.





You can interact with the coverage image in the same way as you would any other image loaded into this tool.

The thing that makes a coverage image a little bit different, however, is that it can automatically adapt, even

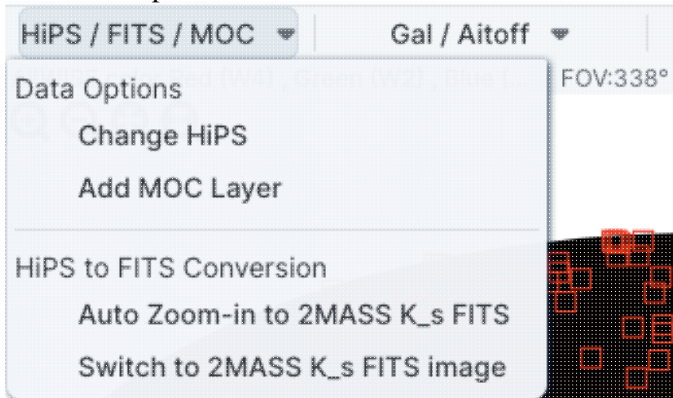
beyond what a HiPS image can intrinsically do. The next subsection includes more details about how it can automatically change to accommodate your needs and zoom level.

Upper Left HiPS menus

In the upper left of the coverage image, there are two drop-down menus.



The first drop-down menu looks like this.

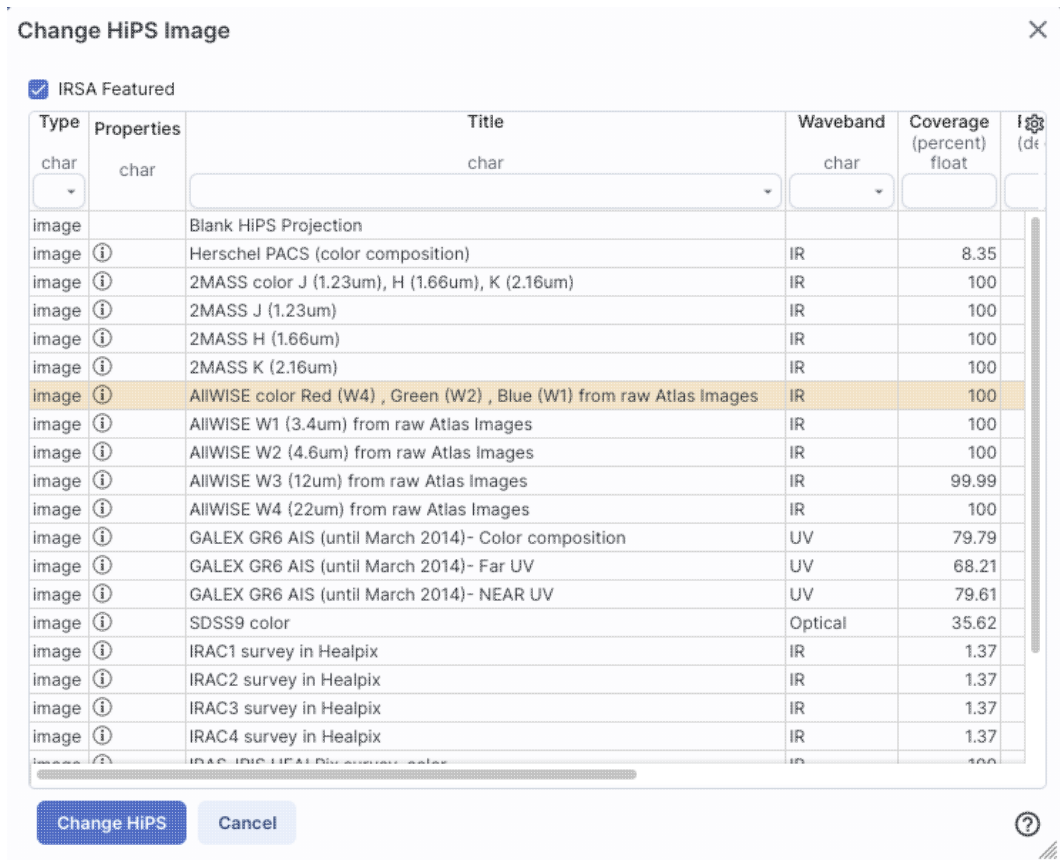


There are two sections here.

Under "Data Options", you can change what data are shown.

Change HiPS: Changing HiPS images

The choices made by any given creator of a HiPS image may result in any particular region being saturated or too faint to see. Color stretches are set by the creator of the HiPS map and cannot be changed; color tables can be somewhat changed by this tool, but that may be insufficient for your needs. If the HiPS map as shown does not suit your needs and you wish to change the HiPS image, click on the "HiPS/MOC" menu, and then click "Change HiPS". It brings up this pop-up:



Things to note:

- To select a new image, click on the row corresponding to the new HiPS image you want, and click "Change HiPS" on the bottom left.
- To cancel without selecting a new image, click "Cancel."
- This is an interactive table, so all the [filtering](#) and [column manipulation](#) tools apply here too. You can filter down the columns to find the image you want to use.
- To learn more about each HiPS map, click on the i with the circle in the second column. It will spawn another window with standardized information about the HiPS map.
- By default, it shows HiPS maps corresponding to IRSA data collections. To see a more comprehensive list, unclick the box marked "IRSA Featured."

Add MOC Layer: Adding a MOC Overlay

It is often useful to see what other data are available. Click on the "HiPS/MOC" menu, and then click "Add MOC Layer." It brings up this pop-up:

Add MOC Layer ✕

Search Use my MOC

☒ Featured MOC

Coverage (percent) float	Waveband char	Title char	HiPS Order (HEALPix) int	Release Date (date) char
8.35	IR	Herschel PACS (color composition)	9	2019-07-31T11
79.79	UV	GALEX GR6 AIS (until March 2014)- Color composition	8	2019-05-05T00
68.21	UV	GALEX GR6 AIS (until March 2014)- Far UV	8	2019-05-05T00
35.62	Optical	SDSS9 color	10	2019-05-05T00
1.37	IR	IRAC1 survey in Healpix	9	2019-05-05T00
1.37	IR	IRAC2 survey in Healpix	9	2019-05-05T00
1.37	IR	IRAC3 survey in Healpix	9	2019-05-05T00
1.37	IR	IRAC4 survey in Healpix	9	2019-05-05T00
77.08	Radio	HIPASS	3	2019-05-22T11
12.7	Optical	DES-DR1 Y	11	2019-07-05T11
12.84	Optical	DES-DR1 g	11	2019-05-23T11
12.7	Optical	DES-DR1 i	11	2019-05-23T11
12.7	Optical	DES-DR1 r	11	2019-06-04T11
12.71	Optical	DES-DR1 z	11	2019-06-11T11
0.01906	Optical	HLA-SDSSg : F475W	13	2023-03-09T11
0.00126	Optical	HST PHAT - F275W - WFC3/UVIS	14	2019-05-05T00
82.42	Radio	NVSS - The NRAO VLA Sky Survey (intensity maps)	5	2019-05-05T00
78.12	Optical	PanSTARRS DR1 color (from bands z and g)	11	2019-05-20T00
97.14	UV	ROSAT Wide Field Camera Color composition	3	2019-05-20T11

Add MOC Cancel ?

Things to note:

- Coverage (the first column) is the fraction of the sky covered by that MOC.
- To select a new MOC, click on the row corresponding to the new MOC you want, and click "Add MOC" on the bottom left.
- To cancel without selecting a new image, click "Cancel."
- This is an interactive table, so all the [filtering](#) and [column manipulation](#) tools apply here too. You can filter down the columns to find the image you want to use.
- By default, it shows MOCs likely to be most interesting for IRSA users. To see a more comprehensive list, unclick the box at the top left.
- If you have your own MOC FITS file, you may upload it via the "Use my MOC" tab on the top center.

Under "HiPS to FITS Conversion", you can control whether the viewer will automatically toggle between image types as needed.

By default, the coverage image is most likely a HiPS image. FITS images are best for small regions of the sky, and HiPS images are best for large regions of sky.

Auto Zoom-in to 2MASS K_s FITS:

If you select this, then when you zoom in very close to a target, it will automatically convert to a FITS image when you get close enough.

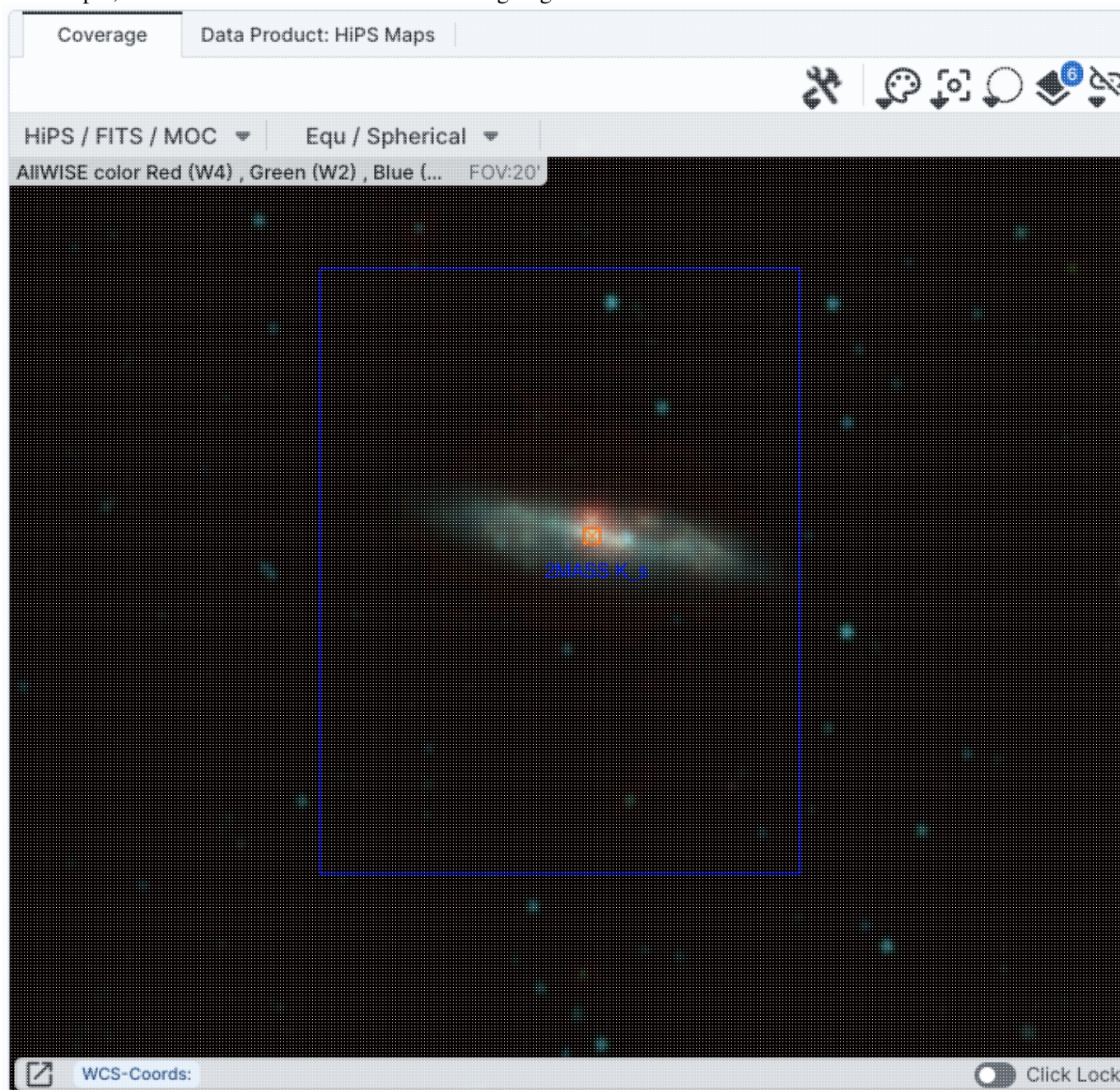
Switch to 2MASS K_s FITS image:

If you select this, then it will jump directly to a FITS image centered on the currently selected target.

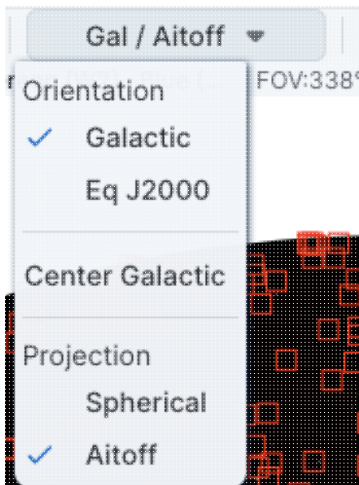
Note that if you swap between HiPS and FITS and back again, it will include a region on the HiPS image that is the footprint of the FITS images you had just loaded. A label appears at the center of that

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footprint, which may be disconcerting if you are not zoomed out enough to see the region itself. Here is an example, zoomed out so it is more clear what is going on:



The second drop-down menu looks like this.



There are three sections in this menu.

Orientation

Under "Orientation", you can control whether the coordinates are in Galactic or Equatorial J2000 (RA/Dec). This can be used in conjunction with the image readout and/or the coordinate layer button.

Center Galactic

If you select "Center Galactic", the HiPS image slews to put Galactic North up, the Galactic Center in the center of the field of view, and the Galactic Plane horizontally across your field of view. This is useful if you have been zooming or scrolling around to look at individual sources and need to bring it back to a familiar orientation quickly.

Projection

Under "Projection", you can control whether the display is in Spherical or Aitoff coordinates. Aitoff projection works better for all-sky displays.



Euclid Data Explorer at IRSA: Tables

All of the tables in the Euclid Data Explorer at IRSA (whether they are the results of a search, catalogs, the contents of a FITS header, or something else) are interactive tables, and they have the same basic properties, discussed in this section. The specific broad case of [catalogs](#) is in another section.

Contents of page/chapter:

- +[Table Header](#)
- +[Table Columns](#)
- +[Adding Columns](#)
- +[Table Filters](#)
- +[Table Actions: Searches](#)
- +[Row Details](#)
- +[Table Cells](#)
- +[Saving Tables](#)
- +[Table Navigation](#)

Table Header

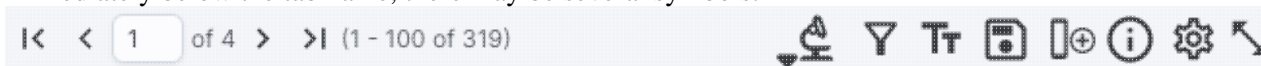
These interactive tables -- called Firefly tables, after the software that is running here -- all have the same functionality, regardless of the contents of the table. If it looks like this sort of table, you can work with it whether it is a catalog, an image header, a list of images, etc.

If you have loaded a table into a tab and it doesn't take up the whole screen, to see more of the window, grab the divider between the window panes and slide it up/down or over as needed, or use the expand arrow icon () to enlarge the window pane to take up the whole window.

The table is shown exactly as it has been provided to the tool, with all columns as defined by the creator of the table. To understand what each column is, please see the documentation associated with that catalog or table.

The tab (and table) name itself likely indicates its origin. To remove the tab, it is likely that you can click on the "X" on the tab.

Immediately below the tab name, there may be several symbols:



which we now describe, going from left to right along the top of the tab.

Tips and Troubleshooting : If you can't see the complete collection of tools, you can make your browser window larger, make the table window larger (using , as above), or grab the divider between the window panes and slide it up/down or over as needed.



Table navigation

The first thing to notice is that (typically) only the first 100 rows of the retrieved catalog (or table) are displayed in the table. In the example here, there are 319 sources that were retrieved as a result of the search, grouped into 4 'pages.' The left/right black arrows plus the page number allow you to navigate

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among these 'pages' of 100 sources each. Note that the entire set of results (not just the 100 rows you are currently viewing) can be sorted by clicking on any column's name.



Table Actions: Searches

This drop-down has choices to launch new searches, and as such, it has a [separate section below](#).



Filter

Filters are complex and powerful enough that they are covered in a [separate section below](#).



Table as text

Clicking on this changes the table display into a fixed-width text display. The icon then changes to  click this again to return to the default table view.



Save table

This is how you can save the table. It has a [separate section below](#).



Add a column

This icon adds a new column to the table. This has a [separate section below](#).



Info link

You may or may not see this icon. This is an "information" button and, if it exists, it may provide additional information about the table. It could have information about the job that was used to retrieve it:

Table Info

Job Info

Table Metadata

Phase: COMPLETED

Job ID: 45-qbh48_14768035791

Created: 2025-06-06T22:13:55.791Z

Owner:

Start Time: 2025-06-06T22:13:55.803Z

Run time limit: 86400s

End Time: 2025-06-06T22:13:59.942Z

Actual run time: 4s

Planned end:

Destruction: 2025-06-13T22:13:55.791Z

Parameters

request: {"RequestClass":"ServerRequest","META_INFO":{"jobId":"45-qbh48_14768035791","dataServiceOptions":}

cmd: tableSearch

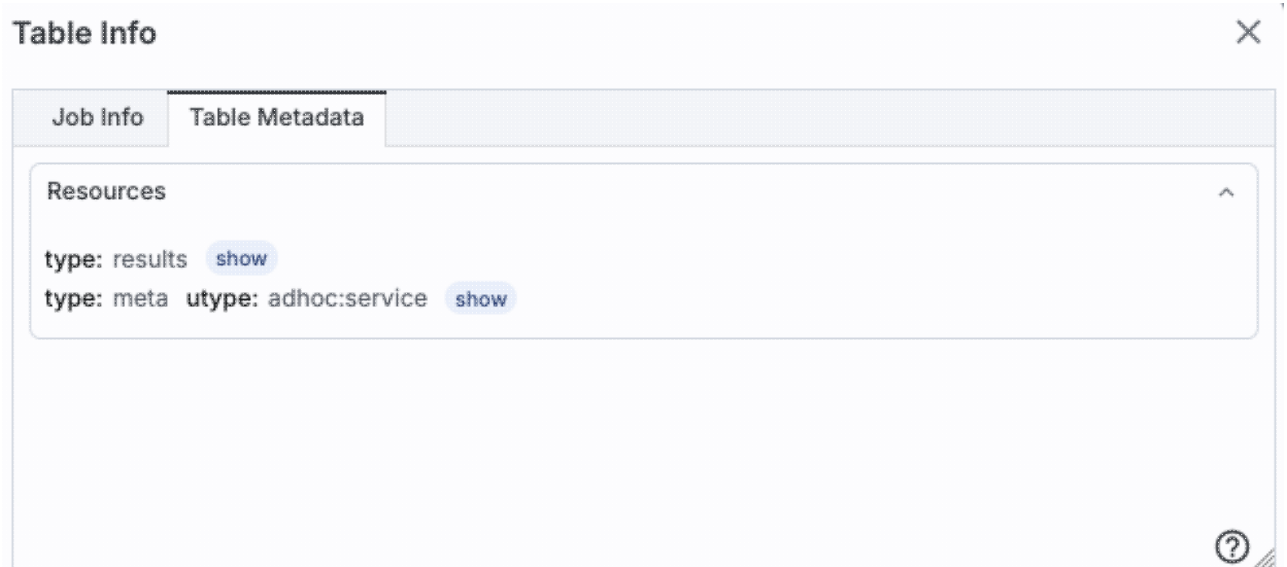
Extra Information

userEmail: Guest

userId: Guest

title: Objects_1

where the direct link to the job is given there (and can be copied by clicking on the clipboard, ready to be pasted into a helpdesk query, for example), with a job id as shown. It could also just have information about the table metadata:



where the information about this table includes information about the query that produced it.



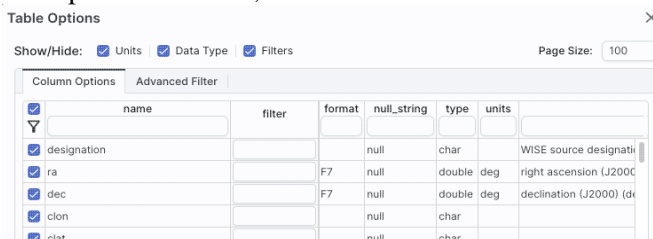
Row details

You may or may not see this icon. This is how you get more information about the currently-selected row. It has a [separate section below](#).



Table options

Clicking on this icon brings up options for the table, e.g., how many rows are displayed per page, which columns are shown, metadata about each column if available, whether units and data types are shown at the top of the column, shown here:



By default, it is often but not always the case that all columns are shown. To show or hide columns, select the tickbox in each given row. The default page size is 100 rows. Note that expanding the page size to numbers much greater than 100 may result in a substantial performance degradation (e.g., your browser will appear to freeze or not appear to be doing anything while it manages and renders the large table). See the [Filters section below](#) for more things to do from the table options pop-up.



Expand

Clicking on this expands the catalog window pane to take up the entire browser window. To return to the prior view, click on "Close" in the upper left.



Help

The last option on the top of the catalog tab may be a context-sensitive help marker, which should bring you to this online help.

Table Columns

Depending on what you did to display a table, the columns that are shown may be in easily-human-readable form, or may reflect column names used within the individual catalog. Please consult the detailed documentation associated with your specific table if the headers are not clear to you.

The table is shown exactly as it appears in the corresponding database (or as it appeared on your disk), with all columns as defined for that catalog. To understand what each column is, please see the documentation associated with that catalog. (For IRSA catalogs, this documentation is available via navigating through the IRSA website.)

Clicking on the column names sorts the table by that column; clicking once sorts in ascending order, clicking a second time sorts in descending order, and clicking a third time returns the table to the original order. Small arrows appear next to the column names to remind you if the column is sorted in ascending or descending order. When you do a single-position search on catalogs, depending on how you do it, it could be that two new columns are appended to the end of the catalog as it is returned to you. These columns are:

- dist - the distance between the source in question and the location you specified
- angle - the position angle between the target position you requested and the object it found (degrees E of N)

When you do a multi-position search on catalogs, you could have three new columns prepended to the catalog as it is returned to you. These columns are :

- cntr_01 - the target position you requested
- dist_x - the distance between the target position you requested and the object it found
- pang_x - the position angle between the target position you requested and the object it found (degrees E of N)

These additional columns can help you assess if the target it found is the target that should be matched to the position you requested.

It could be that, when you do a multi-position search on catalogs, you have an option for "one-to-one matching". If that is selected, the line (and only one line) of output is included for each line of input. It chooses the closest source within the radius you specify, or if there is no match, it adds a line indicating no match.

Tips and Troubleshooting

- You can hide or display columns; click on the gears () to get to the table options, and tick the box corresponding to the row you want to hide or show.
- If you are constructing and loading your own catalog where you don't specify the formatting, the tool tries to guess the formatting of the column based on the first row's values. Therefore, if you have a value in the first row that happens to be a string like "null" where the rest of the column isn't like that, or happens to have only one decimal place where the rest of the column has 2 or more, it will guess incorrectly and format the other rows just like the first one. Try editing your catalog file to put the most general case as the first row.
- If you create a new column that turns a floating point column into an integer with the "FLOOR()" function, you need to be sure to set the resulting column type to "long". For example, if you have data covering several days or years, and you have a column that is a floating-point MJD, you can convert it into an integer, e.g., via FLOOR(mjd) for days or FLOOR(mjd/365.24) for years, then you can use the

drop-down filter menu for the new column to quickly compare different time ranges. But, the new column must be an integer (e.g., "long") in order for this to work properly.

- If you need to, say, take the square root of a column that occasionally has a negative number, and you want it to attempt to handle this in a physically reasonable manner, you can construct expressions like this for a column named 'col' that has some positive and some negative numbers:
`if("col">=0,sqrt("col"),-sqrt(-"col"))`

Adding Columns

This icon



allows you to add a new column to your catalog. When you click on it, it brings up this pop-up window:

This window asks for:

- *Name* of the column (required) -- it cannot have special characters like a minus sign or a percent symbol; you can only use letters, numbers, and underscores.
- *Mode* "Enter expression" or "Use preset function" -- options shown here correspond to "Enter expression" options; the preset function options are included in the last bullet here.
- *Expression* (required) -- using basic SQL operators, you can manipulate columns to create the new column. (See more on this below.)
- *Data Type* -- specify if your new column is a double precision floating point ("double"), a long integer ("long"), or a string ("char").
- *Precision* -- if you have selected "double" for data type, select how many decimal places your new column should display. For example, if you want the numbers to display as 1.23, enter "F2".
- *Units* -- specify the units of your new column. For more information, see [IVOA documentation](#)
- *UCD*, or unified content descriptor -- for VO compliance, add this for your new column. For more information, see [IVOA documentation](#)
- *Description* -- add a description for your new column.
- *Select a preset* -- if you select "Use preset function", you can choose (a) "set filtered rows to 'true' and the rest to 'false'", (b) "set selected rows to 'true' and the rest to 'false'", or (c) "number rows in current sort order". These options are useful for tagging items you have selected in myriad ways (from plots, images, complicated filters), or ordered in complicated ways. For example, if you have constructed a complicated filter, then you can create a column that is true for the selected rows; if you cancel the complicated filter, you can then easily recreate the complicated filter by simply filtering on your newly created column.

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In order to construct the expression for your new column, your input should follow the syntax of an SQL expression. If you click on the magnifying glass next to the form input, you get a pop-up window that can help you construct an expression; click "apply" to apply the expression.

You need to use the column names exactly as they appear in your catalog. Supported operators are: +, -, *, /, =, >, <, >=, <=, !=, LIKE, IN, IS NULL, IS NOT NULL. You may use functions as well; for a list of all available functions, [see here](#) . Some examples include:

- "w3mpro" - "w4mpro"
- $\sqrt{\text{power}(\text{"w3sigmpro"},2) + \text{power}(\text{"w4sigmpro"},2)}$
- $(\text{"ra"} - 82.0158188) * \cos(\text{radians}(\text{"dec"}))$
- $\text{"phot_g_mean_mag"} - (5 * \log_{10}(1000 / \text{"parallax"}) - 5)$

Tips and Troubleshooting

- When you create a new column that is calculated from other columns, it is created statically. That is, it is not dynamically updated like a spreadsheet, but calculated once and left alone after that.
- When you create a new column, the header of the new column is red to let you know that the column is not present in the original catalog.
- When you save the catalog, the header of the saved catalog indicates that you have added a column. When you load the catalog back into the tool, the header of the new column is still red.
- You can edit or delete columns after you have created them; click on the gears () to get to the table options, and then click on the edit icon to bring up a dialog box to edit or delete the column.
- You can hide columns; click on the gears () to get to the table options, and tick the box corresponding to the row you want to hide or show.

Table Filters

Filters are a *very* powerful way of exploring the table full of search results. Click on this icon  in order to start the process of adding filters. A text entry box appears above each of the current catalog columns, with a small version of the filter icon corresponding to that row on the far left. You can type operators and values in these boxes -- hit return or tab after typing or click in another box to implement the filter.

Example: From a catalog, show only those sources with declination above a certain value (say, 31 degrees), type "> 31" in the box at the top of the "dec" column. Or, if you have retrieved a WISE catalog and would like to only view the objects with a W1 (3.4 micron) profile-fitted magnitude less than 6 magnitudes, in the box at the top of the 'w1mpro' column, type "< 6" in the form.

For columns (fields) with a limited set of choices, on the right edge of the text entry box, an arrow appears; click on it to get a drop-down from which you can select the available choices. To implement the filter, make the choices, and click "Apply" when you are done. Click "clear" in the top of the drop-down menu to remove that filter.

Type	Ba
clear ☒ all-sky ☒ compilation ☐ extragalactic ☐ galactic ☐ simulated Apply	

After you impose a filter, then the number of rows in the table is restricted according to the rules you have specified, and the "filters" icon on the top right of the catalog pane has changed to remind you that there has

been a filter applied, in this case four filters: . To clear the filters, click on the cancel filters icon (which also appears after you impose filters): .

Filters can be used in combination. Note that the filters between columns are logically "AND"ed together, but filters within the same column can be logically "AND"ed or "OR"ed together; examples are below.

The available logical operators are :

- = which means 'equal to' (exactly!), e.g., the parameter on which you are querying (the column headers as shown) is exactly equal to this value you are specifying.
- > which means 'greater than'
- < which mean 'less than'
- != which means 'not equal to' (exactly!)
- >= which means 'greater than or equal to'
- <= which means 'less than or equal to'
- IN which means 'included within this list', e.g., the parameter on which you are querying is included within the list you are specifying (if the column filter is free-form text, type "value1,value2" and it will give you rows that have value1 or value2).
- LIKE which means 'resembles the text that is entered', e.g., the text resembles the text that you type in the box.
- IS which effectively is the same as =
- IS NOT which effectively is the same as !=

Examples:

- Retain rows for which a certain parameter is not an empty string: !="
- Retain rows for which a certain parameter is not NULL and is larger than 1.234: > 1.234 and IS NOT NULL
- Retain rows that have values between -0.5 and 1.25: > -05 and < 1.25
- Retain rows with a parameter greater than one value or exactly not equal to another value: > 12345 or != 3000
- Retain rows with a parameter equal to one of the values in a list: IN a,b,c,d

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You can also interactively impose filters from [plots](#) from a catalog. Moreover, all the same operators that are available for making [plots](#) can be applied in filters. In both cases, see the plots section for more information.

You may also be able to select rows one at a time via the far left column and then filter that down. Example: Retrieve a catalog of any sort. Select rows by ticking the box on the far left, say, every other row out of the first 12. Click on the filter icon on the top of the column. The filter is imposed to only include the 6 rows you selected.

If you click on the table options icon (), you get a pop-up that includes a place to filter columns. Here is an example of the table columns for a Euclid catalog that has been filtered to just have errors < 0.1 uJy in each of Y, J, and H:

Table Options

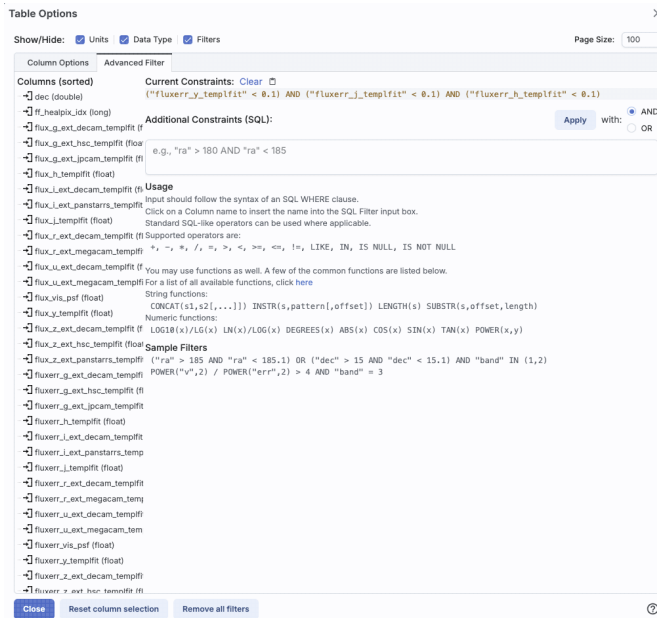
Show/Hide: ☒ Units ☒ Data Type ☒ Filters Page Size: 100

☒	name	filter	format	type	units	arraySize	UCD
☒	id			char		*	
☒	tileid			long	NA		Euclid Tile ID
☒	ra		F10	double	deg		pos.eq.ra: Source barycenter RA coordinate (SE
☒	dec		F10	double	deg		pos.eq.dec: Source barycenter DEC coordinate (SE
☒	flux_vis_psf		F10	float	uJy		VIS band source PSF-fitting photometr
☒	fluxerr_vis_psf		F10	float	uJy		VIS band source PSF-fitting photometr
☒	flux_y_templatefit		F10	float	uJy		NIR Y band source template fitting flux
☒	fluxerr_y_templatefit	< 0.1	F10	float	uJy		NIR Y band source template fitting flux
☒	flux_j_templatefit		F10	float	uJy		NIR J band source template fitting flux
☒	fluxerr_j_templatefit	< 0.1	F10	float	uJy		NIR J band source template fitting flux
☒	flux_h_templatefit		F10	float	uJy		NIR H band source template fitting flux
☒	fluxerr_h_templatefit	< 0.1	F10	float	uJy		NIR H band source template fitting flux
☒	flux_u_ext_decam_templatefit		F10	float	uJy		Uext DECam band source template fitti
☒	fluxerr_u_ext_decam_templatefit		F10	float	uJy		Uext DECam band source template fitti
☒	flux_g_ext_decam_templatefit		F10	float	uJy		Gext DECam band source template fitti
☒	fluxerr_g_ext_decam_templatefit		F10	float	uJy		Gext DECam band source template fitti
☒	flux_r_ext_decam_templatefit		F10	float	uJy		Rext DECam band source template fitti
☒	fluxerr_r_ext_decam_templatefit		F10	float	uJy		Rext DECam band source template fitti
☒	flux_i_ext_decam_templatefit		F10	float	uJy		Iext DECam band source template fitti
☒	fluxerr_i_ext_decam_templatefit		F10	float	uJy		Iext DECam band source template fitti
☒	flux_z_ext_decam_templatefit		F10	float	uJy		Zext DECam band source template fitti
☒	fluxerr_z_ext_decam_templatefit		F10	float	uJy		Zext DECam band source template fitti
☒	flux_u_ext_megacam_templatefit		F10	float	uJy		Uext Megacam band source template f
☒	fluxerr_u_ext_megacam_templatefit		F10	float	uJy		Uext Megacam band source template f
☒	flux_r_ext_megacam_templatefit		F10	float	uJy		Rext Megacam band source template f
☒	fluxerr_r_ext_megacam_templatefit		F10	float	uJy		Rext Megacam band source template f
☒	flux_g_ext_jpcam_templatefit		F10	float	uJy		Gext JPCAM band source template fitti
☒	fluxerr_g_ext_jpcam_templatefit		F10	float	uJy		Gext JPCAM band source template fitti

Close Reset column selection Remove all filters

You can type in constraints in the filter box in much the same way as you can from the catalog itself; note that the column description is included here, which may make this way of setting filters more useful when working with a new (to you) catalog.

The second tab is the advanced filter interface:



Here, the columns are listed alphabetically on the left, the constraints you have imposed are in the "current constraints" box, and you can apply additional SQL constraints via the free-form text box. Hints for syntax are given below the entry box. This window can be resized such that you can see the whole set of hints and imposed filters. Note that in this interface, column headers must be enclosed within double quotes.

Cancelling filters

After you impose a filter, then the "filters" icon on the top right of the catalog pane has changed to remind you

that there has been a filter applied, in this case just one filter:  To clear all the filters at once, click on the cancel filters icon (which also appears after you impose filters): .

Tips and Troubleshooting

- If you impose logically inconsistent restrictions such as "exposure_time > 160" and "exposure_time < 100" (">160;<100" in the filter box for a column called "exposure_time"), no data will result, because no data are (can be) both less than 160 seconds long and greater than 100 seconds long at the same time. However, "exposure_time > 160 or < 100" works just fine (">160 or <100" in the filter box for the column "exposure-time").
- If you impose nonsensical filters (like using a letter where a number should be, like "w1snr < f") then it will let you know that something has gone really wrong, and let you go back to fix it.
- However, a filter like "ph_qual < f" could be valid -- if the column with which you are working is a string, then a string is a valid filter. It is case-insensitive. For the ph_qual column in the 2MASS catalog, the values are always three letters, such as AAA or ABA or CUU. A filter like "ph_qual < f" will operate as if you have alphabetized the list. Any string that starts with A comes before F and so will be retained. If you do "ph_qual < BBB" then AAA will be left in, but so will "BAU", because alphabetically, BAU precedes BBB.
- If you impose filters from a plot, it can manifest as several filters on the catalog, e.g., one for each side of the square you have drawn on the plot. If you want to remove, say, just one of the four filters (rather than all of them by cancelling all filters), you can do so from the table options pop-up.
- If you want to copy all of the "current constraints", even if the entire field is not visible to you, you can click on the clipboard icon to copy the entire string, and then paste it into another field or application to

see what it is.

- If you are choosing filters from a list of terms, cancelling those filters might not work the way it cavalierly seems like it should. If a down arrow appears next to the filter box, then a list of options you can select is available. Tick the boxes you want, and click "Apply" to apply the filter. Now, if you want to change the filter, click the down arrow, select different options, and click "Apply" again to re-impose the new filter. To remove the filter, you have to treat it like you would when applying a modified second filter -- unselect the choices, or hit 'clear', and **then hit Apply again**. If you deselect the choices and then click elsewhere in the window without hitting clear, your actions are interpreted as 'cancel without doing anything' as opposed to 'impose the new filter I just set' (which is 'cancel all filters'). When you are resetting the filter to be 'select nothing', it is treating that as a new filter setting, so you need to set up that filter and click 'Apply' in order for it to understand.
- If you impose filters from a plot, image, or table, you can cancel them from a plot, image, or table. That is, if you impose filters from a plot, and different additional filters from the image, when you click the 'cancel filters' icon from the table, *all* the filters are canceled at once. If you have filters imposed from multiple places, clicking on 'cancel filters' doesn't cancel just the filters imposed from that place; it cancels all of them. If you want to be able to reconstruct a complicated set of filters, though, you can add a column to your table that is one of the preset functions -- set it to true if the row is filtered. Then you can cancel all your filters at any time but you can easily recover the filtered data by filtering on that one new column.

Table Actions



This icon implements a new search, an 'action', on the currently selected row of the table. When you click on it, it reveals a drop-down:

Cone and Point Actions based on center: 62.165637, -47.999372 Equ J2000

Search NED at row with 5" radius

Search Simbad at row with 5" radius

Go to and Search Simbad at row with 5" radius

Show table of all Euclid products for this row

For this example, the selected row is 62.165637,-47999372 in J2000 decimal degrees. From this drop-down, you can:

- Launch a NED search at this position with a 5 arcsecond radius ([more information about NED searches](#))
- Launch a Simbad search at this position with a 5 arcsecond radius, and put the results in a table here in the tool
- Launch a Simbad search at this position with a 5 arcsecond radius, but start another browser window or tab at Simbad with the results
- Show a table of all Euclid products for this row.

Any of these searches (except the search that launches another browser window with the Simbad results) places the search results into this same tool.

Row Details



This icon is not always available. When it is available, when you click on it, a new pop-up window appears with information about the row you have selected:

Row Details: irsa_catalog_search_results.tbl



(1 - 51 of 51)

Y Tt [Icon] [Icon] [Icon]

☐	Name char	Value char	Units char	Type char
☐	cntr_01	1		long
☐	dist_x	0.602755	arcsec	double
☐	pang_x	122.272629	deg	double
☐	objname_01	HD787		char
☐	ra_01	3.0415960000E+0		double
☐	dec_01	-1.7938278000E+1		double
☐	designation	J001210.01-175618.1		char
☐	ra	3.0417448	deg	double
☐	dec	-17.9383674	deg	double
☐	sigra	0.0167	arcsec	double
☐	sigdec	0.0157	arcsec	double
☐	sigradec	-0.0050	arcsec	double
☐	w1mpro	-0.781	mag	double
☐	w1sigmpro	null	mag	double
☐	w1snr	0.3		double
☐	w1rchi2	2.183E-4		double
☐	w2mpro	-0.011	mag	double
☐	w2siampro	null	mag	double

In some tools, this content appears as additional tab elsewhere in the tool (not in the table pane, but often viewable at the same time as the table itself), as an additional tab called "Details."

In either incarnation, this information is sometimes called a "property sheet."

This table consists of each of the columns of the retrieved catalog with additional information about each field where available. (Not every catalog may have this information available.) For additional information, please consult the full documentation that accompanies the catalog.

Note that if you leave the pop-up or tab open as you select different rows in your main table (or catalog), it is dynamically updated.

Tips and Troubleshooting

- The property sheet is a more expanded, vertical view of the information shown in a row of a catalog, along with documentation of the catalog columns. If you think of the main table (catalog) view as a single row that you have to scroll left and right to see in its entirety, this view is sort of an orthogonal view, where you have all of the same contents of that row but shown as its own table, with the full header description, if available, and you can scroll up and down to see the entire contents (as opposed to left-right). *This is sometimes a more user-friendly way to view any given row.*
- Because you can sort/filter the data in the property sheet, you can restrict what values are shown. Those filters are respected as you page through your main table.

- When changing rows in the main table, the property sheet scrolls to preserve the visibility of whatever row in the details tab is highlighted. If you scroll down in the property sheet *without changing the highlight*, when you change rows in the main table, because the first row in any table is always highlighted by default, the property sheet will scroll back to the top.

Table Cells

Some cell values may be too long for the cell space. If that is the case, an ellipsis ("...") will appear in the cell as you mouse over it:

access_url	access
char	c
https://irsa.ipac.caltech.edu/dat: ...	image/fi
https://irsa.ipac.caltech.edu/data/Sf	image/fi
https://irsa.ipac.caltech.edu/data/Sf	image/fi

If you click on the ellipsis, you get a drop-down menu:

access_url	access_fo
char	char
https://irsa.ipac.caltech.edu/dat: ...	image/fits
https://irsa.ipac.caltech.edu/data/Sf	image/fi
https://irsa.ipac.caltech.edu/data/Sf	image/fi
https://irsa.ipac.caltech.edu/data/Sf	image/fi
https://irsa.ipac.caltech.edu/data/Sf	image/fi
https://irsa.ipac.caltech.edu/data/Sf	image/fi
https://irsa.ipac.caltech.edu/data/Sf	image/fi

Copy to clipboard

View as plain text

from which you can choose to copy the cell value or view it in a pop-up window.

If you view it in a pop-up window, it will attempt to format it in a readable fashion:



which, for most cells, will be functionally indistinguishable from no special formatting. It will only matter for very complicated cells.

Saving Tables



Click on the diskette icon (), if available, to save the table.

You obtain this pop-up:

You have several choices to make. In order, they are:

File format

You can save the table in a variety of formats:

It defaults to saving it as an [IPAC table file](#) , which is basically ASCII text with headers explaining the type of data in each column, separated by vertical bars.

Other formats include comma-separated values (csv, suitable for, e.g., Excel), tab-separated values (tsv), and three different versions of [VO tables](#) . You can save the file in [parquet file format](#) , which is a highly efficient, compressed, column-oriented format for tabular data that has been adopted by many recent wide area survey projects. You can also save the file in [DS9 Regions file format](#) . The advantage of saving it here as a regions file (as opposed to from the [visualization](#)) is that this way, the entire catalog is guaranteed to be saved.

File name

The tool tries to make a guess at a sensible filename. Feel free to change it to something that makes sense to you.

File location

You may save your file to a local file (on your disk) or, if you are [logged in](#), in the [IRSA Workspace](#) .

Modifications to the table

Depending on what you have been doing to the table at this point, you may have [filtered](#) or [added columns](#). If you want to save the table as it is currently displayed, with all filters as imposed and any columns hidden, and any added columns as shown, select "Save table as displayed." If you want to save the original table, with all rows and the original columns intact, choose "Save table as originally

retrieved."

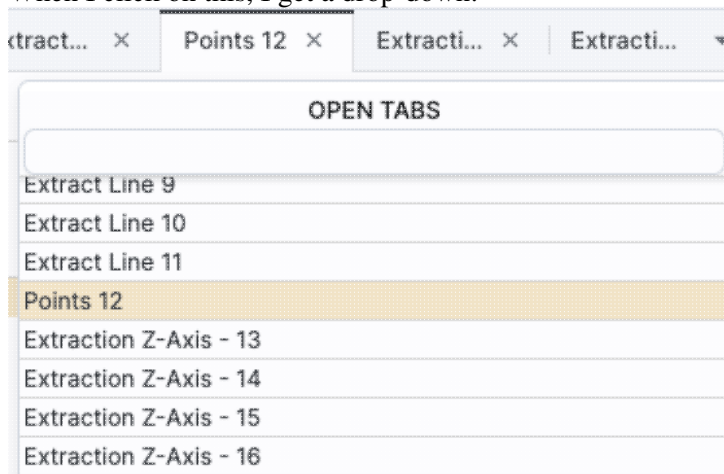
Table Navigation

At any time, you can move among tables by just clicking on the tab name. But, with the ability to [extract data](#) from images comes the ability to rather quickly drown in tables. There is a way to navigate among a lot of table tabs that have accumulated.

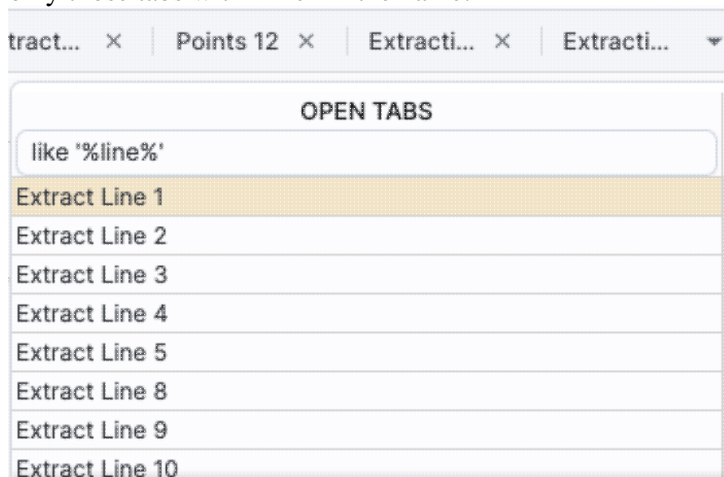
This is probably best explained via an example. Here, I have tabs showing that I have [extracted](#) several lines, drills, and points from my images:



On the far right of the collection of tabs, at the top right of the table pane, I have a downward pointing arrow. When I click on this, I get a drop-down:



This drop-down shows that the tab marked "Points 12" is in the foreground (it is shaded yellow) and this drop-down has a filter box at the top. That filter box at the top works just like the filters discussed [above](#), so if I want to find the tabs with the extracted lines, I can type "line" in the box, and it will filter down the list, leaving only those tabs with "line" in the name:



Then, from there, I can select the tab I want to bring to the foreground. (When I select a tab to bring to the foreground, that tab is also in the foreground for plotting.)

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In this fashion, I can navigate easily among many tabs that are open at the same time, even if I have so many tabs that their headers are not completely shown.

Euclid Data Explorer at IRSA: Catalogs

Catalogs are a special case of [tables](#); the basic functionality of tables is covered in the [Tables section](#). You can choose from any of a wide variety of catalogs to load for overlaying on your [visualized data](#). Catalogs [derived from the Euclid products](#) are also available. Plotting catalogs is covered in the [Plots section](#).

Contents of page/chapter:

- +[Introduction](#)
- +[IRSA Catalogs](#) -- Searching for catalogs from IRSA
- +[Interacting with Catalogs](#)
- +[Hierarchical Catalog Display](#)
- +[Details Tab](#) -- More information about the columns

Introduction

There are several different ways to get catalogs into the Euclid Data Explorer. You can retrieve them via an [initial search](#), or via any [additional searches](#).

This chapter focuses on the simplest of those additional blue tabs, as well as the basics of interacting with catalogs. The basic functionality of tables is covered in the [Tables section](#).

When you click on the "hamburger" in the upper left , it pulls open a "drawer" from the left hand side which enables you to [add or remove tabs](#) from the row of blue tabs on the top of your window. You can add (or remove) "IRSA Catalogs." The other catalog searches accessible from the "drawer" are covered in [another chapter](#).

IRSA Catalogs -- Searching for catalogs at IRSA

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The screenshot shows the Euclid Data Explorer interface. At the top, there are tabs for Results, Images, Inspect Objects, Search by ID, Euclid Catalogs, IRSA Catalogs, and Job Monitor. The IRSA Catalogs tab is active.

Select Project: WISE (dropdown)
Select Catalog: AllWISE Database (dropdown)

AllWISE Source Catalog
 Rows: 747634026 Cols: 334 [info](#) [Column Def](#)

AllWISE Multiepoch Photometry Table
 Rows: 42759337365 Cols: 48 [info](#) [Column Def](#)

AllWISE Reject Table
 Rows: 428787253 Cols: 334 [info](#) [Column Def](#)

AllWISE Atlas Metadata Table
 Rows: 18240 Cols: 349 [info](#) [Column Def](#)

AllWISE Frame Cross-Reference Table
 Rows: 21208389 Cols: 6 [info](#) [Column Def](#)

AllWISE Atlas Inventory Table

Search Method: Cone (dropdown)
 4h00m41.68s -50d15m23.4s Equ J2 ... Try NED then Simbad (dropdown)
 60.17367, -50.25650 Equ J2000 or 4h00m41.68s, -50d15m23.4s Equ J2000

Radius
 10 (input) arcseconds (dropdown)
 Valid range between: 1" and 3600"

Table Selection: Long form (dropdown) [Reset](#)

☐	name	constraints	description	units	indx	dbtype
☒	designation		WISE source designation		n	varchar2(20)
☒	ra		right ascension (J2000)	deg	n	number(10,7)
☒	dec		declination (J2000)	deg	y	number(9,7)
☒	sigra		uncertainty in RA	arcsec	n	number(7,4)
☒	sigdec		uncertainty in DEC	arcsec	n	number(7,4)

Add additional constraints here (SQL)

Ex: w3snr>7 and (w2mpro-w3mpro)>1.5 and ra>102.3 and ra<112.3 and dec<-5.5 and dec> -15.5(source_id_mf = '1861p075_ac51-002577')

The format for date type is yyyy-mm-dd

[Search](#)

The upper left quadrant of this window is where you specify which catalog you want to search. To change catalogs, first select the "project" under which they are housed at IRSA, such as 2MASS, IRAS, WISE, MSX, etc. The available choices underneath that change according to the project you have selected. A short description is provided for each of the catalogs, with links for more information (including definitions of the sometimes cryptic column names); an example is here:

AllWISE Source Catalog
 Rows: 747634026 Cols: 334 [info](#) [Column Def](#)

AllWISE Multiepoch Photometry Table
 Rows: 42759337365 Cols: 48 [info](#) [Column Def](#)

AllWISE Reject Table
 Rows: 428787253 Cols: 334 [info](#) [Column Def](#)

AllWISE Atlas Metadata Table
 Rows: 18240 Cols: 349 [info](#) [Column Def](#)

AllWISE Frame Cross-Reference Table
 Rows: 21208389 Cols: 6 [info](#) [Column Def](#)

AllWISE Atlas Inventory Table

The upper right quadrant of this window is where you specify the target (the position is sometimes pre-filled with its best guess as to what you want) and the search method (cone, elliptical, box, polygon, multi-object, all-sky), and the parameters that go with that search method (e.g., the radius of the cone). The parameters for each of these searches change dynamically as you select search options, which we describe next.

Tips and Troubleshooting: Pick your units from the drop-down first, and then enter a number; if you enter a number and then select from the drop-down, it will convert your number from the old units to the new units.

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There are both upper and lower limits to your search radius; it will tell you if you request something too big or too small. Note that these limits are catalog-dependent.

Cone search:

The screenshot shows the 'Cone' search method selected. It includes a search bar with placeholder text 'Coordinates or Object Name' and a button 'Try NED then Simbad'. Below the search bar are examples of search strings: '19h17m32s 11d58m02s equ j2000', '12.3 8.5 b1950', and 'J140258.51+542318.3'. The 'Radius' section has a text input field containing '10' and a dropdown menu set to 'arcseconds'. A note below indicates the 'Valid range between: 1" and 360000"'. The interface is clean with a light blue background and rounded rectangular buttons and input fields.

You can put in a position, but sometimes it attempts to guess a position, based on prior searches. You specify the cone radius; the default is 10 arcsec.

Elliptical search:

The screenshot shows the 'Elliptical' search method selected. It features the same search bar and examples as the cone search. The 'Semi-major Axis' section has a text input field with '10' and a dropdown menu set to 'arcseconds', with a note about the valid range. The 'Position Angle' section has a text input field with '0'. The 'Axial Ratio' section has a text input field with '.26'. The interface maintains the same light blue theme and rounded design as the cone search form.

You can put in a position, but sometimes it attempts to guess a position, based on prior searches. You specify the search ellipse's semi-major axis, position ratio, and axial ratio. Defaults are as shown.

Box search:

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Search Method: Box

Coordinates or Object Name Try NED then Simbad

Examples: 'm81' 'ngc 18' '12.34 34.89' '46.53 -0.251 gal'
'19h17m32s 11d58m02s equ j2000' '12.3 8.5 b1950' 'J140258.51+542318.3'

Side:

10 arcseconds

Valid range between: 1" and 360000"

You can put in a position, but sometimes it attempts to guess a position, based on prior searches. You specify the box's length on a side; default is as shown.

Tips and Troubleshooting: If you enter coordinates in non-equatorial units (e.g., Galactic or ecliptic), the search is still carried out in equatorial coordinates (RA and Dec).

Polygon search:

Search Method: Polygon

Coordinates:



- Each vertex is defined by a J2000 RA and Dec position pair
- A max of 15 and min of 3 vertices is allowed
- Vertices must be separated by a comma (,)
- Example: 20.7 21.5, 20.5 20.5, 21.5 20.5, 21.5 21.5

Search Method: Polygon

Search area ☒ Image ☐ Visible ☐ Custom

Coordinates:



- Each vertex is defined by a J2000 RA and Dec position pair
- A max of 15 and min of 3 vertices is allowed
- Vertices must be separated by a comma (,)
- Example: 20.7 21.5, 20.5 20.5, 21.5 20.5, 21.5 21.5

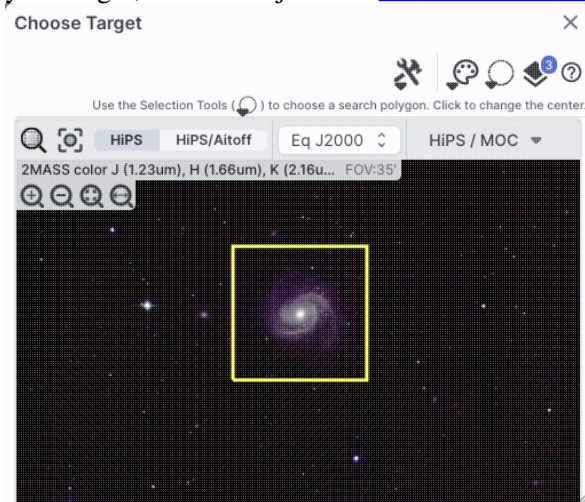
For this, note that it no longer has a single target location. It will sometimes try to pre-fill the vertices of the position it thinks you want, based on prior searches. If you have images loaded, it will give you choices based on the current image -- you can select whether you want the catalog request to match the entire area of the image you have selected ("image"), or just the portion of the image you can see in the

Euclid Help

current view ("visible"), or your own ("custom") area. (However, note that if you have selected a HiPS image before searching, you are limited to a maximum of 5 degrees.) The list of vertices in the coordinates box are in decimal RA and Dec in degrees. You must enter at least 3 and at most 15 vertices, separated by a comma. Note that, for overlaying catalogs on HiPS images, you cannot select "image", because HiPS images are generally very, very large, so this would result in too many points being returned. There is a maximum of 5 degrees imposed on catalog searches to match HiPS images.

If you [select a rectangular region](#) of your image and then select a polygon catalog search, you will have a fourth radio button above, "selection", which matches the corners of your selected image region.

If you select the "bullseye" icon on the right (), you get a pop-up with a way to interactively select your target; this works just like [this interactive target refinement](#) (go there for more details) :



Multi-Object search:

Search Method: Multi-Object

☒ Local File ☐ Workspace

Choose File Choose a file

Radius

arcseconds

Valid range between: 1" and 360000"

For a multi-object search, it can't guess what position you want. You need to upload a file (from your disk or the [IRSA Workspace](#)) in [IPAC table format](#), which is a varietal of plain text. (IRSA has a [table validator](#) which may be helpful.) Note that you also have to specify the radius over which to search for each of the targets in your list.

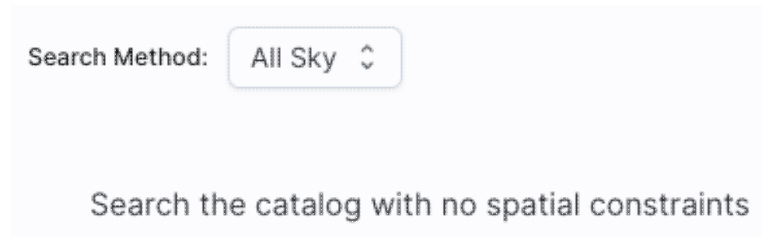
When you do a multi-position search on catalogs, three new columns are added to the catalog as it is returned to you. These columns are :

- ◇ cntr_01 - the target position you requested
- ◇ dist_x - the distance between the target position you requested and the object it found
- ◇ pang_x - the position angle between the target position you requested and the object it found

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These additional columns can help you assess if the target(s) it found is the target that should be matched to the position you requested.

All-sky search:



Because this is an all-sky search, it does not have a single target entry box. In order to constrain this search, you need to impose constraints on the bottom of the screen (see below).

The bottom of this window allows you to set restrictions on specific columns. It gives you a list of all the available column names in the corresponding catalog. (Most catalogs have identical "standard" and "long form" selections, but some have more columns available in "long form".) From here, you can choose what to display (tickboxes on the left), and filter what is returned ("constraints" column). For example, only return objects with values in column *y* that are greater than *x*. If you add more than one restriction, they are combined logically using an "AND" operators; be careful, because you can thus restrict data such that none of the catalog meets your criteria.

Click on "Search" to initiate the search. It will load the catalog into a tab of its own. The objects will also be overlaid on any images you have loaded, and a default x-y plot will be shown. (For more on the x-y plots, see [Plots section](#).) All of these representations are interlinked -- clicking on a row in the table shows it on the image and in the plot, and clicking on an object in the image shows it in the table and in the plot, and clicking on an object in the plot shows it in the table and on the image.

To close the catalog search window without searching for a catalog, click on "Cancel".

Tips and Troubleshooting

- If the catalog search is successful quickly, it will promptly return the results in a tab of its own.
- The search may take a long time to return, especially if you have asked for a large catalog, and you may think that nothing has happened, but be patient and eventually it will return a tab.
- Use large search radii with caution! Be sure you understand how many sources you are likely to retrieve. Searches that retrieve more rows will take longer. Searches that retrieve tens of thousands of rows will take quite a while.
- If you want to impose additional constraints on the catalog during your initial search, you can do so in the lower half of the screen (e.g., $\text{SNR} > n$ in some band, or an SQL command), you can place constraints at this point. However, be advised that it is easy to combine constraints such that no sources are retrieved!
- If you overlay a large catalog, the tool will show cells with a number enclosed indicating the number of sources in that region. As you zoom in closer and closer, the tool will adjust those bins to smaller and smaller cells until it shows you individual sources. [Go here](#) for more information!
- If you overlay a large catalog, then turn around and [save a regions file from the catalog overlay](#), then the entire catalog may not be saved. To get a large catalog saved as a regions file, [save it from the table](#).
- By default, it may show you fewer columns than are available in the full catalog. By selecting "long form" (above the list of columns), you can access the full range of available columns. In some cases, there are literally hundreds of columns that you can access!

The search results are then shown in a [Firefly table](#) and you can [interact with it](#).

Interacting with Catalogs

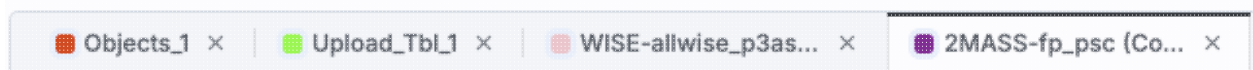
When you load a catalog, the tool may create a table, a plot, and/or, if your catalog has position information (e.g., RA and dec), it overlays the catalog on an image. All three of these ways of displaying the catalog are interlinked and interactive.

Catalogs are a special case of [tables](#); the basic functionality of tables is covered in the [Tables section](#). You can sort and filter the table.

[Plots](#) are also covered in a different section. You can make scatter plots, heat maps, and histograms. You can plot columns from your catalog, including simple mathematical manipulations of catalog columns.

If the catalog has positions included, the catalog will also be overlaid on the loaded image(s). The [Visualization section](#) includes information about that. Each catalog that you load is overlaid on the image using different, customizable symbols and colors.

When you have catalogs loaded into the tool, the header of the catalogs has the name of the catalog and a color swatch:



This color swatch corresponds to the symbol color that is used in the image overlays. You can change the color by clicking on the color swatch in the header, or by navigating to the layers in the image pane. See the [color picker section](#) of the visualization chapter for more information.

Tips and Troubleshooting

- Large catalogs will be displayed hierarchically! See next section.
- If you save the overlays from an image as a regions file, you may not get your complete catalog, especially if it is a large catalog (see next section!). However, you can save the full contents of a single catalog as a regions file using the "save" (diskette) icon in the table toolbar, instead of the image toolbar.
- The "color swatches" may not appear immediately. To make loading faster, sometimes the colors don't load until they are actually needed. If you are in a situation where no images are visible, then no color swatches may appear until you ask the tool to show you an image (like the [coverage image](#)), and then the color swatches will appear.

Hierarchical Catalog Display

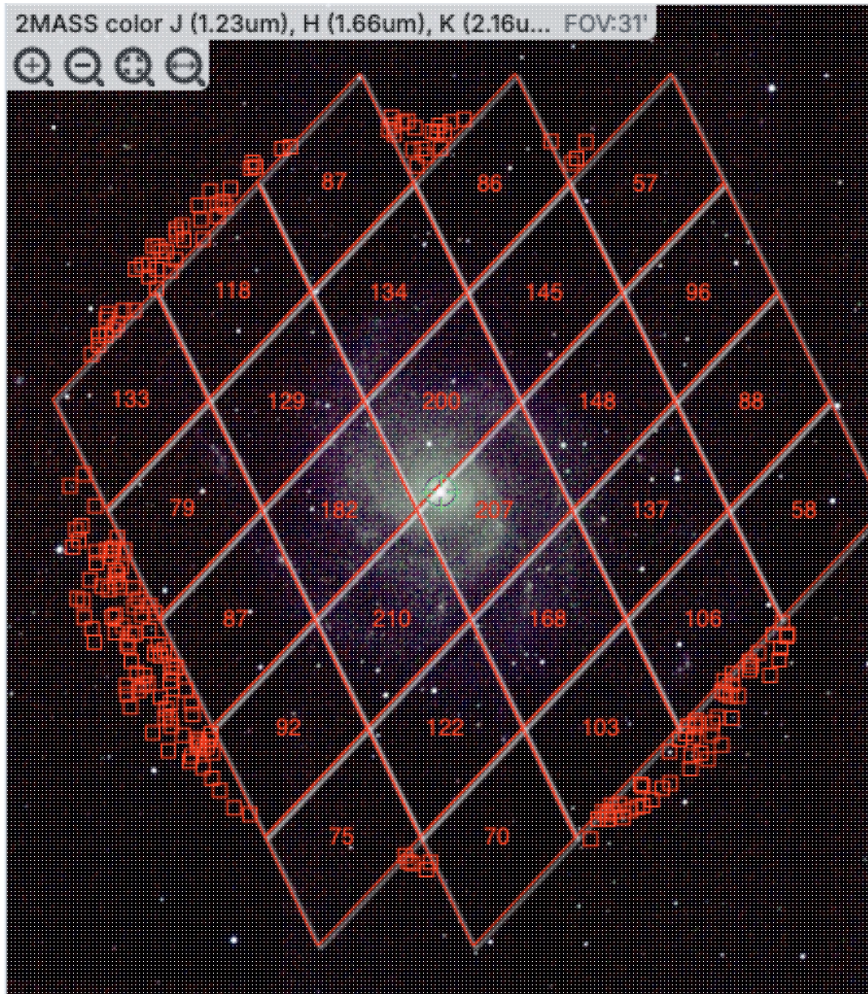
If one has a large catalog loaded into the tool overlaid on top of lots of images the possibility exists that the computer or the network could be overwhelmed trying to render all the points on all the images. Historically we dealt with this by "thinning out" the catalog and not showing all the points. However, there is a better solution, which is employed here!

For catalogs below about 1000 points, the tool will show the individual points on the image.

For catalogs above that threshold, the tool will bin up the catalogs based on HEALPix pixels (see [HiPS section here](#) for more links). In summary, the sky is broken up into sections, and the tool will show symbols with a number indicating the number of sources in that region. Then, when you zoom in, it will dynamically adapt to show you smaller and smaller cells until it shows you all the individual sources.



From the layers icon (see [visualization chapter](#)), you can bring up many display options. Below are examples of what is displayed, the options seen in the layers, and additional options. The same catalog and zoom level and minimum group size are used for each view. The "Min Group" option here is 50, so if there are cells with fewer than 50 sources, then the individual sources are shown, and if there are more than 50 sources, then the cell is shown with a number inside corresponding to the number of sources from the catalog. (See below for additional information.)

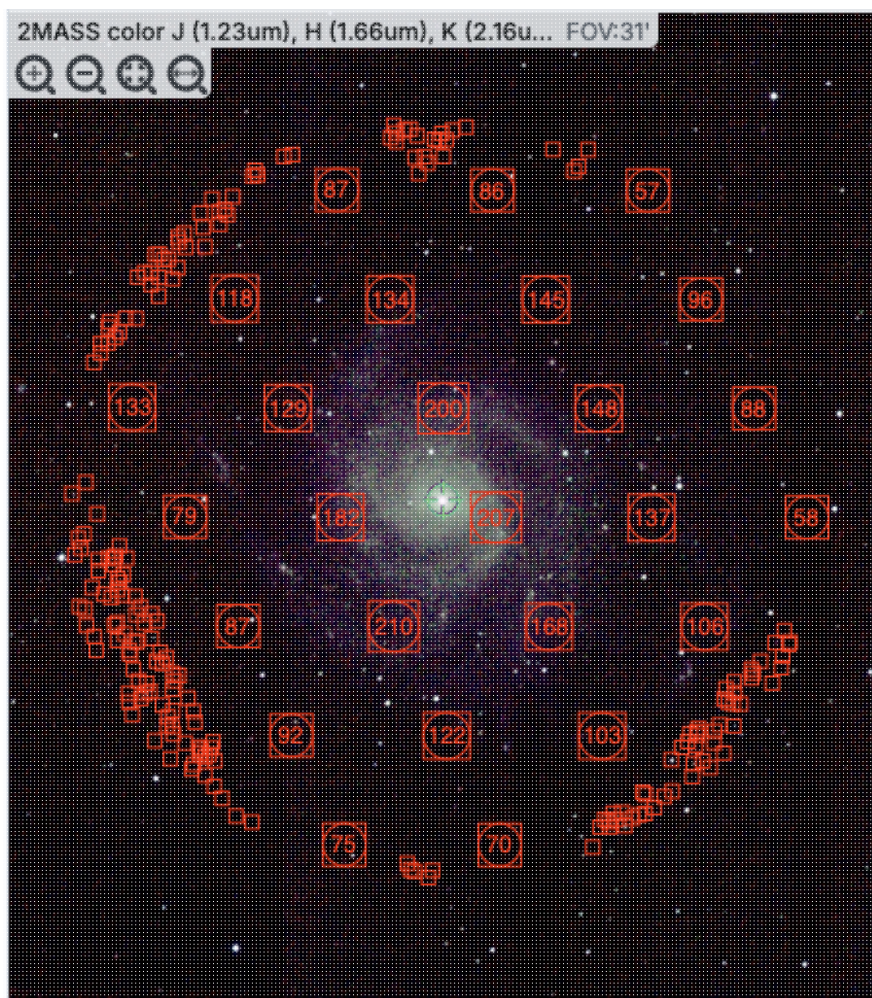


☒ Coverage: Spitzer-sphotdr4 (Cone:6
 Grouping **Healpix Grid** ↕ Min

In this view, the 'cells' used are the cells explicitly shown in the image. The size of the cells is very clear. In the top row 1 across the top have fewer than 50 sources (so the individual sources are shown), then the next row 57 sources respectively.

☒ Coverage: Spitzer-sphotdr4 (Cone:6
 Grouping **Box** ↕ Min

In this view, the 'cells' are shown by circles enclosing the sources. The sizes are the same as in the prior screenshot, but it is obvious to new users.



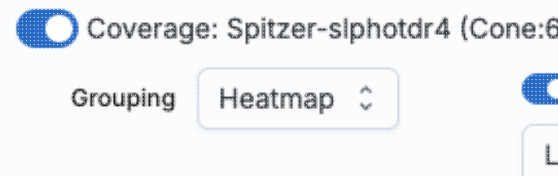
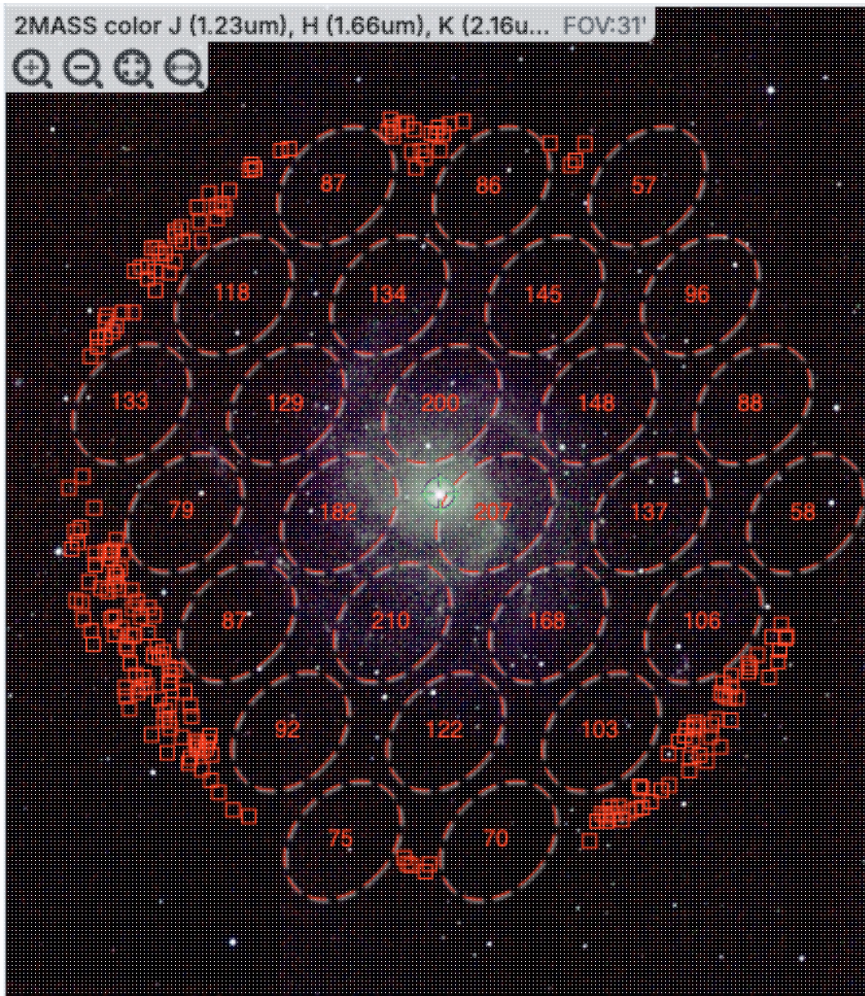
☒ Coverage: Spitzer-sphotdr4 (Cone:6

Grouping

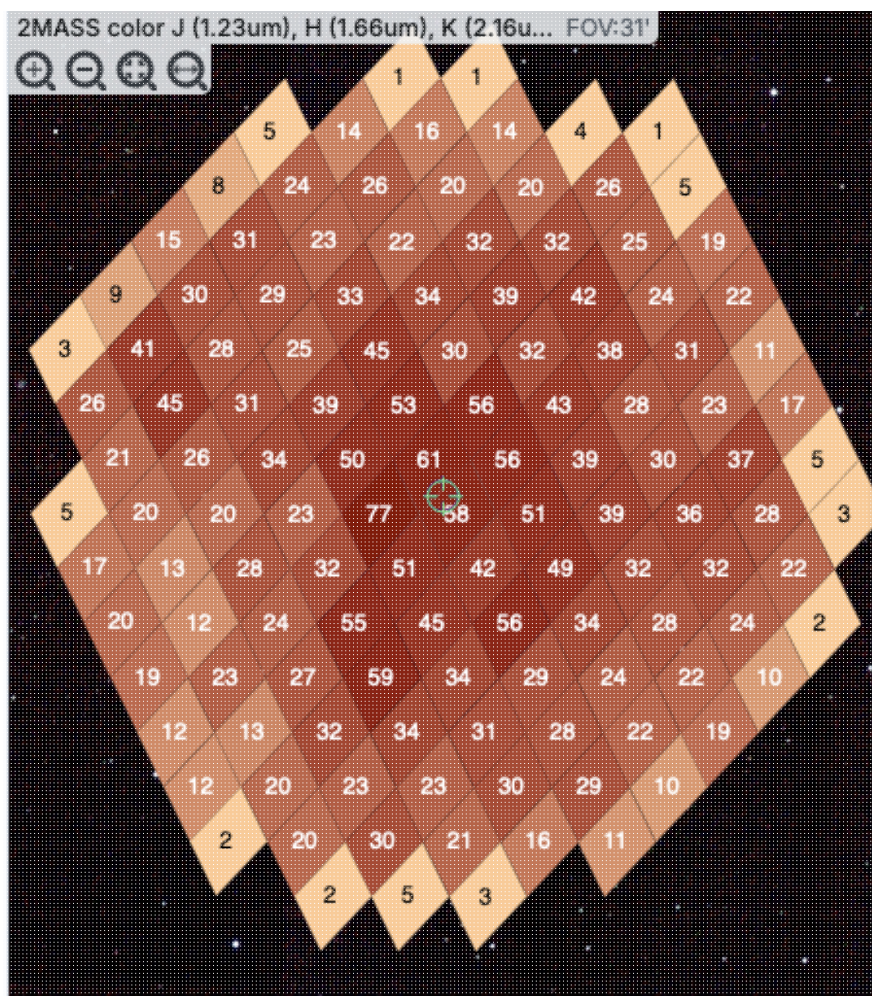
Ellipse ↕

Mir

In this view, the 'cells' are shown by ellipses showing the same cell sizes as in the prior screenshot, but the numbers are less obvious to new users. It may be more obvious to experienced users that groups of points.

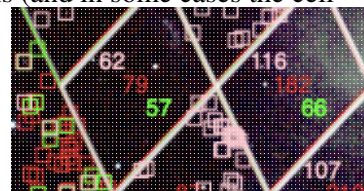


Finally, in this view, the 'cells' are again shown as a grid. The color of the cells corresponds to the number of sources in each cell. You can choose the color range by changing the color using the 'Color' dropdown, which you can also change the transparency. This view shows how many sources are in each cell, but makes it difficult to see the image, though you can change the transparency of this overlay. This view still can make seeing the image challenging in some cases.



Tips and Troubleshooting

- For all of these renditions, when you zoom in close enough, it will dynamically adapt and show you individual sources when you zoom in.
- For all of these renditions, if you click on a cell, it will display all of the sources in the cell. You can click on many cells in a row and it will continue to display all the sources it can until it reaches the point at which it thinks performance will suffer, at which point it will turn some of the points back into cells.
- If you want to have more of your catalog shown as individual sources, pick a smaller "min group" number from the layers pop-up.
- If you have more than one catalog loaded, the numbers within the cells (and in some cases the cell



indicators themselves) will be offset slightly so that you can see them.

- If you have a catalog that includes sources from all over the sky, it very well may just give you box groupings, and may not allow you to change that view until you zoom in.
- If you have cells where only 1/4 of a cell is populated, it automatically renders a smaller cell, so if you have a sparsely populated but still large catalog, the size of the display will always be "small" size cells.
- If you are looking at many footprints from, say, a complex, and long ObsCore search, if you have more than 30,000 footprints, it may not be able to render all of the outlines of all of those images. It may

render the centers of all of those images as if it were a catalog, in which case you will encounter these kinds of hierarchical catalog display options.

Details Tab

When you have a table loaded on the left, you will have an additional tab on the right hand side, under the plot, called "Details." This additional tab is sometimes called a "property sheet." This tab is, itself, another [Firefly table](#), and consists of each of the columns of the retrieved catalog with additional information about each field where available. (Not every catalog may have this information available.) This information can be used to learn more about each of the columns in retrieved. For additional information when it is showing details about a catalog, please consult the full documentation that accompanies the catalog.

Tips and Troubleshooting

- The property sheet is a more expanded, vertical view of the information shown in a row of a table or catalog, along with documentation of the catalog columns. Because you can sort/filter the data in the property sheet, you can restrict what values are shown. Those filters are respected as you page through a catalog. So, for example (see screenshot below), you can pull up the property sheet, filter it down to only show the fields that involve the string "flux" by filtering on "flux", and then step through the values in the catalog and inspecting the brightnesses as shown in the property sheet for each source.
- When changing rows in the main table, the property sheet/details tab scrolls to preserve the visibility of whatever row in the details tab is highlighted. If you scroll down in the property sheet *without changing the highlight*, when you change rows in the main table, because the first row in any table is always highlighted by default, the property sheet will scroll back to the top.

id	ra	dec	flux_viz_psf	fluxerr_viz_psf
char	(deg)	(deg)	(uJy)	(uJy)
-5978247914830020722	102020059	59.7824791085	-49.3000722677	145.5553
-597805044493144288	102020059	59.7805044493	-49.314268584	34.090644
-59775667482997865	102020059	59.7756674861	-49.299765100	34.202526
-5981351949315819	102020059	59.8135194988	-49.331591988	143.27802
-598006520493249151	102020059	59.8006520005	-49.3249151718	25.258535
-598096275493081582	102020059	59.8096275409	-49.3081582537	17.732275
-598036624493236614	102020059	59.8036624257	-49.3236614709	403.99277
-59775997493052845	102020059	59.7759974915	-49.30528455	1469.3915
-59737815493155876	102020059	59.7378155536	-49.3115676408	484.8279
-598145436493559829	102020059	59.8145436608	-49.3559829931	483.8543
-598223640493625891	102020059	59.8223640468	-49.3625891615	47.226433
-598023894493481644	102020059	59.8023894658	-49.3481644347	1712487
-598160974493654298	102020059	59.8160974807	-49.3654298566	23.72179
-597937677493481347	102020059	59.7937677661	-49.2461347792	51.587284
-597826245492712487	102020059	59.7826245367	-49.271497598	13.509018
-59779018492763127	102020059	59.7790181921	-49.276312762	10.252837
-597854738492891635	102020059	59.7854738923	-49.2891635189	23.034452
-59797800492761806	102020059	59.7978000919	-49.2761806134	106.66561
-598032131492775391	102020059	59.8032131779	-49.2775391793	10.253668
-597923741492830635	102020059	59.7923741818	-49.2830635941	160.58594
-598173574927239011	102020060	59.8173572026	-49.2739011028	105.00291
-597920198492560372	102020059	59.7920198519	-49.256037295	167.66347
-598036253492924071	102020059	59.8036253863	-49.2924071453	21.868275
-598439066493517616	102020060	59.8439066276	-49.3517616551	1151.7793
-59971415493659617	102020060	59.9174156552	-49.3659617892	18.905436
-598014543493898931	102020060	59.8014543878	-49.3698931037	32.66022
-59864775493816328	102020060	59.8647751749	-49.3816328661	42.605186
-59898773049369177	102020060	59.8987731012	-49.3699175053	44.789696
-59986273493580092	102020060	59.9862737488	-49.3580092858	12.161736
-598913770493486663	102020060	59.8913770191	-49.3486663921	15.737985
-59869294493773313	102020060	59.8692942455	-49.3773313985	20.669342
-598568799493557919	102020060	59.8568799803	-49.3557919933	17.474014

Euclid Data Explorer at IRSA: Other Searches

Besides the Euclid Catalog search, there are several more searches you can add to the Euclid Data Explorer using the [side menu to add to the tabs at the top](#). Several of them are complicated, and similar. This chapter covers these choices. These searches retrieve [tables](#), most of which are [catalogs](#). For the results of these searches, if the tool recognizes positions in a catalog, it will overlay the catalog on [images](#) and [make plots](#).

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- +[Interactive Target Refinement](#)
- +[TAP Searches: More about constraints](#)
- +[ObsCore Searches: More kinds of constraints](#)
- +[Euclid catalogs](#)
- +[TAP Search](#)
- +[ObsCore Search](#)
- +[VO SCS](#) -- VO Simple Cone Search
- +[NED Objects](#) -- Searching for NED objects

Introduction & Terminology

There is a lot of terminology in this chapter to understand.

- VO = [Virtual Observatory](#) 
- TAP = [table access protocol](#) . TAP services enable complex queries of tables using ADQL.
- ADQL = [astronomical data. query language](#) 
- ObsCore = [core components of Observation Data Model](#) 
- Data model = A standard logical structure for a type of dataset; more flexible and general than a data format.
- ObsTAP = TAP service that serves ObsCore tables

There are myriad places on the web to learn more about things like TAP queries and ADQL, as well as all the rest of the VO standards and protocols. We just provide a brief overview here in the context of this tool.

The Euclid Data Explorer can help you interactively create ADQL which then you can copy and use in your own code elsewhere.

By using TAP and ObsTAP queries, you can use IRSA services to talk to other archives that also comply with these standards, world-wide.

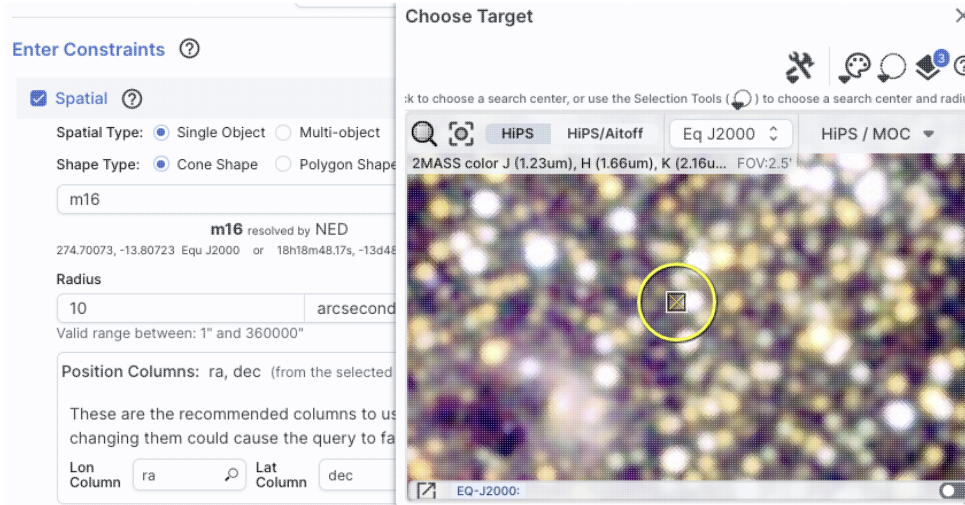
The first several parts of this section talk more generally about interactive target refinement and constraints that are common to more than one of the searches discussed here. Specifics of particular searches follow after that.

Interactive Target Refinement

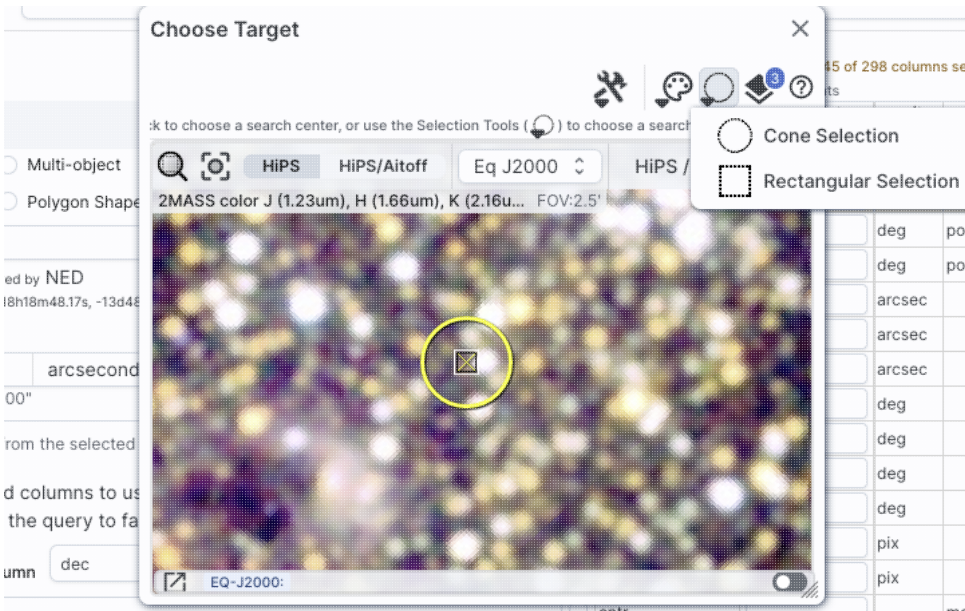
Whenever you see this icon  in IRSA tools, you can click on it to bring up a window to **interactively refine your target selection via clicking on a HiPS map**. Here, we are using a TAP search to demonstrate this process, but you can find this kind of target refinement in several places in various IRSA tools, including this

one. This is also the same kind of target selection you can use on the main [search screens](#) for "Images" and "Inspect Objects."

When you click on the icon  you bring up a window:



If you have entered a target already, the window arrives already centered on the target. If not, it is centered on the galactic center, zoomed out. If you have entered a cone search radius already, then the circle drawn on the image is that cone size. You can manipulate this image with the same basic tools as in the [visualization tools](#).

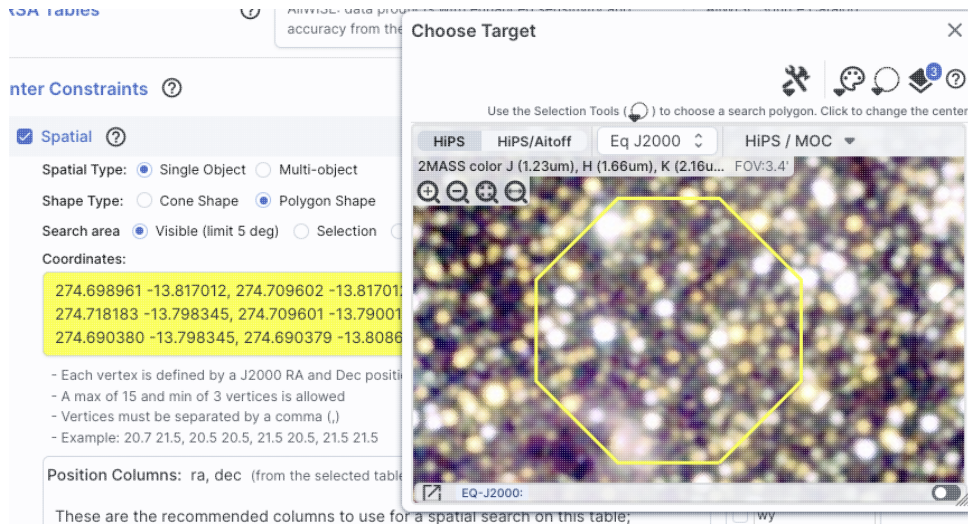
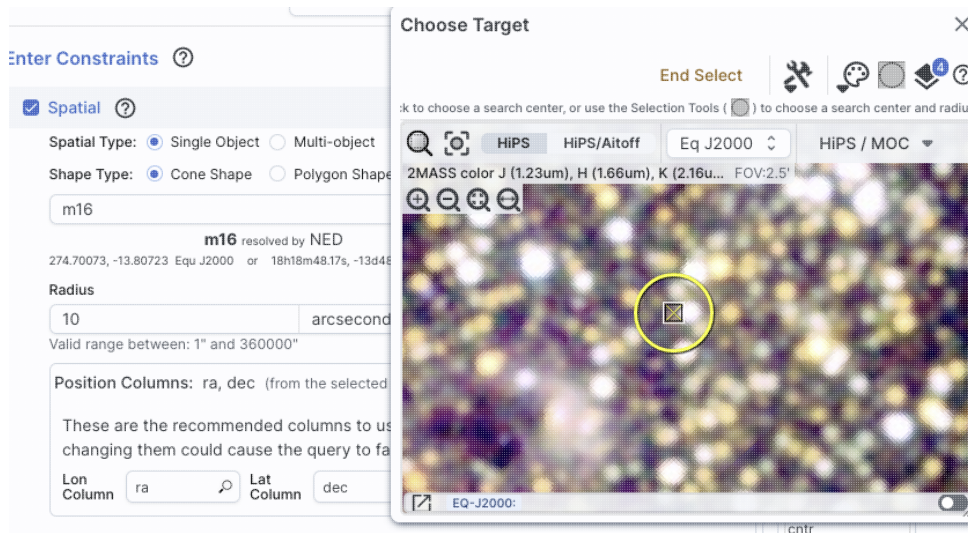


To change the search region interactively, choose the selection tools and draw a shape on the image.

Note that if you have selected a cone search on the left, no matter what you select on the right, it will give you a cone search. If you change the cone position or radius in the yellow boxes after you change the selection, it will update the region in the image.

If you want to quit out of the selection without changing, click on "end selection" (the brown text near the top of the image).

Euclid Help



If you select polygon on the left, and you use the selection tool for "cone selection" on the right, you will get a spherical polygon (a polygon where the line segments are on a sphere).

When you are done with this pop-up window, click on the 'x' in the upper right of the window. Then you can continue with whatever you were doing before you started to refine your target parameters.

TAP Searches: Constraints

You can have several different ways of constraining your search depending on the options you have selected before the "Enter Constraints" section, and sometimes the options depend on what kind of service is available at the TAP service you have selected. If the options do not appear initially, click on the downward arrow to "unfold" the options.

Enter Constraints: Spatial

This part of the interface allows you to specify the details of a spatial search. You need to specify both what kind of search you want to do and which columns of the catalog are to be used for coordinates.

Enter Constraints ☒ Spatial Spatial Type: ☒ Single Object ☐ Multi-objectShape Type: ☒ Cone Shape ☐ Polygon Shape

m101

Try NED then Simbad **m101** resolved by NED

210.80227, 54.34895 Equ J2000 or 14h03m12.54s, +54d20m56.2s Equ J2000

Radius

10

arcseconds 

Valid range between: 1" and 360000"

Position Columns: ra, dec (from the selected table on the right) These are the recommended columns to use for a spatial search on this table;
changing them could cause the query to failLon
Columnra Lat
Columndec ☒ Spatial Spatial Type: ☒ Single Object ☐ Multi-objectShape Type: ☐ Cone Shape ☒ Polygon ShapeSearch area: ☒ Visible (limit 5 deg) ☐ Selection ☐ Custom

Coordinates:

269.19395 -26.40912, 263.61623 -26.40912, 263.47850 -31.40291, 269.33168
-31.40291 

- Each vertex is defined by a J2000 RA and Dec position pair
- A max of 15 and min of 3 vertices is allowed
- Vertices must be separated by a comma (,)
- Example: 20.7 21.5, 20.5 20.5, 21.5 20.5, 21.5 21.5

Position Columns: ra, dec (from the selected table on the right) These are the recommended columns to use for a spatial search on this table;
changing them could cause the query to failLon
Columnra Lat
Columndec 

This is what it looks like when you do a **single target cone search**; note that you have the same name resolution options as in any other search here.

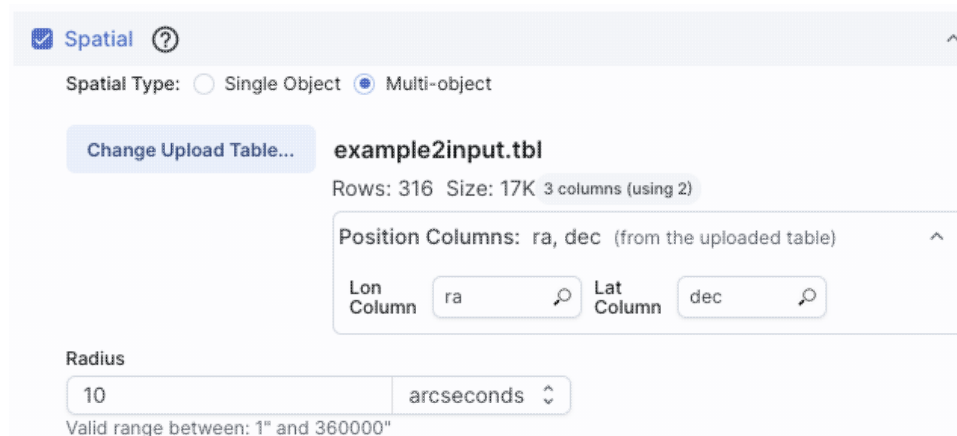
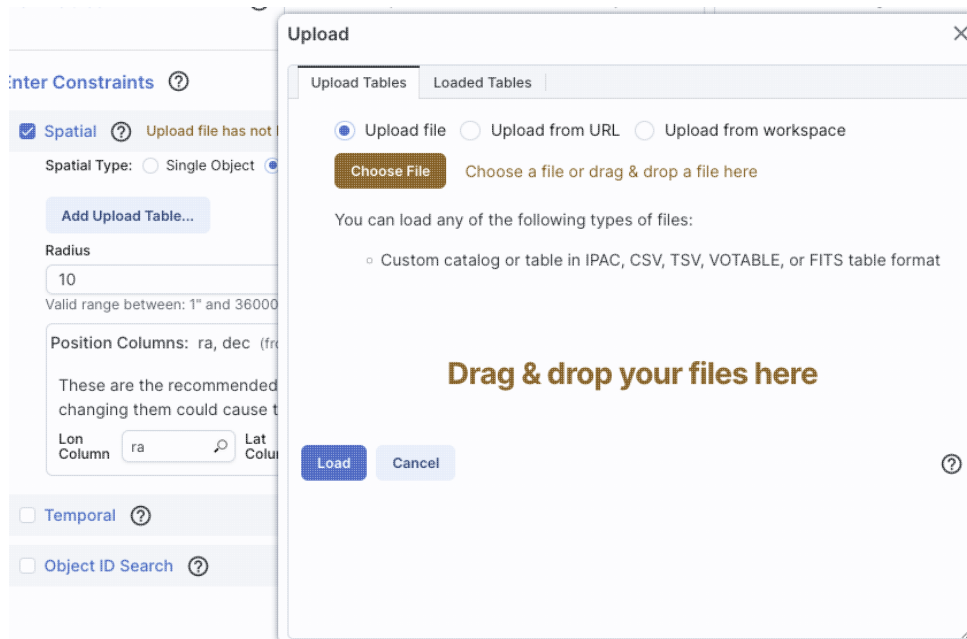
And, this is what it looks like when you do a **single target polygon search**. The search areas here (visible, selection, and custom) are the same as when you do a polygon search on [catalog](#) -- that is, you can select whether you want the catalog request to match the entire area of the image you have selected ("image"), or just the portion of the image you can see in the current view ("visible"), or your own ("custom") area. The list of vertices in the coordinates box are in decimal RA and Dec in degrees. You must enter at least 3 and at most 15

vertices, separated by a comma.

You can also click

on this icon  to [interactively refine your search position](#).

If you want to perform a **multi-target search**, click on "multi-object", which automatically brings up this pop-up, from which you can load a table from disk ("Upload tables" tab) or select one of the tables you have already loaded into the tool (click on the "Loaded tables" tab). Your uploaded catalog has to follow all the same rules as normal [catalogs from disk](#).



After you find your file with your listed positions and upload it, the tool attempts to guess which two columns are the position columns. In this example, it has (correctly) guessed that the position columns are "ra" and "dec". If it guesses wrong, or can't figure it out, you can help it along by clicking

on the down-arrow to 'expand' that part of the panel and selecting the two coordinate columns to use.

Regardless of what configuration you use, the last thing to check is which columns the tool has assumed are the position columns in the catalog to be matched to your position, region, or list of positions. Again, it attempts to make an educated guess as to the right columns, but if it guesses wrong, you can help it along by clicking on the down-arrow to 'expand' that part of the panel and selecting the two coordinate columns to use.

Position Columns: ra, dec (from the selected table on the right)

These are the recommended columns to use for a spatial search on this table; changing them could cause the query to fail

Lon Column Lat Column

Enter Constraints: Temporal

This part of the interface allows you to specify which column of the catalog is to be used for timing, and allows you to constrain the date in two different systems.

This is what the panel looks like initially, where you specify the column in the catalog you are searching with the time and then the dates. If you don't remember what the column is in the catalog, click on the magnifying glass to get a pop-up with a list of all of the columns.

Temporal

Temporal Column

☒ UTC date/times (ISO format) ☐ MJD values

Start Time End Time

e.g.: 2019-02-07T08:00:20 e.g.: 2019-02-07T08:00:20

2019-02-07 2019-02-07

Euclid Help

For the dates and times, if you click on the calendar icon at the far right of the entry box, you get a pop-up from which you can specify the date and time, shown here.

These are the recommended column names for changing them could cause the query to fail.

Lon Column: ra Lat Column: dec

☒ Temporal Time is Required

Temporal Column:

☒ UTC date/times (ISO format) ☐ MJD values

Start Time: Calendar icon
 e.g.: 2019-02-07T08:00:20
 2019-02-07 08:00:20
 2019-02-07

End Time: Calendar icon
 e.g.: 56800, 56800.3333

☐ Object ID Search

If you would like to work in MJD instead of ISO dates, select the "MJD" radio button. Note that it echoes below the box what it thinks you've entered in two different systems (UTC and MJD) to verify what you have entered.

☒ Temporal Time is Required

Temporal Column:

☐ UTC date/times (ISO format) ☒ MJD values

Start Time: Calendar icon
 e.g.: 56800, 56800.3333

End Time: Calendar icon
 e.g.: 56800, 56800.3333

Enter Constraints: Object ID

This part of the interface allows you to match object IDs. This is important, since most of the Euclid catalogs do not have ra/dec, but instead rely on users matching by object ID or tile ID.

This is what the panel looks like initially:

☐ Object ID Search ?

Performs an exact match on the ID(s) provided, not a spatial search in the neighborhood of the designated objects.

☒ Enter list of object IDs ☐ Load object IDs from a table

Enter one or more object id's separated by commas, semi-colon or space

Object ID (from table): **unset** (from the selected table on the right)

This will be matched against Object ID selected from the uploaded table above

Object ID:

This is what the panel looks like after you have selected your uploaded list of IDs (in this case, a file called "table_Objects_1.tbl", which consists of an IPAC table file that turns out to be the results of an Inspect Objects search, which contains the object_id field), and it is being matched against the euclid_q1_phz_photo_z catalog, where the relevant field is

☒ Object ID Search ?

Performs an exact match on the ID(s) provided, not a spatial search in the neighborhood of the designated objects.

☐ Enter list of object IDs ☒ Load object IDs from a table

Change Upload Table... **table_Objects_1.tbl**
 Rows: 147, Columns: 37 (using 1), Size: 131K

Uploaded Object ID: **object_id** (from the uploaded table)

Object ID:

Object ID (from table): **object_id** (from the selected table on the right)

This will be matched against Object ID selected from the uploaded table above

Object ID:

☐ Use "select IN" style SQL instead of TAP Upload

"object_id".

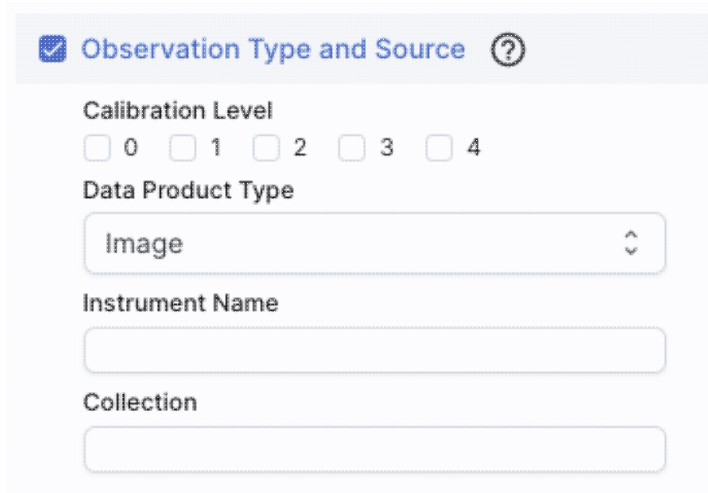
Tips and Troubleshooting

- ◇ The names have to match exactly, so if one of the fields is a long integer, the IPAC table file to which you are comparing must also cast the ID as a long. (Computers are painfully stupid! You can't have one be a string and one be a longint.)
- ◇ If the catalog to which you are matching is not indexed by the name column you are using, the search may take a long time.
- ◇ If you are doing, say, an object ID search, you need to turn off the position search, otherwise it doesn't understand what you want it to do.

ObsCore Searches: More kinds of constraints

These are several additional ways of constraining your search depending on the options you have selected before the "Enter Constraints" section. These options most often appear if you have configured an ObsCore search. If all of these options do not appear initially, click on the downward disclosure arrow to "unfold" the options.

Enter Constraints: Observation Type and Source



☒ Observation Type and Source ?

Calibration Level

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4

Data Product Type

Image

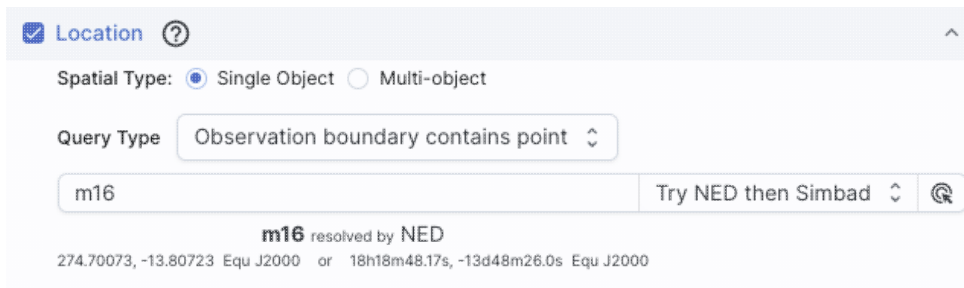
Instrument Name

Collection

This panel provides a way to constrain the:

- ◇ *Calibration level* - 0 is the least processed and 4 is the most processed, and not all instruments provide all levels
- ◇ *Data product type* - image, cube, spectrum, SED, time series, visibility, event, measurement, or none specified. You can select more than one of these at a time by using a right mouse click.
- ◇ *Instrument name* - must match exactly, wild cards not accepted
- ◇ *Collection* - must match exactly, wild cards not accepted

Enter Constraints: Location



☒ Location ?

Spatial Type: ☒ Single Object ☐ Multi-object

Query Type: Observation boundary contains point

m16 Try NED then Simbad

m16 resolved by NED
274.70073, -13.80723 Equ J2000 or 18h18m48.17s, -13d48m26.0s Equ J2000

This panel provides a way to constrain the location of your search. Here, it is a single object search, which works just like it does above, including the [interactive target refinement](#) via the bullsye icon. You can also upload a list of targets by

selecting "multi-object" -- it brings up the same pop-up as above, from which you can load a table from disk ("Upload tables" tab) or select one of the tables you have already loaded into the tool (click on the "Loaded tables" tab). Your uploaded catalog has to follow all the same rules as normal [catalogs from disk](#).

You can specify via the drop-down the type of your query: "observation boundary contains point", "observation boundary contains shape", "observation boundary is contained by shape", "observation boundary intersects shape", and "central point (s_ra, s_dec) is contained by shape." The latter refers to the columns "s_ra" and "s_dec" in the ObsTAP table.

Enter Constraints: Timing

☐ Timing ?

Time of Observation Completed in the Last... ⌵

Enter time Hours ⌵

Exposure Duration

-Inf to +Inf seconds

This panel provides a way to constrain the observation time of your search. This is the default option, where you want data completed in the last x hours (or other unit of time).

This is the alternate option, where you want data overlapping a specified date range, where you can specify UTC or MJD times.

☐ **Timing** ?

Time of Observation Overlapping specified range

☒ UTC date/times (ISO format) ☐ MJD values

Start Time End Time

YYYY-MM-DD HH:mm:ss YYYY-MM-DD HH:mm:ss

e.g.: 2019-02-07T08:00:20 e.g.: 2019-02-07T08:00:20

2019-02-07 08:00:20 2019-02-07 08:00:20

2019-02-07 2019-02-07

Exposure Duration

-Inf to +Inf seconds

Enter Constraints: Spectral Coverage

☐ **Spectral Coverage** ?

Select observations whose wavelength coverage

contains

enter wavelength nanometers

☐ **Spectral Coverage** ?

Select observations whose wavelength coverage

overlaps

-Inf to +Inf nanometers

This panel provides a way to constrain the spectral coverage of your search. This is the default option, where you want data containing a given wavelength.

This is the alternate option, where you want data overlapping a specified wavelength range.

Euclid Catalogs

The "Euclid Catalogs" tab is one of the default tabs available when the Euclid Data Explorer loads, and looks like this:

Euclid Help

It is a customized TAP search of the Euclid catalogs available at IRSA. At the top, you can select the Euclid catalog you wish to search. Upon selection, the options on the bottom change. For the default MER catalog, the catalog has RA and Dec, and the constraints on the left work just as [the TAP constraints described above](#); the available columns are on the right. The list of columns on the right works like [any other table here](#) -- you can sort or filter the columns, or select all with a single click.

Many of the Euclid catalogs do not have ra/dec, and in those cases, you will need to sort on or [match by object ID](#).

The result of any Euclid catalog search is a catalog that can be interacted with like any other [catalog in this tool](#).

TAP Search

To see this tab as a choice on the top, you may need to select it from the [side menu](#). Or, you may land in this tab from a [table action](#), or from the TAP table selection help.

When you first go to this tab, you will see this near the top of your screen:

At the top, you now have a choice of which TAP service you want to use, and it defaults to IRSA's. You can select your favorite from the list, or use the toggle on the left to enter your own custom URL. If you want to hide this top row after setting it (to, say, regain screen real estate), look for this on the far right:

the "TAP Services:" button (show/hide) will reveal or conceal this top row.

Euclid Help

The rest of this search screen is basically identical to that which you get from the [TAP Search](#) described above, even if you pick a TAP service other than IRSA's (with a few exceptions, including if it's ObsCore; next section).

You can then select which table, or table collection and then table, you'd like to search from the pull-down menus.

For VizieR's services in particular, because there are so many tables, the tool will give you a slightly different interface under the "Tables" section of the window. Here is the default Vizier choices as of this writing:

Select TAP Service: ☒ Enter my URL ☐ Choose a TAP service from the list

VizieR (CDS) Tables

Table Collection (Schema): large_tables (tables: 145) extremely large catalogs

gaiaedr3 (rows: 1811709771) GaiaSource EDR3 data (using ESA name) (Gaia collaboration)

Table Collection (Schema) count: 28 Table count: 145

Note that it tells you how many tables and rows are available. Switching to tables associated with journal articles, far more tables are available:

Select TAP Service: ☒ Enter my URL ☐ Choose a TAP service from the list

VizieR (CDS) Tables

Table Collection (Schema): J_AJ (tables: 7541) Astronomical Journal

J/AJ/100/1091/table9 (rows: 3698) Galaxy Parameters (PELETIER)

Table Collection (Schema) count: 28 Table count: 7541

Now, if you click on the second tier menu (J/AJ/100/1091/table9), you get a pop-up, which is another [Firefly table](#) like any other in this tool, so it's searchable and sortable:

Choose Table

Table Name char	Description char	Rows char
like '%Massey%'		
J/AJ/101/1408/mt91	Observations in Cyg OB2 (tables 2,5,6) (Massey P., Thompson A.B.)	801
J/AJ/103/1205/stars	All stars with UVB photometry with their bolometric magnitudes and effective temperatures which were not listed in the o	795
J/AJ/103/1205/ubv	UBV data from Tables 3-6 in the paper (Parker J.W.M., Garmany C.D., Massey P., Walborn N.R.)	1229
J/AJ/105/980/catalog	Photometry and cross-identifications (tables 1 and 2) (Massey P., Johnson J.)	768
J/AJ/105/980/table4	The brightest and bluest stars (Massey P., Johnson J.)	95
J/AJ/105/980/table5	New Spectral types (Massey P., Johnson J.)	19
J/AJ/105/980/table6	Distance & Reddening derived from spectroscopy (Massey P., Johnson J.)	48
J/AJ/106/1906/posmk	MK classification, with accurate position (Hillenbrand L.A., Massey P., Strom S.E., Merrill K.M.)	77
J/AJ/106/1906/table1	NGC 6611 Optical and Near-IR Photometry Data (Hillenbrand L.A., Massey P., Strom S.E., Merrill K.M.)	1022
J/AJ/108/1256/posmk	*Position and MK types of selected stars (Garmany C.D., Massey P., Parker J.W.)	29
J/AJ/108/1256/table3	UBV photometry of stars in LH 58 (Garmany C.D., Massey P., Parker J.W.)	839
J/AJ/110/2715/m33	Photometry of M33 stars (Massey P., Armandroff T.E., Pyke R., Patel K., Wilson C.D.)	490
J/AJ/110/2715/ngc6822	Photometry of NGC 6822 stars (Massey P., Armandroff T.E., Pyke R., Patel K., Wilson C.D.)	167
J/AJ/119/2214/table2	Catalog of Photometry and spectroscopy of 19 Magellanic Cloud OB associations (Massey P., Waterhouse E., DeGioia-Ea	548
J/AJ/119/2214/table5	Derived parameters for the highest mass unevolved stars (Massey P., Waterhouse E., DeGioia-Eastwood K.)	184
J/AJ/121/2020/table1	CTIO Photometry (Bianchi L., Scuderi S., Massey P., Romaniello M.)	3232
J/AJ/121/2020/table3	WFPC2 Photometry (Bianchi L., Scuderi S., Massey P., Romaniello M.)	1025

Choose

which makes it trivially easy to find tables in which you are interested, such as those associated with papers by Massey, as shown. Select the table that you want to search, and then continue to specify the rest of your search, just as described above in the [TAP Search](#) screen discussion.

The result of any TAP search is a catalog that can be interacted with like any other [catalog in this tool](#).

Tips and Troubleshooting

- All the drop-downs near the top are roughly searchable. This is very useful if you are trying to find a particular table or service that you can't quite recall. Click in the drop-down area, type the first letter of what you are looking for, and it will jump to the first instance of a string starting with that letter. Hit that letter again, and it goes to the second instance of a string starting with that letter.

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- Not every table available via this interface even has RA/Dec or, if it does, it may not be searchable via positions. If you have selected a table that doesn't have positions, it will not yield results if you try to search by position.
- If none of the columns are selected, then the tool behaves as if you have selected all of the columns.
- There is a maximum number of returned rows at the bottom. If you are anticipating more than this number of rows, increase this number!
- If you arrive at the advanced ADQL page from the "Populate and edit ADQL" button, this is a one-way trip -- any changes you make to the ADQL here are NOT transmitted automatically back to the "UI Assisted" query page.

ObsCore Search

An ObsCore search is technically a subcategory of a TAP search, but it is somewhat of a special subcategory in that it can return images, spectra, catalogs, and more, or even links to services. As such, it has [different search options](#).

To launch an ObsCore search, you need to find a server that supports an ObsTAP search, and flip the corresponding toggle on the left, for example:



The "UI Assisted"/"Edit ADQL" switch at the top right works [just like it does above](#) -- use the UI to construct a query or dive right into the ADQL yourself.

Then in the remaining part of the screen, impose the constraints you want -- see [the constraints section above](#).

At the bottom of the screen, you can "Populate and edit ADQL" if you want to work with the ADQL directly, or just search straight away after setting your search parameters.

This kind of search is somewhat hobbled in this tool; you may find it more satisfying to do this kind of search in the [IRSA Viewer](#)  tool, specifically because this kind of search yields much more than just a row in a catalog; it can give you images, spectra, and more. This table is like [any other table in this tool](#), so it can be sorted, filtered, etc.

VO SCS -- VO Simple Cone Search

(SCS = simple cone search.)

To see this tab as a choice on the top, you may need to select it from the [side menu](#).

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As for the other searches, the tool may try to pre-fill the target position with the coordinates of the target with which you have been working. In this case, you are limited to a cone search, so the next option is the cone search radius. As usual, pick your units from the drop-down first, and then enter a number; if you enter a number and then select from the drop-down, it will convert your number from the old units to the new units. There are both upper and lower limits to your search radius; it will tell you if you request something too big or too small.

If you know your VO URL already, you can jump down to the Cone Search URL box and type or paste your URL into the box and hit search.

More commonly, however, users do not know *a priori* which URL to use. Click on "Find Astronomical Data Resources" to be dropped into a VO search. Find the URL corresponding to the catalog you want, copy it, and go back and paste it in the URL box. The URL should not have the RA and Dec in it; the tool will add your RA and Dec as listed to the URL in the right syntax. Click on "Search" to initiate the search.

Example

Load the tool. Search on IC1396. Go to the catalogs tab. Choose "VO Catalog." It wants the root URL for a cone search. Click on "Find Astronomical Data Resources", which goes [here](#) . Search on IPHAS. Get [this page](#) . Look for the complete catalog release (not just one associated with one specific study). The name of the catalog goes [here](#) . Hit the [+] to expand it. There is one URL listed there, under "available endpoints for the standard interface." Copy that URL and paste it into the search form. The IRSA tool will append your coordinates and radius and return you a table.

Tips and Troubleshooting

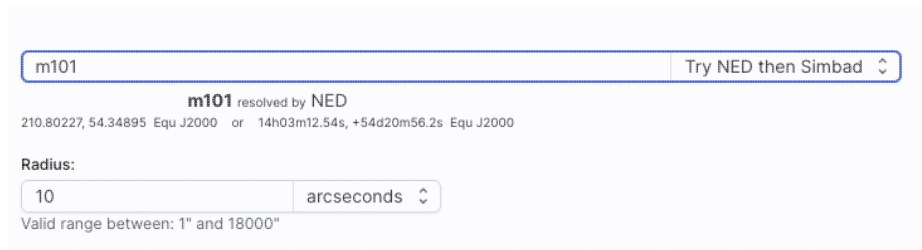
- Note that searching the VO means that you are using resources not specifically housed at IRSA, so servers may be down, or timeouts set, or limits on numbers of returned sources, etc., that are beyond our control. In most cases the solution is to specify as precise a search as possible. The URL you enter into the box in the search panel must be a Cone Search base URL (not containing RA and Dec parameters, which are inserted into the URL by the tool in response to the search parameters you give it).
- The master list of registries is [here](#) . You can also search the registries directly via that link (as opposed to via the IRSA tools).

The result of any VO SCS search is a catalog that can be interacted with like any other [catalog in this tool](#).

NED Objects -- Searching for NED objects

(NED= [NASA Extragalactic Database](#) )

To see this tab as a choice on the top, you may need to select it from the [side menu](#).



As for the other catalog searches, the tool may pre-fill the target position with its best guess of the coordinates of the target with which you have been working. You can use an object name in place of coordinates. Note that although NED is used for name resolution, the actual search is then performed using coordinates, as opposed to name. In this case, you are limited to a cone search, so the next option is the cone search radius. Pick your units from the drop-down first, and then enter a number; if you enter a number and then select from the drop-down, it will convert your number from the old units to the new units. There are both upper and lower limits to your search radius; it will tell you if you request something too big or too small.

From the NED results, you have one-click access to the fully detailed information from NED on any object returned from such a search. The search results will generally include a column "Details", though you may have to scroll to the right to see it. Clicking on a link in this column takes you directly to the full NED information display for the selected object in a new window.

The result of any NED search is a table that behaves like any other [table in this tool](#).

Euclid Data Explorer at IRSA: Plots

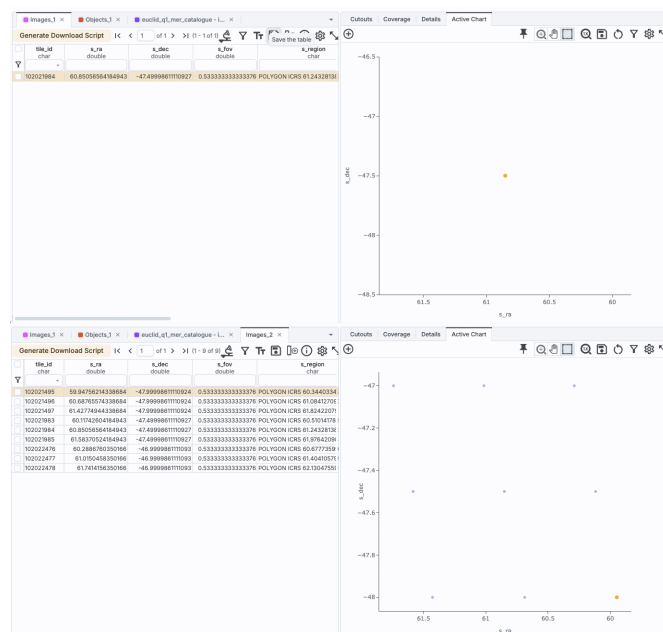
Plots (sometimes called charts) are made from [Tables](#), and, more commonly (or usefully) from [Catalogs](#). Plotting is covered in this section. The [Tables](#) section discusses tables more generally, and the specific case of loading [catalogs](#) is in another section. If your table has RA and Dec in it, the [Visualization](#) section covers how the catalog can be overlaid on images. [Spectra](#) take advantage of features of both plots and [tables](#).

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Default Plot

When doing an [Images search](#) for a target using the default "Image contains target", you typically get one image returned, and the default plot is often somewhat less than useful -- it grabs the 's_ra' and 's_dec' from the list of images, which is just the coordinates of the reference pixel (the center pixel) of the retrieved images. When you have just one tile in your search results, this is a phenomenally uninteresting plot, because it is a single point (see first plot below). If you instead do an Images search using "any pixel overlaps search region", you get more tiles, but still a fairly uninteresting plot (see second plot below).



You can change what is plotted (see below) but plots of image metadata may not be what is most desirable.

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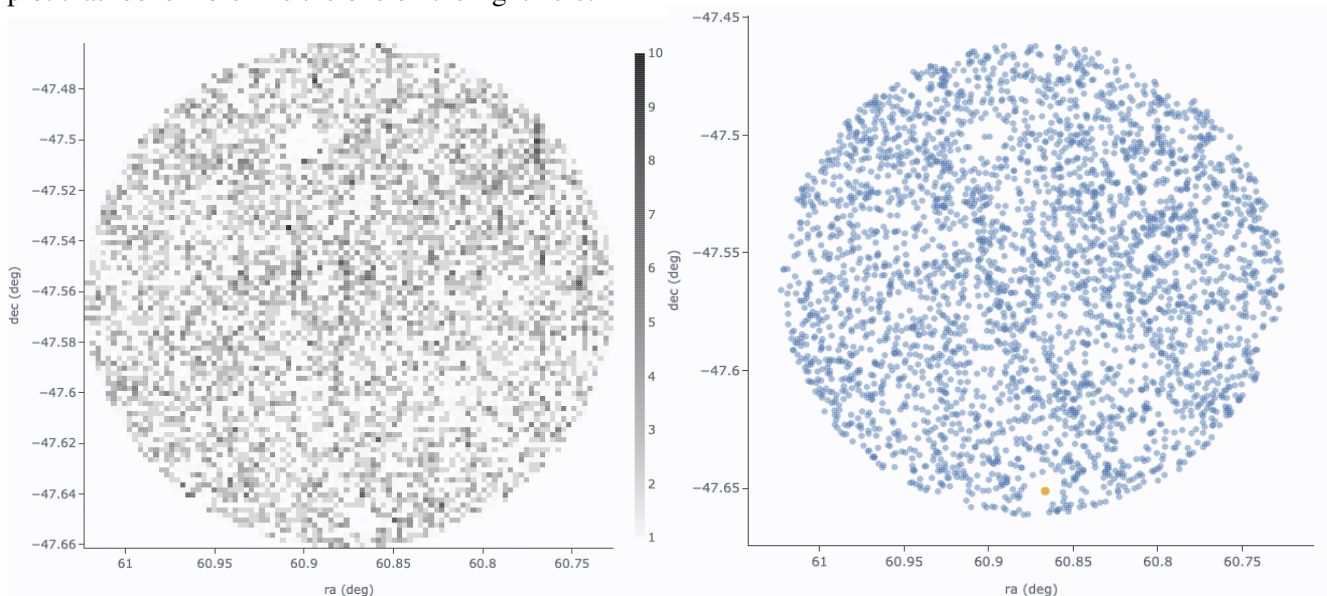
If you do an [Inspect Objects search](#), a [Euclid Catalogs](#) search, or any other [catalog](#) search, you will get a catalog loaded, and then have more interesting plots. The default plot for a catalog will also be RA and Dec, but with more points... and more columns to choose from.

Note that all of these RA/Dec plots follow astronomical convention -- RA increases to the left.

To obtain a full-screen view of your plot, click on the expand icon in the upper right of the window pane: . To return to the prior view, click the "Close" arrow in the upper left.

Plot format: a first look

If you have loaded a catalog with many (> 5,000) points, you may have an RA/Dec plot that looks something like the one on the left here. If you have loaded a catalog with few (< 5,000) points, you will have an RA/Dec plot that looks more like the one on the right here.



The difference between them is that, for larger catalogs (left), the plot is binned -- the shades of grey correspond to how many points are encompassed in each 'cell', with the density scale given on the right hand side of the plot. In the context of this tool, this is called a **heatmap**. For smaller catalogs (right), each individual point is shown as a blue dot. In the context of this tool, this is called a **scatter plot**. Note that even when individual points are shown, where the points overlap, the color is darker.

In either case, letting your mouse hover over a point tells you the values of the point under your cursor, and (if binned) how many points are represented:

ra = 325.2655066 deg
dec = 57.0346142 deg
represents 14 points

for binned plots, and

ra = 323.271454 deg
dec = 57.1493865 deg

for just one point.

ra = 324.7363179 deg
dec = 57.4941601 deg

Clicking (in an unbinned plot) highlights that point, and it stays highlighted, though you must keep your mouse on the point in order to see the information about it.

The reason the tool makes a heatmap for large catalogs is to more fairly represent the point density -- and to make the plotting faster. In these cases, though, it will not give you the option to overplot errors (see below). If you have a heatmap and want a scatter plot, you need to filter or otherwise restrict the catalog to have fewer points (see below). You can change the bin size and shading via the plot options pop-up (more on this below).

Plot Navigation

The top of the plot window has a row of icons something like this:



which we now describe.



Add new plot

You may or may not have this icon. Clicking on this icon adds a new plot. This has a [separate section](#) below.



Pin plot

This icon may not always appear. Clicking on this icon pins the plot. This has a [separate section](#) below.



Combine chart

This icon does not always appear. Clicking on this icon attempts to combine plots; it has a [separate section](#) below.



Show table

This icon does not always appear. Clicking on this icon pulls to the foreground the table that generated the plot that is currently in the foreground. This is related to pinning, which has a [separate section](#) below.



Plot mode

This trio of icons controls the plot interaction 'mode'. By default, you are in 'selection' mode, as seen here -- the last icon is darker, like a pushed-in button. To activate the other modes, click on the other icons, and they become darker or "pushed in."



Zoom mode

When this mode is active, when you click and drag in the plot, the plot is zoomed to the region you have selected. Even when this mode isn't active, you can also zoom using your scroll

feature on your mouse. To return to the original view, click on .



Pan mode

When this mode is active, when you click and drag in the plot, it moves around in response to

where you drag. To return to the original view, click on .



Select mode

When this mode is active, when you click and drag in the plot, you are given additional options

at the top of the plot :



The checkmark means "select" and the funnel means "filter." The difference is that filtering (temporarily) limits what is shown in the plot, catalog, and image (see [general information on filters](#)), and selecting just highlights the points enclosed within your

selection. To cancel either one, click on cancel filters  or cancel selection .



Re-scale plot

Return to the view that optimizes the range of x and y to show the currently displayed points.

Tips and Troubleshooting: Did you accidentally zoom in the plot with your magic mouse or touchpad? Click on this icon to reset the plot.



Save plot

Save the plot. It will save as a png file, wherever your browser is configured to save files. The saved png is the same size as it is on your screen. If you want a big version, make the desired plot big on your screen (expand the view to take up as much space as possible) before saving the png.



Undo

Restore everything to the defaults. If you've played a lot with the plot, you may want to undo everything you've done. Click this icon to restore everything back to the defaults.



Filter from plot

Pull up interactive filters. This button brings up filters for the displayed catalog in an interface [like all the other tables here](#), except you don't see the values in the catalog themselves; you can enter filters here in the same way you can everywhere else in this tool (see [general information on filters](#)).



Configure plot

Click on this icon to [change what is plotted](#) (much more on this below).



Expand plot

Click on this icon to make the plot take up the whole browser window. To return to the prior view, click the "Close" arrow in the upper left.



Help

This icon may not appear, but if it does, it is a context-sensitive help marker, which should bring you to this online help.

Plot Linking: Plots are linked to catalog and image(s)

If you move your mouse over any of the points in the plot, you will get a pop-up telling you the values corresponding to the point under your cursor. For scatter plots, if you click on any of the points, the object(s) corresponding to that point will be highlighted in the overlays in the images shown, and highlighted in the catalog table. This works the other way too -- click on a row in the catalog, or an object in the images, and the object will be highlighted in the plot or the catalog or the image.

Changing What is Plotted

To change what is plotted, click on the gear icon in the upper right of the plot window pane: . Configuration options then appear; the options are a little different depending on whether the points are binned or not. This section describes how to change what is plotted, i.e., the "Modify Trace" option at the top of both of these pop-ups. The [overplotting](#) option (and, for that matter, [adding plots](#)) are covered in more detail below.

This is the configuration window for a binned (a.k.a. heatmap and/or greyscale) plot. By default, the "chart options" may be hidden; to reveal them, click on the name "Chart Options" or the disclosure arrow on the right. To hide them again, click on the disclosure arrow on the right.

Plot Parameters

Overplot New Trace

Modify Trace

For X and Y, enter a column or an expression
ex. log(col); 100*col1/col2; col1-col2

X:

ra

Y:

dec

Color Scale:

GreySeq

reverse

Number of X-Bins:

100

Number of Y-Bins:

100

Chart Options

Chart title:

X Label:

ra (deg)

Options:

grid

reverse

top

log

Y Label:

dec (deg)

Options:

grid

reverse

right

log

Set plot boundaries if different from data range.

X Min:

X Max:

Y Min:

Y Max:

Enter display aspect ratio below.
Leave it blank to use all available space.

Apply

Close

Plot Parameters

Overplot New Trace

Modify Trace

For X and Y, enter a column or an expression
ex. log(col); 100*col1/col2; col1-col2

X:

ra

Error:

Y:

dec

Error:

Trace Style:

points

Trace Options

Chart Options

Apply

Close

The configuration window for a plot that shows individual points, once fully extended, is much longer (and scrollable), and so is shown here in two parts. Both the "Trace Options" and "Chart Options" may be hidden by

Euclid Data Explorer at IRSA: Plots

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Plot Parameters ✕

☐ Overplot New Trace ☒ Modify Trace

Trace Options ^

Symbol:

Color: 🔍

Color Map: 🔍

Color Scale:

Size Map: 🔍

Chart Options ^

Chart title:

X Label:

Options: ☐ grid ☒ reverse ☐ top ☐ log

Y Label:

Options: ☐ grid ☐ reverse ☐ right ☐ log

Set plot boundaries if different from data range.

X Min: X Max:

Y Min: Y Max:

Enter display aspect ratio below.
Leave it blank to use all available space.

X/Y ratio:

?

default; to reveal them, click on the name or the disclosure arrow on the right. To hide them again, click on the disclosure arrow on the right.

Options found in both kinds of plots

In either case, you can **specify what should be plotted on each axis**. The magnifying glass is a link that brings up a table that lists all of the available columns in the catalog. Alternatively, you can just start typing, and viable options appear below the box. Whatever you put in the box must match the column name as shown in the catalog *exactly*.

Click on the black triangle to reveal additional options.

In both of the examples above, RA is plotted on the x-axis. It has pulled the column name for the label; in this table, the column is "ra" rather than "RA", and it is case-sensitive. It has copied over the units ("deg") from the catalog, and plotted the x-axis increasing to the left as per astronomical convention. You can change what column is plotted, and whether or not errors are shown. Under "**Chart Options**", you can specify:

- ◊ title of the plot;
- ◊ labels on the x and y-axis;
- ◊ whether or not there is a grid shown;
- ◊ whether or not the axis is reversed (as for ra in the examples above);
- ◊ whether the x-axis is on the top or bottom and the y-axis is on the left or right;
- ◊ whether or not the axis is logarithmic;

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- ◇ the maximum and minimum values of the plot range;
- ◇ the aspect ratio of the plot (e.g., square or rectangular).

By default, the boundaries of the plot are set to encompass the full data range. Here you can change the boundaries to specific numbers. (This can also be set via filtering from the plot; see below.)

You can enter **simple mathematical relations** in these boxes too, such as (for a WISE catalog) "w1mpro-w4mpro" to put [W1]-[W4] on one axis. Supported operators:

- ◇ +, -, *, /
- ◇ abs(x), acos(x), asin(x), atan(x), atan2(x), ceil(x), cos(x), exp(x), floor(x), lg(x), ln(x), log10(x), log(x), power(x,y), round(x), sin(x), sqrt(x), tan(x)
- ◇ degree(x) and radians(x) are also supported -- these are the same functions as in ADQL and convert radians to degrees or degrees to radians. For small astrometric offsets, you could make a scatterplot of dec2-dec1 vs. (ra2-ra1)*cos(radians(dec1)) instead of typing cos(dec1*pi()/180). (NB: pi() is also a supported function you can use, instead of typing 3.14159.)
- ◇ Non-alphanumeric column names (e.g., those with - or + or similar characters) should be quoted in expressions.

Click "Apply" to apply, and "Close" to return to the plot without making changes. (For the latter, you can also click the 'x' in the upper right.)

Options found only in binned plots

(Plots are binned by default if there are > 5,000 points in the catalog.) From the pop-up, you can control the color table that is used (greyscale is the default; there are many other choices in the drop-down menu), as well as the number of bins in the x and y directions. The default value for the number of bins is 100 in both directions.

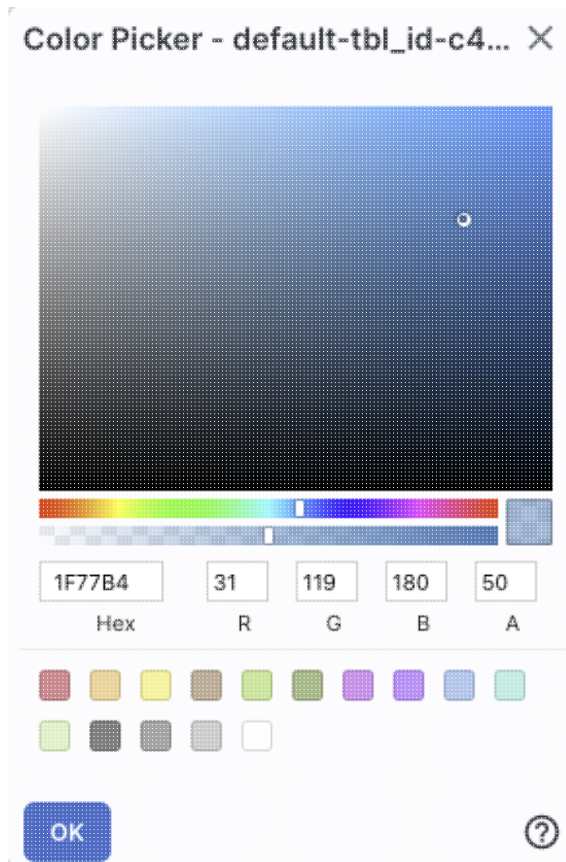
Options found only in plots showing individual points

You can add errors. Toggle the error switch, and then additional choices appear. From there, you can select symmetric or asymmetric errors, and then you can specify an error as either an existing column in the catalog, or calculated from a column in the catalog.

Under "**Trace Style**," you can control whether the points are shown as individual points, connected points, or just lines connecting the points.

Under **Trace Options**, you have many choices.

- ◇ Choose the **symbol type**: circle (default), open circle, square, open square, diamond, open diamond, cross, x, upward-pointing triangle, hexagon, or star.
- ◇ Choose the **color**. By default, the point color is a mid-range blue that is darker where more points. This is specified by the rgba vector shown in the example here (31, 119, 180, 50) where the last number is in units of fraction of 1, so 0.5=50% in this example. Click on the magnifying glass to bring up a color picker window:



From here, you can click on your desired color in the top colorful box. Immediately below that box, you can change the color and saturation of the top box so that you can select from a different range of colors. Below that, you can enter numerical hex codes or RGBA values (where the value for RGB is between 0 and 255, and A is in units of percent, e.g., 50 = 50%). Finally, you can also select from a pre-defined set of 15 colors by clicking on any of the small boxes. Note that the numerical codes update as you select different colors. Click "OK" to implement your color choice, or click 'x' in the upper right to close the window without changing the color.

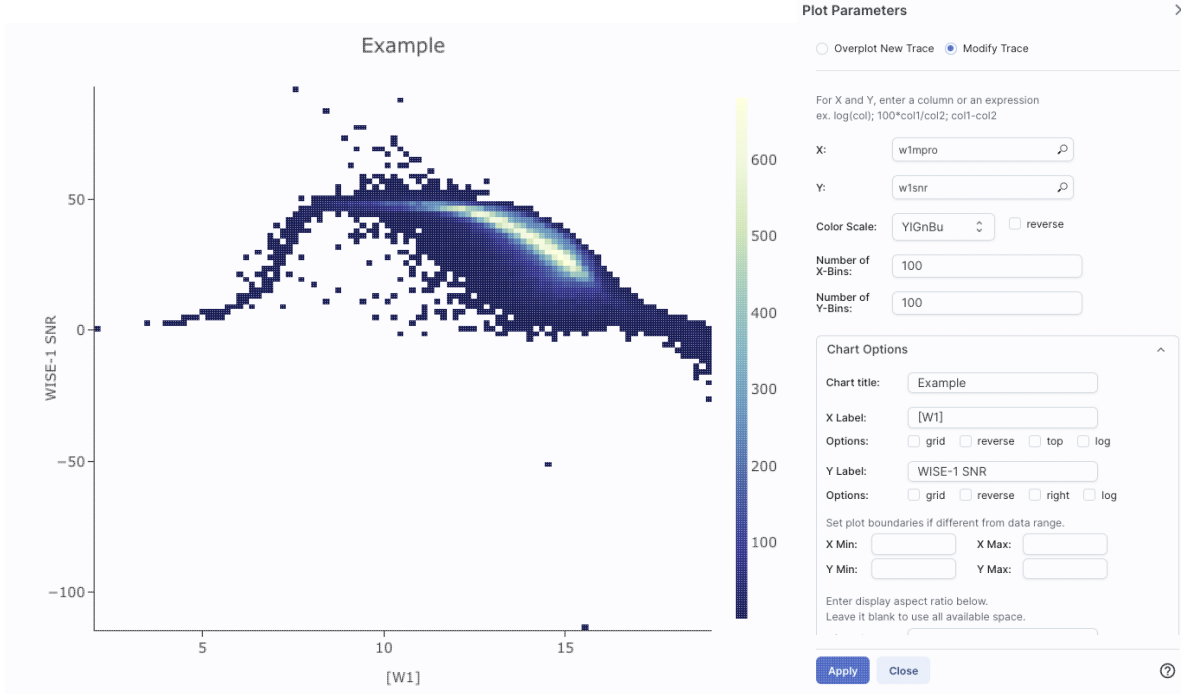
Tips and Troubleshooting: Don't like the transparency feature of the points that makes them darker when there are more points? Set the last value of the vector (A) to 1. Don't like the blue? Pick a different color entirely. Want the faintest point to be brighter than it is by default? Set the last element of the color vector ("A") to be 0.7 or 0.8.

- ◇ Choose the **color map**. By default, all of the points are the same color, but darker where there are more points. You can change this such that the color scale of the points is tied to a column value, such as `w1snr` (WISE-1 signal-to-noise ratio) in a WISE catalog. If you select this option, you can also change the color scale to any of many different options (see the drop-down). Simple mathematical relations (as above) are also permitted in this box.
- ◇ Choose the **size map**. By default, all of the points are the same size. You can change this such that the color scale of the points is tied to a column value, such as `w1snr` (WISE-1 signal-to-noise ratio) in a WISE catalog. Simple mathematical relations (as above) are also permitted in this box.

Example: Load a large WISE catalog. Plot `w1snr` (WISE-1 signal-to-noise ratio) vs. `w1mpro` (WISE-1 profile fitted magnitude). It defaults to a heatmap. Change the labels, making the y-axis label "WISE-1 SNR" rather than the more cryptic column header "w1snr". Change the x-axis label to "[W1]". Change the greyscale to

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yellow-green-blue ("YlGnBu") to make it easier to see the lowest-populated bins. Depending on your catalog, you may need to adjust the ranges. Obtain this plot:



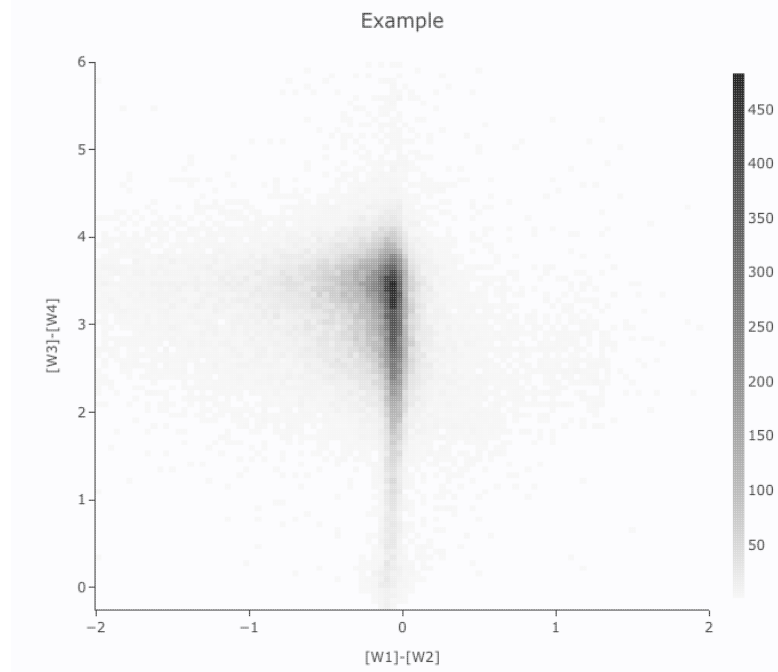
Example: Load either a smaller WISE catalog, or the same large WISE catalog, but [filter](#) it down such that w1snr, w2snr, and w3snr are all greater than 10, which limits the number of points to be <5,000. Plot w1snr vs. w1mpro. It shows the points individually. Change the labels. Change the point color map to scale with w2mpro (WISE-2 profile fitted magnitude). Change the point size map to scale with w4snr (WISE-4 signal-to-noise). Obtain this plot:



Plotting Manipulated Columns

You can choose a single column to plot against another column, as above. However, you can also do simple mathematical manipulations.

For example, if you have loaded a WISE catalog, you can plot $[W1]-[W2]$ vs. $[W3]-[W4]$. In terms of the names of the columns in the database, this is $w1mpro-w2mpro$ vs. $w3mpro-w4mpro$.



Plot Parameters

☐ Overplot New Trace
 ☒ Modify Trace

For X and Y, enter a column or an expression
 ex. log(col); 100*col1/col2; col1-col2

X:

Y:

Color Scale: ☐ reverse

Number of X-Bins:

Number of Y-Bins:

Chart Options

Chart title:

X Label:

Options: ☐ grid ☐ reverse ☐ top ☐ log

Y Label:

Options: ☐ grid ☐ reverse ☐ right ☐ log

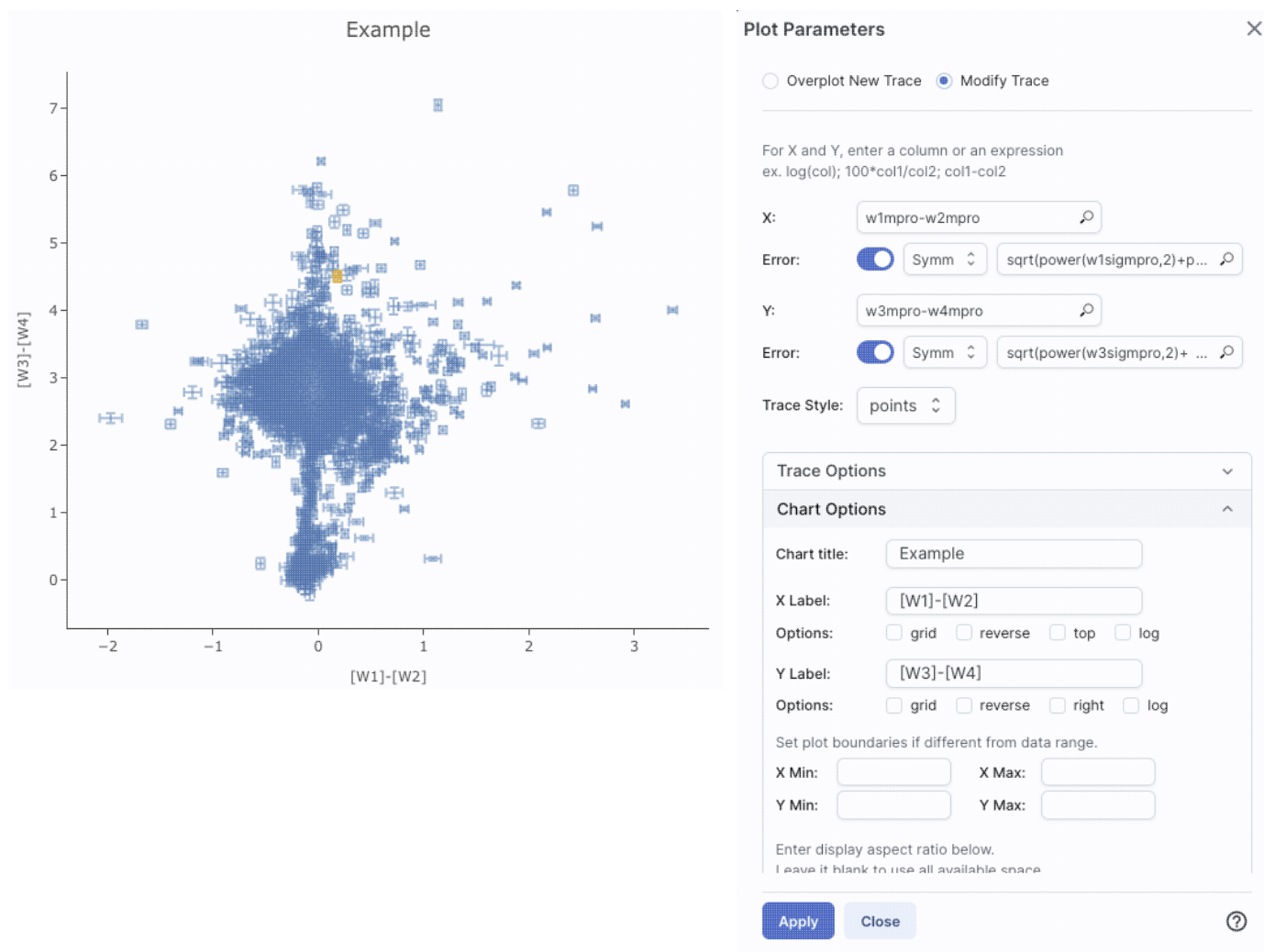
Set plot boundaries if different from data range.

X Min: X Max:

Y Min: Y Max:

Enter display aspect ratio below.
 Leave it blank to use all available space.

If you have few enough points that the plot is not binned, you can add errors that you calculate. Here, the expression for the x-axis errors is $\sqrt{\text{power}(w1sigmpro,2)+\text{power}(w2sigmpro,2)}$ and for the y-axis errors, it is $\sqrt{\text{power}(w3sigmpro,2)+\text{power}(w4sigmpro,2)}$ -- that is, the errors for the individual photometric points added in quadrature.



Restricting What is Plotted (from the plot)

You can also restrict what data are plotted in any of several different ways.

You can [filter the catalog](#) from the table itself (discussed in another section).

You can set axis limits on the plot itself from the plot options pop-up (discussed above).

However, and perhaps more powerfully, you can set limits from the plot itself using a rubber band zoom. Click

on the select icon in the plot  Then, click and drag in a sub-region of the plot. New icons appear:

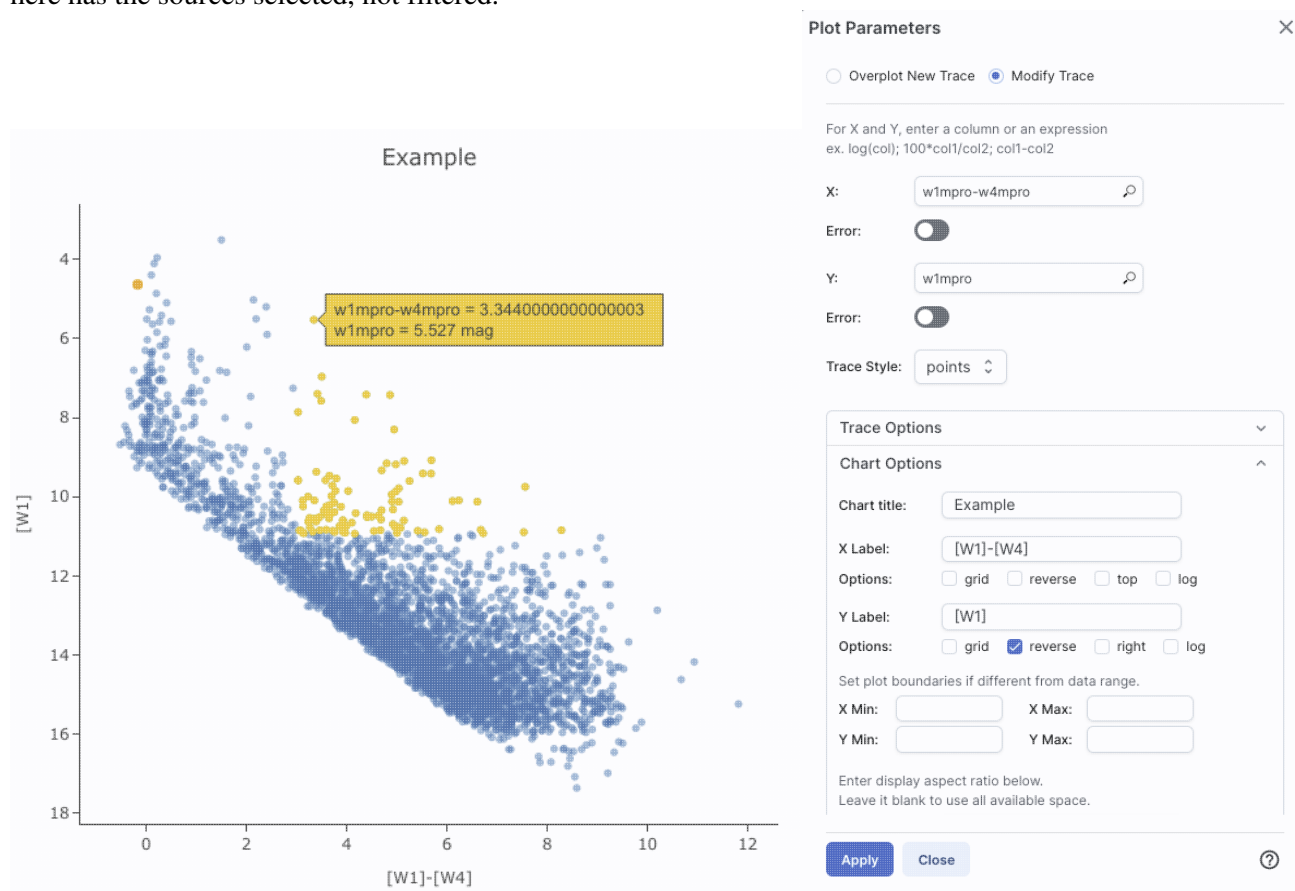


If you click on the funnel icon, only those data points that pass the filter are shown in the plot, in the table, and/or overlaid on the image(s). (This is the behavior of 'filter', as opposed to 'select'; the former restricts what is shown, the latter just highlights the points.) For more on filters, see [the filtering discussion in the tables section](#).

Example: Obtain a WISE catalog of a star-forming region, say IC1396. Filter down the catalog to only have detections at all four WISE bands. (Limits have undefined errors, so ask the catalog to filter down such that $w1sigmpro > 0$, $w2sigmpro > 0$, $w3sigmpro > 0$, and $w4sigmpro > 0$). Plot $w1mpro - w4mpro$ on the x-axis, and

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w1mpro on the y-axis. Reverse the y-axis to put bright objects at the top. Click and drag in the plot to select the bright and red objects, and filter them down to get a subset of bright and red sources. For clarity, the screenshot here has the sources selected, not filtered.



Overplotting

At the top of the pop-up that you get when you click on the gears, you have two radio buttons:

☐ Overplot New Trace ☒ Modify Trace

They are "Overplot New Trace" and "Modify Trace." Modifying traces (plots) has been covered above; in this section, we will cover overplotting. This is sometimes called "multi-trace," meaning that more than one thing is plotted.

When you select "Overplot New Trace," you get a new interface that is very similar to the original interface where you selected what to plot:

Plot Parameters

☒ Overplot New Trace
☐ Modify Trace

Plot Type:
Scatter

For X and Y, enter a column or an expression
ex. log(col); 100*col1/col2; col1-col2

X:

Error:
☐

Y:

Error:
☐

Trace Style:
points

Trace Options

Chart Options

OK
Close

?

As before, you need to :

- select a plot type (scatter, heatmap, histogram);
- tell it what column(s) (and and manipulations thereof) you want for x, y, and associated errors;
- select the trace style (points, connected points, lines);
- set any additional trace options;
- set any additional chart options.

The best way to explain how to use this feature is probably with an example. We have a plot of [W1] vs. [W1-W4] from above. We want to add on top of it a plot of [W2] vs. [W1-W4]. Click on the "Add Trace" button to bring up the pop-up. Select "Overplot New Trace." Enter "w1mpro-w4mpro" for x and "w2mpro" for y. Expand "Options." Note that it has preserved the overall chart title, but has erased the X and Y labels (and lost the rest of the y axis) because the overplot could literally be anything. The x-axis need not be the same columns or even the same units as the first plot. It need not be the same columns or even the same units as the first plot. Type them in again. Here is the configuration:

Plot Parameters

Overplot New Trace

Modify Trace

Plot Type:

Scatter

For X and Y, enter a column or an expression
ex. log(col); 100*col1/col2; col1-col2

X:

w1mpro-w4mpro

Error:

Y:

w2mpro

Error:

Trace Style:

points

Trace Options

Chart Options

Chart title:

Example

X Label:

[W1]-[W4]

Options:

grid

reverse

top

log

Y Label:

[W1] or [W2]

Options:

grid

reverse

right

log

Set plot boundaries if different from data range.

X Min:

X Max:

Y Min:

Y Max:

OK

Close

window right before clicking "ok", and the resultant plot

Example

[W1] or [W2]

[W1]-[W4]

trace 0 trace 1

After you add the overplot, if you click on the gears again that the choices at the top of the window have changed. You can add another overplotted trace, modify a trace, or remove a trace. Each trace that you add is a new 'layer' on the plot. A drop-down menu near the top of the window controls which trace is 'active' for setting the x, y, errors, trace style, name, size, color, etc. there is now a drop-down menu at the top of the window. There is a legend on the plot specifying which color corresponds to which trace. In this example, the plot above has appeared with a blue and green color scheme, which may be too hard to

Euclid Data Explorer at IRSA: Plots

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Plot Parameters

☐ Overplot New Trace
 ☒ Modify Trace
 ☐ Remove Active Trace

Choose Trace: trace 1

For X and Y, enter a column or an expression
ex. log(col); 100*col1/col2; col1-col2

X: w1mpro-w4mpro

Error: ☐

Y: w2mpro

Error: ☐

Trace Style: points

Trace Options

Name: [W2]

Symbol: circle

Color: rgba(144,19,254,0.5)

Color Map:

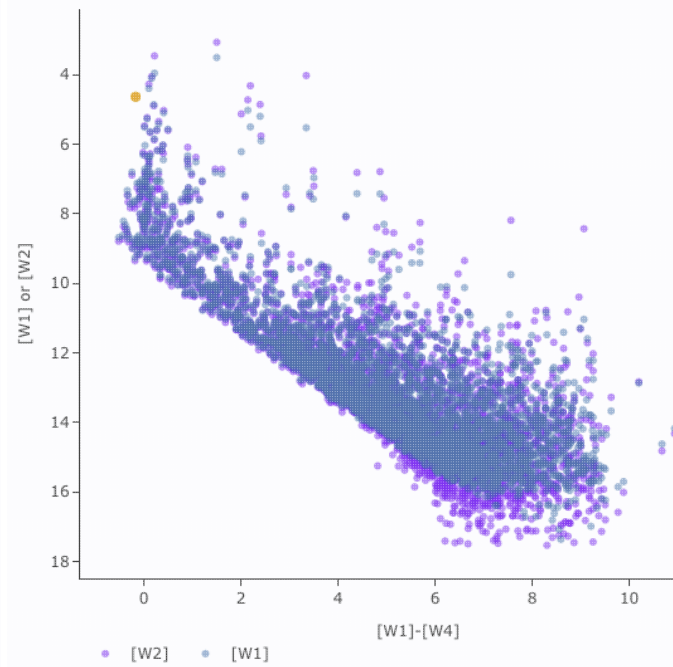
Color Scale: Greys

Size Map:

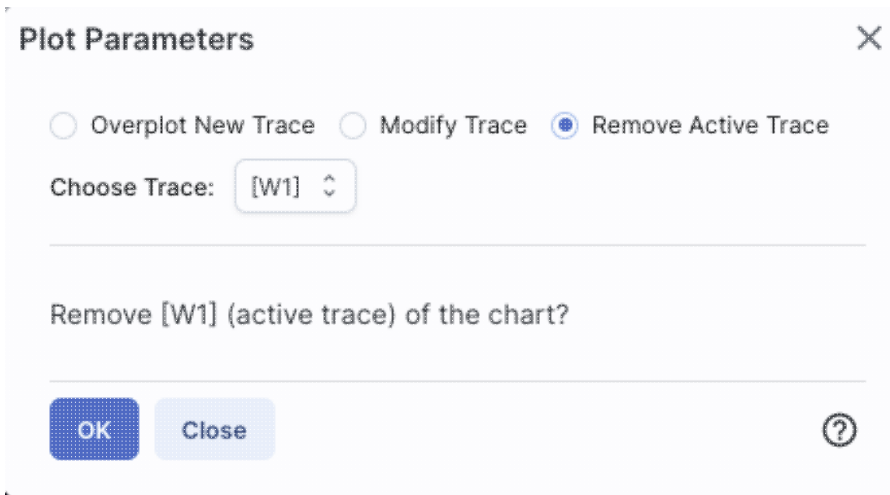
Chart Options

differentiate. To change the new points' color, click on the gear icon to open the "Modify Trace" pop-up window. Ensure "Modify Trace" is selected, select "trace 1" (as opposed to "trace 0", the first one you loaded), go down and expand "Trace Options" and pick a different color. You can also change the legend name from "Trace 1" to, in this case, "[W2]". Click the "apply" button to apply the changes to the plot. Note that once you change the trace name, the relevant drop-down menus in the pop-up window and the legends on the plot update accordingly.

Example



Note that the pop-up spawned by clicking the gears now has an additional option at the top: "Add New Chart", "Overplot New Trace", "Modify Trace", and "Remove Active Trace." From here, you can modify a trace you have already plotted (as described above), overplot another trace (also as described above), or remove the selected trace:



Plot Parameters [X]

☐ Overplot New Trace
 ☐ Modify Trace
 ☒ Remove Active Trace

Choose Trace: [W1] [v]

Remove [W1] (active trace) of the chart?

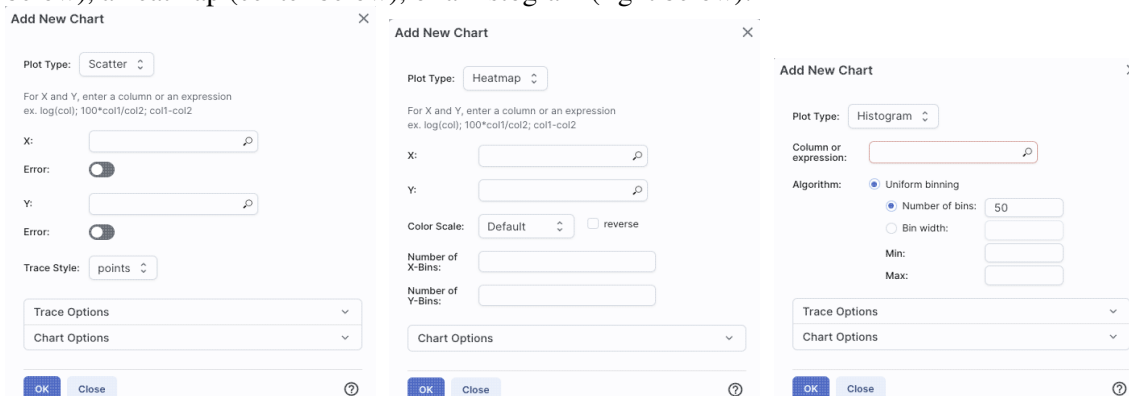
Tips and Troubleshooting

- Right now, the overplotting only works from the same catalog -- that is, you cannot plot [W1] vs. [W1]-[W4] from one catalog and overplot [W1] vs. [W1]-[W4] from another catalog. (We enthusiastically await this capability too.)
- You can easily get yourself into a physically nonsensical situation, say, by overplotting a histogram onto a scatter plot. If you find yourself in a hopeless mess, click on the "undo" icon to reset everything  and try again.
- When you have more than one thing (trace) plotted, double click on the legend to bring that trace to the foreground and temporarily hide the other traces.

Adding Plots



Clicking on this icon brings up a dialog from which you can choose to make another scatter plot (left below), a heatmap (center below), or a histogram (right below):



Add New Chart [X]

Plot Type: Scatter [v]

For X and Y, enter a column or an expression
ex. log(col); 100*col1/col2; col1-col2

X: [] [v]

Error: ☐

Y: [] [v]

Error: ☐

Trace Style: points [v]

Trace Options [v]

Chart Options [v]

Add New Chart [X]

Plot Type: Heatmap [v]

For X and Y, enter a column or an expression
ex. log(col); 100*col1/col2; col1-col2

X: [] [v]

Y: [] [v]

Color Scale: Default [v] ☐ reverse

Number of X-Bins: []

Number of Y-Bins: []

Chart Options [v]

Add New Chart [X]

Plot Type: Histogram [v]

Column or expression: [] [v]

Algorithm: ☒ Uniform binning

☒ Number of bins: 50 []
 ☐ Bin width: []

Min: []

Max: []

Trace Options [v]

Chart Options [v]

The options for these plots here are very similar to what is described above. You can specify which columns to plot or manipulate and plot, specify labels, etc.

Scatter plots allow you to choose points, connected points, or lines; you can add errors to each point. There is a maximum of 5,000 points for scatter plots.

Heatmap plots are binned scatter plots; you can choose what color scale and how many bins to use.

Histogram plots allow you to choose how many bins or the bin width. Note that, if you provide a minimum number, the binning starts at the minimum value you provide, and may exceed the maximum you entered in order to fit in a whole bin.

You can change what is plotted after plotting by clicking on the gears, as described above.

You can have many plots up at the same time.

You can view multiple plots all at once or one at a time by clicking on the corresponding icons above the plots

(just as when you have multiple images loaded).  The single box means "one at a time", the set of four boxes means "all the plots at once". If you are viewing one at a time and have more than one plot loaded, you will see the ">" and "<" signs (as in the image here), and you can scroll among the plots by clicking on these arrows (just as when you have multiple images loaded).

Tips and Troubleshooting

- Note that many plots of a large catalog may make your browser run slowly.
- You can force the tool to make a scatter plot even if you have a catalog of >5,000 points; it just might make your browser slow down. You can even overplot a scatter plot on top of a heatmap if you really want to!
- To remove a plot, click on the 'x' in the upper right corner of the plot

Pinning Plots

The idea behind "pinning plots" (or "pinning charts") is that you can retain a plot. Within this tool, "pinning" just means "hold on to this item within this tool." It doesn't mean "save this plot to disk", nor does it mean "download the data behind this"; it means "retain this item in this tool for now." Think of it as if you have a metaphorical bulletin board behind your computer monitor and you want to put a plot you make on that bulletin board temporarily (with a pushpin!) while you continue to work on other plots or other catalogs. For example, you could make the same color-magnitude diagram from two catalogs of two different regions, pin both, and then compare them side-by-side.

When you make a plot that you want to retain, click on the "pin chart" icon  and it will make a copy of that chart and keep it in your plot area, even as you continue to make more plots and work with more catalogs.

It saves your pinned plot in a different tab than your current plot. To change between them, just click on the corresponding tab. Here, there are three pinned charts, and the current view is the active chart:



Tips and Troubleshooting

- When you pin a plot, and then filter its parent catalog, the plot updates correspondingly, because it is still linked to its parent catalog.
- When you have multiple catalogs (or tables of any sort) loaded, if you want to bring to the foreground the catalog tab corresponding to a pinned plot, click on "show table" , and it will bring the corresponding catalog to the foreground of your tables pane.
- If you click on a source in the image (or catalog or plot), the same source is highlighted in the catalog

(or image or plot).

- To change a pinned plot, click on the plot to bring it to the foreground, then click on the gears in the the corresponding plot area, and change what is plotted as described [above](#).
- You can view the plots one at a time or in a grid by clicking on the icon for one-at-a-time (big square) or tiled (4 small squares; if you are viewing them one at a time, you can use the ">" and "<" arrows to



scroll through the list):

- There is a maximum of 12 charts that you can pin at one time.
- When many plots are pinned, and you view many plots at once, the margins on the plots will shrink down (effectively vanish) to make the data more easily visible. To view the plots with axes, view the plots one at a time.
- To remove a pinned plot, click on the blue 'x' in the upper right corner of the plot.
- If you remove a catalog by clicking on the 'x' in the corresponding catalog tab, the pinned plot will be removed as well.

Combining Plots



When you have more than one plot pinned, you have an additional icon that can appear -- it means "Combine Chart".

This option only appears if you have pinned at least two plots, and it will only let you combine plots if it recognizes that you have spectra loaded. These can be spectra you have loaded in (and pinned) from a Euclid search.

The information on how to combine plots can be found in the [chapter on spectra](#).

Euclid Data Explorer at IRSA: Spectra

Visualization of spectra use capabilities of [Tables](#) and [Plots](#). Generic help on those capabilities can be found in those other sections; this section is a generic help page for spectra, which are a special case of both tables and plots, and collects all the spectra-specific information in one place.

Contents of page/chapter:

- +[Plotting Spectra](#)
- +[Redshifting Spectra](#)
- +[Viewing as a Table](#)
- +[Combining Spectra](#)

Plotting Spectra

Spectra are plotted by default as signal (in $1e-16$ erg/Angstroms/s/cm²) vs. lambda in Angstroms, with connected points. These plots, while they look like other kinds of [plots](#) in IRSA tools with this look-and-feel, have different choices than regular plots, because the tool understands that it is plotting a spectrum.

Changing what is plotted by clicking on the gears is similar to, but not quite the same as, [the generic case](#). Now, because it knows it is plotting a spectrum, you can select the x- and y-axis columns and units from a pre-defined set of choices in the drop-down menus, where it will convert the units when necessary.

Plot Parameters

☐ Overplot New Trace
 ☒ Modify Trace

X-axis

Spectral axis column (λ):

Spectral axis units:

Spectral Frame:

Y-axis

Flux axis column:

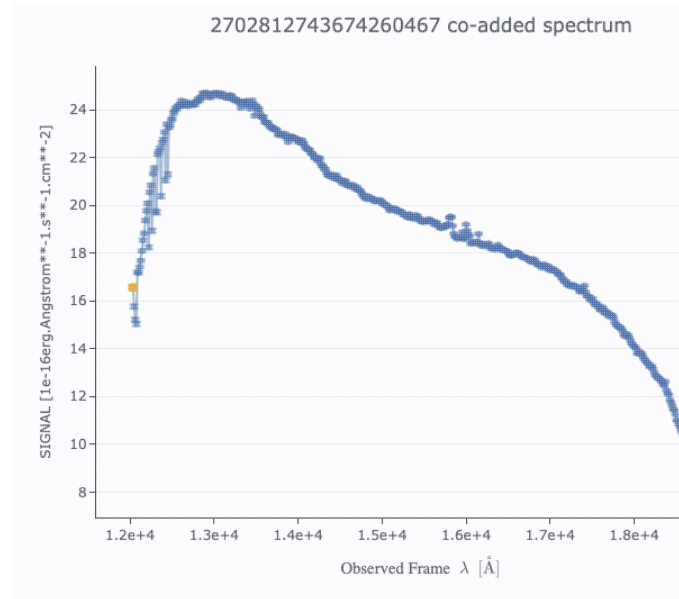
Error: ☒ Symm

Flux axis units:

Trace Options

Chart Options

In this example, the tool has identified the wavelength axis as 'WAVELENGTH', understood the units (Angstroms), and is showing them in the observed reference frame. It has identified the flux axis column as 'SIGNAL' and the corresponding error column as 'UNCERTAINTY', and understood the units as $1e-16$ erg/Angstroms/s/cm². From the drop-down menus, you can choose to convert the wavelength to Angstroms, nanometers, microns, millimeters, centimeters, or meters. It is plotting the spectrum as connected points, with error bars.



You don't have as much flexibility in these plots as you do for [plots in general](#), but the options you do have are highly customized to spectra, such as redshifts. See the next section!

Redshifting Spectra

When the tool recognizes the wavelength axis, it offers you a choice of redshifting the spectrum. By default, it assumes you want to plot the data as observed:

Spectral axis column (λ): "WAVELENGTH" 🔍

Spectral axis units: Å ↕

Spectral Frame: Observed Frame ↕

but if you pick "Rest Frame":

Spectral axis column (λ): "WAVELENGTH" / (1 + 0) 🔍

Spectral axis units: Å ↕

Spectral Frame: Rest Frame ↕

☒ Enter Redshift: 0

you can enter a redshift, and it shows you how it adjusts the wavelength axis accordingly:

Spectral axis column (λ): "WAVELENGTH" / (1 + z) 🔍

Spectral axis units: Å ↕

Spectral Frame: Rest Frame ↕

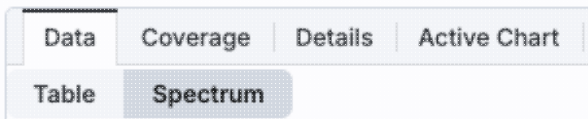
☒ Enter Redshift: 3

Click 'Apply' to implement these changes in the plot. The axis labels on the plot correspondingly change.

To change back to the data as observed, simply pick "Observed Frame" from the drop-down menu.

Viewing as a Table

Near the top left of the spectrum plot, you can find this choice:



The default view is to show the spectrum as a plot. If you click on "Table", it will show you the spectrum as a table. The table view has more information than you get from just the plot, such as the pixel location and the time of observation. You can impose filters on the spectrum from this table, because it behaves just as [all other tables in this tool](#).

Tips and Troubleshooting: Since several of the values in most Euclid spectra are zero to indicate "no data", you probably want to impose a "> 0" filter on the "SIGNAL" column right away to make the plot look better.

Combining Plots

[Pinning plots](#) is covered in the generic plots section, but in brief, pinning allows you to temporarily 'save' a given plot.

When you have more than one plot pinned, this icon may appear at the top of the plot pane:  This means "Combine Chart".

This option only appears if you have pinned at least two plots, and it will only let you combine plots if it recognizes that you have spectra loaded.

To start this process, click to select the first chart you want to combine, then click on the "combine chart" icon. You get a pop-up like this:

Add charts to current chart ✕

☒	Title	From Table	
☒	-600913676502560845 co-added spectrum	-600913676502560845 co-added spectrum	
☒	-601926498502312899 co-added spectrum	-601926498502312899 co-added spectrum	

Chart title:

Apply cascading: ☒

Choose trace names below:

-600651950502289764 co-added spectrum ^

Name:

-600913676502560845 co-added spectrum ^

Name:

-601926498502312899 co-added spectrum ^

Name:

All of the remaining pinned charts that can be combined appear as a list at the top. Once you select them via the tickboxes on the far left of the list (the first one in the list is selected here), they appear as options on the bottom of the pop-up window. For this example, I am combining three Euclid spectra.

Continuing through this pop-up, you can choose to set the title of the new plot you are about to create -- the default is "combined".

The next choice is "Apply cascading." Here is what this is and why it matters. If you are combining spectra that are nearly all the same brightness, the spectra will be plotted on top of each other. Sometimes that is what you want, and sometimes that is not. If you click on the "Apply cascading" option, you have an additional choice:

Apply cascading: ☒

Y-axis: $(y - \min(y)) / (\max(y) - \min(y)) + (i * P)$

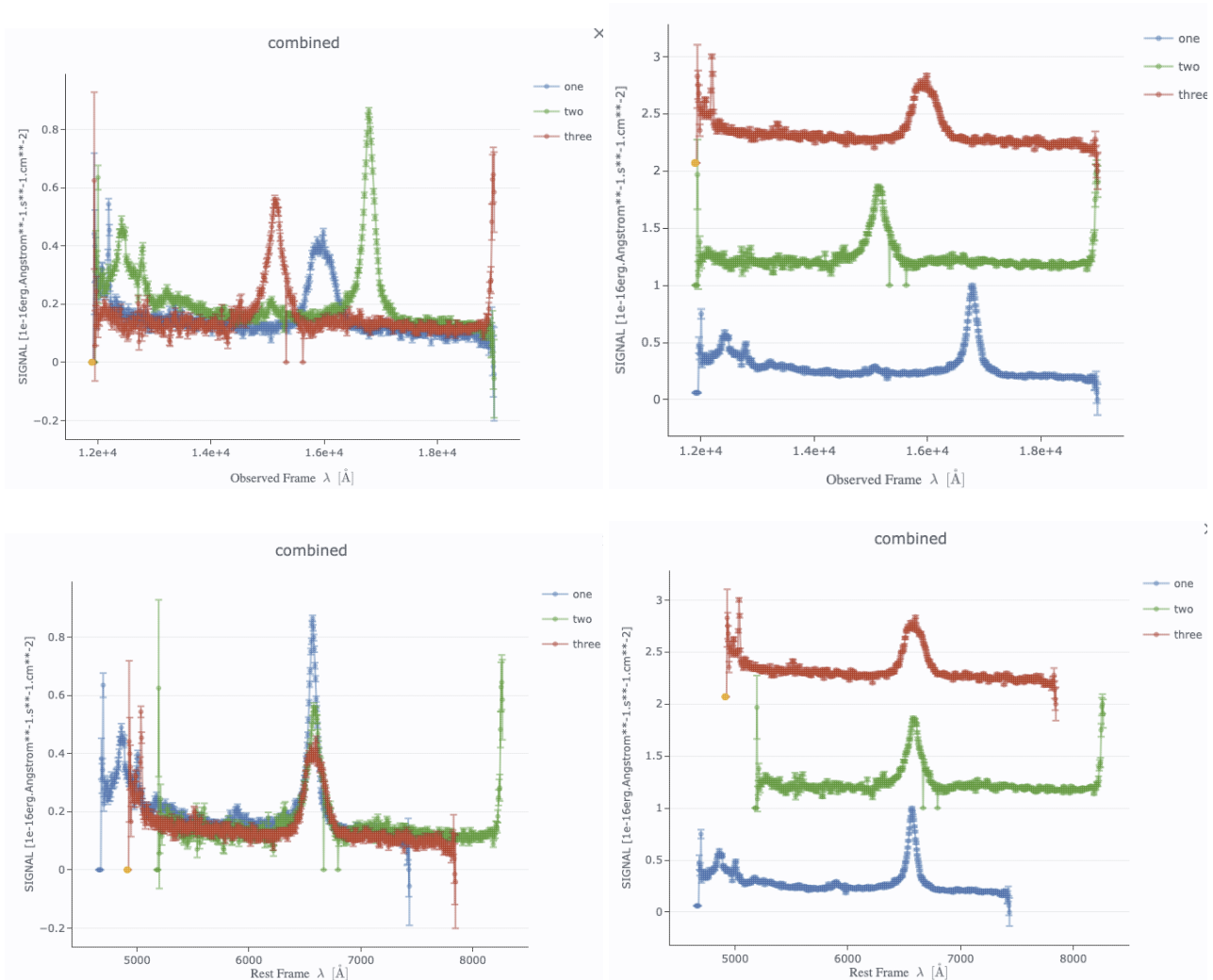
Padding (P):

This is telling you how it is going to stack the spectra on the final plot. See below for examples with and without cascading. You can adjust the amplitude of the cascade by changing the size of the padding, as shown.

Finally, you can change the name of the trace as displayed on the plot (and in the pull-down menus in the tool) for each of the spectra you are combining.

Click "OK" to actually make the new plot.

Here are some examples of combined spectra, both observed and rest frame. All are useful, but in different contexts.



Note that after you combine a plot, there is a new drop-down at the top of the plot that controls which trace is in the 'foreground' for changing plot parameters or selecting points, but you can also simply click on points in the plot to bring that trace to the foreground.

Tips and Troubleshooting

- The plot you have selected when you click on "Combine Chart" is implicitly part of the combining process, so it's not available to select with a tickbox in the pop-up.
- At this time, you can't combine charts that the tool doesn't recognize as spectra, even if they are in the same parameter space.
- To delete a combined plot that you have created, just click on the 'x' in the upper right of the plot.

Euclid Data Explorer at IRSA: Downloading Data

Contents of page/chapter:

- +[Overview](#)
- +[Options for Downloading Data](#)
- +[Job Monitor](#)
- +[Sending Email](#)
- +[Scripts](#)
- +[Job Information](#)

Overview

To save individual things like single tables, images, or plots, look for a diskette icon () in the corresponding pane. [Tables](#), [images](#), and [plots](#) can all be saved individually.

To download data, in the simplest case, on the search [results](#) page, just click the checkboxes on the far left of each row to pick specific observations to download, and then click the "Generate Download Script" button

Generate Download Script to begin the process. A pop-up window will appear in order to define exactly what kinds of data you would like to download. Clicking "Download Script" in the pop-up initializes this process.

To select *all* of the data you have displayed, click on the checkbox at the top of the column of checkboxes, and all of the rows are automatically clicked (even those on subsequent pages if you have more than one page). Then click "Generate Download Script" to initiate the process.

The packaging process spins off into the [Job Monitor](#), which keeps track of its progress and notifies you when the downloads are complete. You can choose to have an [email](#) sent to you to let you know when things are ready, even after the packaging process has started.

Tips and Troubleshooting

- **You** control where the file is saved on your disk through your browser; your browser may be configured to store all downloads in a particular location on your disk. Try looking in a "Downloads" directory, or for "recently modified files."
- You need to be [logged in](#) to use the [IRSA Workspace](#) .

Options for Downloading Data

The choices you have for downloading data are a function of where you are when you initiate the process. The left screen shot here is from an Images results tab, and the right is from an Inspect Objects results tab:

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The image shows two versions of the 'Download Options' dialog box. The left version has 'euclid_images_1' in the title field, 'All data' selected under 'Products to Download', and 'Local File' selected under 'File Location'. The right version has 'euclid_Objects_1' in the title field, 'All data' selected under 'Products to Download', and 'Local File' selected under 'File Location'. Both versions have 'Flattened File Structure' as a toggle and 'Download Script' and 'Cancel' buttons.

From the pop-up, you can choose what to download. In both cases, you need:

Title

The name by which this packaging job will be known to the [Job Monitor](#) as well as what the root filename is for the saved file - change it to whatever you want (time or a description of your search is usually the most helpful).

Products

What, exactly, would you like to download? Read the documentation linked [here](#) and decide what you need.

Flattened file structure

The observations can be bundled one per subdirectory (structured) or all in one directory (flattened).

File location

Where do you want the script to be saved? It can be saved in a file on your local disk or the [IRSA Workspace](#) .

Click on "Download script." If you request relatively little data, the download will happen quickly. If you request a lot of data, you are given a choice to place the job in the [Job Monitor](#).

Job Monitor

To explore the Job Monitor, click on the Job Monitor tab at the top of the screen:



Here is a well-populated job monitor list:

Euclid Help

Job Summary Total: 20 Active: 1 Failed: 0

Notification Email By default, email notification is turned off. To toggle email notification for any given job in progress, click on the blue bell icon:

Title	Service ID char	Type char	Start Time	End Time	Phase char	Control
euclid_Objects_1	IRSA	SCRIPT	2025-06-06 22:38:51		EXECUTING	
euclid_Images_1	IRSA	SCRIPT	2025-06-06 22:38:37	2025-06-06 22:38:42	COMPLETED	
euclid_q1_mer_catalogue - irsatest	IRSA	TAP	2025-06-06 22:17:12	2025-06-06 22:17:12	COMPLETED	
euclid_q1_mer_catalogue - irsatest -	IRSA	TAP	2025-06-06 22:16:19	2025-06-06 22:16:20	COMPLETED	
euclid_q1_mer_catalogue - irsatest	IRSA	TAP	2025-06-06 22:14:10	2025-06-06 22:14:10	COMPLETED	
Objects_1	euclid	SEARCH	2025-06-06 22:13:55	2025-06-06 22:13:59	COMPLETED	
Images_1	euclid	SEARCH	2025-06-06 22:13:45	2025-06-06 22:13:47	COMPLETED	
euclid_q1_mer_catalogue - irsatest	IRSA	TAP	2025-06-06 22:04:22	2025-06-06 22:04:22	COMPLETED	
Objects (ID)_1	IRSA	SEARCH	2025-06-06 21:54:48	2025-06-06 21:55:05	COMPLETED	
Objects_3	euclid	SEARCH	2025-06-06 21:52:08	2025-06-06 21:53:35	COMPLETED	
Objects_2	euclid	SEARCH	2025-06-06 21:49:48	2025-06-06 21:49:53	COMPLETED	
Images_3	euclid	SEARCH	2025-06-06 21:47:49	2025-06-06 21:47:51	COMPLETED	
Images_2	euclid	SEARCH	2025-06-06 21:46:49	2025-06-06 21:46:51	COMPLETED	
euclid_q1_mer_catalogue - irsatest	IRSA	TAP	2025-06-06 21:45:46	2025-06-06 21:45:47	COMPLETED	
Objects_1	euclid	SEARCH	2025-06-06 21:44:39	2025-06-06 21:44:46	COMPLETED	
Images_1	euclid	SEARCH	2025-06-06 21:43:47	2025-06-06 21:43:52	COMPLETED	

Note: The listed jobs are limited to your current session, where "session" may refer to your browser or archive, or account with which you're currently logged in. Jobs older than 14 days will not appear.

At the top, it summarizes (in this case) that there are 20 jobs, one of which is currently active, and none of which have failed. The email has been filled out, so that [email notification](#) can easily be toggled on (or off) with a single click.

Below that, there is a table, like [any other table in this tool](#) (with all the associated sorting and filtering capabilities), that lists all of the jobs that have been sent to the Job Monitor in this session, along with basic information like what time (in Universal Time) they were launched. Several in this screenshot are generating data download scripts (type = script), one of which is still executing. There are other jobs that are various kinds of searches (type = search or tap).

On the far right is a collection of icons. The different icons do different things:

- Usually this icon is animated -- the job is executing.
- Display the results of this job in the tool -- usually this appears in reference to a catalog search, and the icon matches that in the "Results" tab, which is where the results will appear after you click on this icon.
- Notification toggled on -- if an email is provided in the top of the Job Monitor, then email will be sent upon completion (see [below](#)).
- Notification toggled off -- this is the default state.
- Download the results of this job to your disk -- this could be a zip file, a data file (e.g., a FITS file), or a download script, depending on what data you are accessing.
- Get more information about this job (see [below](#)).
- Stop this job.
- Discard this job from this list.

Jobs accumulate in the Job Monitor over a given session, which could include more than one browser window accessing the same archive, because it relies on cookies being set. Jobs that are older than 2 weeks will not appear.

Tips and Troubleshooting

- **You** control where the file is saved on your disk through your browser; your browser may be configured to store all downloads in a particular location on your disk. Try looking in a "Downloads" directory, or for "recently modified files."

Sending Email

For large data packaging jobs, you may wish to have the system email you when it is done and ready for downloading.

In order to make this happen, you have to do two things.

1. Enter a valid email at the top of the Job Monitor page. (It should go without saying that if you don't enter a correct email, it can't do anything to fix that.)
2. Tell it that you want it to send you an email for the specific job in question. Click on the blue bell at any time before the job completes to toggle an email being sent to you upon completion.



This means don't send email



This means do send email

The reason it defaults to "don't send email" is so that you avoid spamming yourself - if you make a lot of requests, you most likely don't want it to send you a lot of emails in rapid succession.

If you ask it to email you for a download packaging request, you will be emailed links to obtain a curl or wget script, or a list of URLs that you can feed to your own code to get your data. See the [scripts section](#) for more details.

Tips and Troubleshooting

- By default, it will NOT send you email when it is complete, even if you have an email filled out. (This is to avoid accidentally spamming yourself!) Click on the blue bell at any time before the job completes to toggle an email being sent to you upon completion.

Scripts

If you [get an email from the Job Monitor](#), you will get a curl or wget script that you can execute on your computer to download the files you have requested, or you may choose to obtain just a list of URLs that you can feed to your own code to download the data. The scripts are designed to echo to the screen updates on what they are doing, so that you can track the download's progress.

To use these, save the script to a plain text file, and invoke the script. You may need to do something at the command line like "chmod +x script.sh" and then "./script.sh" to invoke it. You could also copy and paste the script lines individually into your terminal window.

Euclid Help

Generally speaking, the wget script is best for Linux and Unix users. The curl script is best for Mac users, because curl is part of the standard OS distribution; Mac users can also go retrieve and install [wget](#)  and then use the wget scripts.

Double-clicking on the downloaded zip files should uncompress them, and then you should be off and running. However, some Windows users have reported having difficulty unzipping files downloaded from the SOFIA archive using the default application. We recommend using [7-zip](#) .

Job Information

The information you get when you click on the i-in-a-circle  in the Job Monitor looks something like this:

Job Information 

Phase: COMPLETEDJob ID: 45-qbh48_14769517352

Created: 2025-06-06T22:38:37.353ZOwner:

Start Time: 2025-06-06T22:38:37.385ZRun time limit: 86400s

End Time: 2025-06-06T22:38:42.711ZActual run time: 5s

Planned end:

Destruction: 2025-06-13T22:38:37.353Z

Parameters

request: {"startIdx":0,"META_INFO":{"DATA_SERVICE_ID":"euclid","dataServiceI
selectionInfo: true--2
cmd: downloadScriptRequest
downloadRequest: {"startIdx":0,"FileGroupProcessor":"ObsCorePackager","wor

Results

0:  [https://irsatest.ipac.caltech.edu/applications/euclid/servlet/Download?...
1: !\[\]\(0039bff9734e82f11bc9db5c2b8789a3_img.jpg\) \[https://irsatest.ipac.caltech.edu/applications/euclid/servlet/Download?l...
2: !\\[\\]\\(ba9e80c9b8ec1599be1c213249ceaf17_img.jpg\\) \\[https://irsatest.ipac.caltech.edu/applications/euclid/servlet/Download?...

Extra Information!\\\[\\\]\\\(31fe8b58742afe898b0600d2767448db_img.jpg\\\)

userEmail: Guest
userId: Guest
title: euclid_Images_1

!\\\[\\\]\\\(2cc34191097d6db6ef1531525c02f0f8_img.jpg\\\)\\]\\(https://irsatest.ipac.caltech.edu/applications/euclid/servlet/Download?...\\)\]\(https://irsatest.ipac.caltech.edu/applications/euclid/servlet/Download?l...\)](https://irsatest.ipac.caltech.edu/applications/euclid/servlet/Download?...)

It specifies things about the query, like when it was submitted and how long it took, but also the job ID (useful for helpdesk tickets), and the parameters you used (which you can copy using the ellipsis, just like for [table cells](#)), and also what information you provided -- username if you [logged in](#), [email](#) if you provided it, title if you provided it, and the URL that links directly to the job (also useful for helpdesk tickets; to copy it, click on the tiny clipboard icon).

Euclid Data Explorer at IRSA: Downloading Data

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User Registration for the Euclid Data Explorer at IRSA

There is one user registration for all IRSA applications, but data access, preferences, search history, data tagging, etc., are all unique to each archive.

While you certainly **do not have to register** to search the archive, download data, analyze data, and write a paper, you may wish to register.

Login

The "Login" link is in the far top right of the page.

Select this option to log in if you know your password, or to create a new account.

Create Account

Select this option to create a new account.

Find this option by selecting "Login" in the far top right of the browser window, and then "Create an account" appears as an option in the lower left of the pop-up window.

Forgot your Username or Password

If you do not remember your username or password, select this option to retrieve this lost information.

Find this option by selecting "Login" in the far top right of the browser page, and then "forgot your password?" appears as an option below the Login button.

Edit Profile

Find this option by logging in, and then clicking on your account name in the top right of the browser window. Then, select "Edit Profile" to change your password on an existing account.

Change Password

Find this option by logging in, and then clicking on your account name in the top right of the browser window. Then, select "Change Password" to change your password on an existing account.

Update Email

Find this option by logging in, and then clicking on your account name in the top right of the browser window. Then, select "Update Email" to change your email on an existing account.

Frequently Asked Questions (FAQs) about the Euclid Data Explorer at IRSA

Data/Mission questions

What do all these data mean? Where do I start?

The data from Euclid are both big and complex! Please see the IRSA Euclid Mission page [IRSA Euclid Mission page](#)  for lots of pointers to all sorts of documentation.

Interface questions

Wait, what are these diamonds with numbers in them that have appeared on all my images?

If you've loaded a catalog at all, it's probably a big catalog. When there is a big catalog overlaid on the images, the catalog overlay is shown using a [hierarchical catalog display](#). Each of the diamonds is a 'cell', and the number in the middle is showing you how many sources from the catalog is in the cell.

There are many choices you can make for the size of the cells, the way the cells are represented, etc.; if you zoom in, then the individual sources are shown. Please see [the documentation](#) for more details.

I've done a search on the same position from the Images tab and the Inspect Objects tab, but they don't seem to be on the same patch of sky!! What gives??

Believe it or not, the tool is doing what you asked it to do; it's just that the images and regions are .. large. Take a look at the [example described here](#), complete with screenshots.

There are a whole bunch of Euclid catalogs in here but only one of them has RA/Dec (or coordinates in any other system). How am I supposed to use them if they don't have positions?

Yes, you're right, most of the Euclid catalogs don't have positions. (Gaia catalogs do this too!) In order to use these catalogs, you need to have an Object ID. This is what you need to do:

1. Construct a spatial query on the primary MER catalogue, the one that does have RA and Dec. Make sure you extract the object_ids from those search results. If you are working within the Euclid Data Explorer, use the Euclid Catalogs tab, and, just save the results of that query as an IPAC Table file (*.tbl).
2. Go back to the Euclid Catalogs tab, select the table you want that doesn't have RA and Dec. Now you want to execute a [object ID search](#), so untick the box in front of "spatial" (collapse those options if you wish by clicking in the blue header rectangle), and tick the box in front of "object id search". Expand those options by clicking in the header or the downward pointing triangle. Enter your list of object IDs, or if you have the *.tbl file from earlier, select "Load object IDs from a table", find the *.tbl file, tell it that the column you want to match from your file is object_id, remind it that the column you want to match to in the Euclid table is also object_id, and set it off and running.
3. Your results should be loaded into the tool. You can save the results just as [any other table in this tool](#).

If you are creating your own list of object IDs, keep in mind that computers are painfully stupid - the IDs need to match exactly. The field object_id in the database is a long integer. Therefore, your list of object IDs must also be long integers, not strings or short integers.

Do you have any tutorial videos?

Yes. The [IRSA YouTube channel](#)  has several tutorials relevant for more than one archive.

Getting more help

More information on Euclid can be found at <https://irsa.ipac.caltech.edu/Missions/euclid.html> .

Euclid Help

Have a question? Please read the [frequently asked questions \(FAQs\)](#) first.

The [IRSA YouTube channel](#)  has several tutorials.

Found a bug? If you think you have found a bug, before reporting it, please check [the list of known bugs and issues](#)  and read the online help. It may be a "feature" we already know about. If you have found a new, real bug then please do let us know by contacting the [IRSA Help Desk](#) . Please include your operating system version and your browser software and version.

Euclid Data Explorer at IRSA: Notice to Users -- Privacy Notice

Euclid is a European Space Agency (ESA) mission with involvement by the National Aeronautics and Space Administration (NASA). The Euclid Data Explorer is managed by the NASA/IPAC Infrared Science Archive (IRSA), which is an archive of images, catalogs, and spectra from NASA missions. This website is maintained by the Infrared Processing and Analysis Center (IPAC), located on the campus of the California Institute of Technology (Caltech).

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- The date and time you access our site
- The pages you access (recorded by the text and graphics files that compose that page)
- The Internet address of the website from which you linked directly to our site.

We use the summary statistics to help us make our site more useful to visitors, such as assessing what information is of most and least interest to visitors, and for other purposes such as determining the site's technical design specifications and identifying system performance or problem areas.

The website also collects and stores information about your search options, such as

- Name resolver choice (NED/Simbad)
- Page size (number of rows)
- Which search results (tabs) should be displayed
- Email address, if provided, for email notifications
- Search parameters so that you can resubmit your search via your search history
- Data tags, if you create one
- Plus, additional preferences that may be developed in the future, such as those tied to the visualization options.

Euclid Help

If you register as a user, these options will be kept in our database (along with your login ID and password via MD5 hash) and used for your session the next time you log in. If you do not register as a user, these options are set via cookies kept on your computer; if you clear your cookies and start a new session, these preferences are lost.

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Euclid Help

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