



# **An Introduction To The Aladin Sky Atlas**

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The Aladin Sky Atlas (Aladin) is developed and maintained  
by  
The Centre de Données astronomiques de Strasbourg (CDS)

The SIMBAD database is maintained and operated  
by  
The Centre de Données astronomiques de Strasbourg (CDS)

The NASA/IPAC Extragalactic Database (NED) is operated  
by  
The Jet Propulsion Laboratory, California Institute of Technology, under  
contract with the National Aeronautics and Space Administration.

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## **1. Introduction**

Much like the genie in Aladdin's lamp, The Aladin Sky Atlas (Aladin) can perform magic with your deep sky images. Amateur astronomers, with relatively modest equipment, can image surprisingly faint objects. Typically, these faint background objects are simply referred to as... "faint fuzzies."

This document is a step-by-step process which explains how to overlay symbols that identify astronomical objects in a FITS or JPEG image. In a deeply-exposed amateur image, it is common to see galaxies down to magnitude 23 and fainter, with a total galaxy count in the thousands.

Within a single galaxy, Aladin can identify HII regions, planetary nebulae, star clusters and more. Extragalactic objects may include other galaxies as well as quasars. The author has previously identified a quasar with a red-shift value of 2.66. This equates to a distance of about 10 to 12 billion light-years.

## **2. The Necessary Tools & Data**

- A plate-solved FITS image
- A matching JPEG
- The Aladin Sky Atlas program Version 6.005  
<http://bf-astro.com/eXcalibrator/Aladin.exe>
- Any image processing software
- A broadband Internet connection

## **3. A Short Description Of The Process**

- Save the JPEG image as flipped vertically, relative to the FITS image.
- Execute the Aladin Sky Atlas
- Drag and drop the plate-solved FITS image onto Aladin's opening screen.
- Copy the World Coordinates System (WCS) data from the FITS image to the clipboard.
- Drag and drop the JPEG image on top of the FITS image, in Aladin.
- Apply the WCS data to the JPEG image.
- Load data from various databases to identify objects in the FITS or JPEG image.

## **4. The Detailed Work Flow**

### **First - About Plate Solving and WCS Header Data**

Astronomers use plate-solving programs to precisely identify an image's center point, rotation and scale. The program saves the data in the FITS header, allowing other software to perform tasks, such as identifying background galaxies.

Although this is a more advanced technique, amateur astronomers may find reasonably-priced commercial plate-solving programs. Also, there are a few shareware and freeware programs.

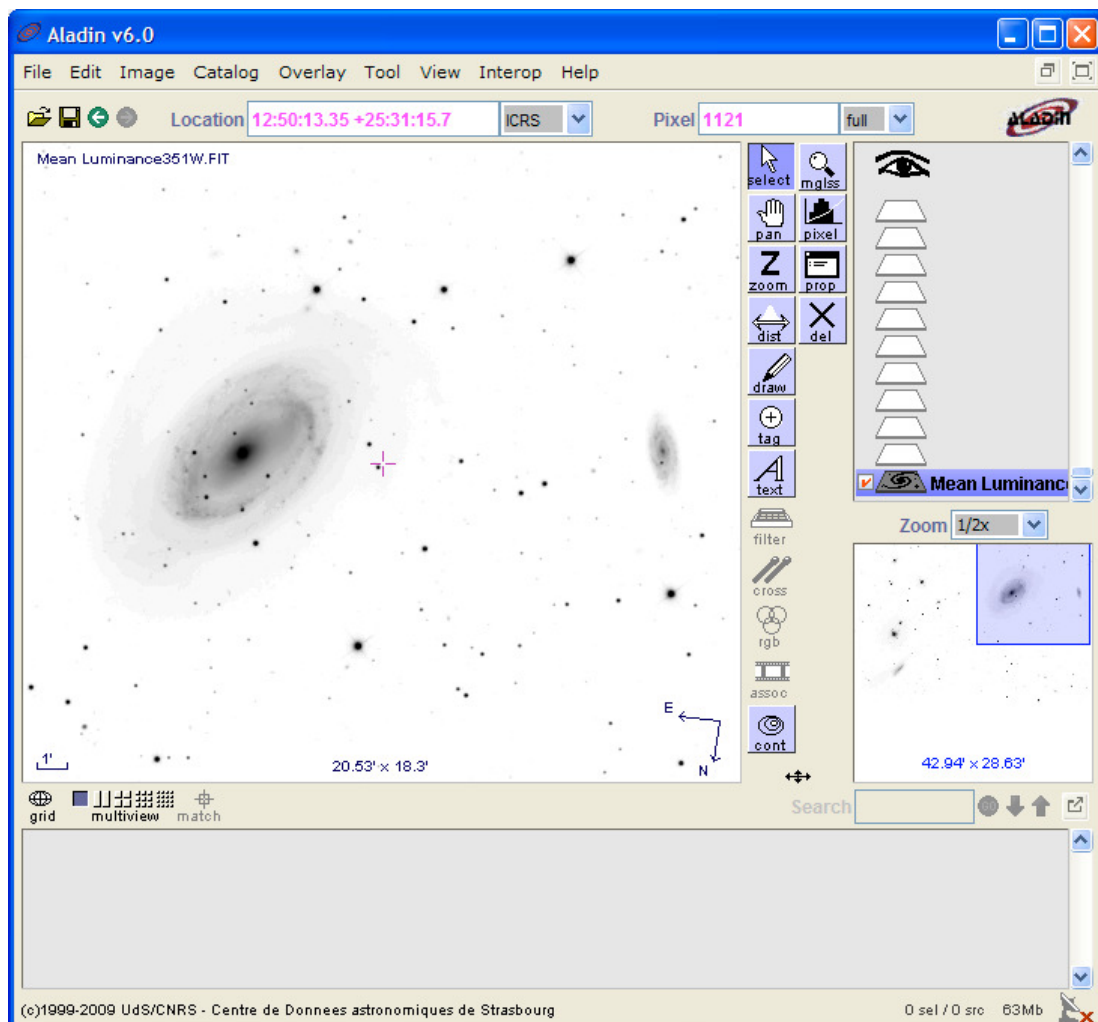
## Next - About The Aladin Sky Atlas (Aladin)

The Centre de Données astronomiques de Strasbourg (CDS) developed and maintains Aladin. Aladin allows the user to view astronomical images and superimpose data from various catalogs or databases.

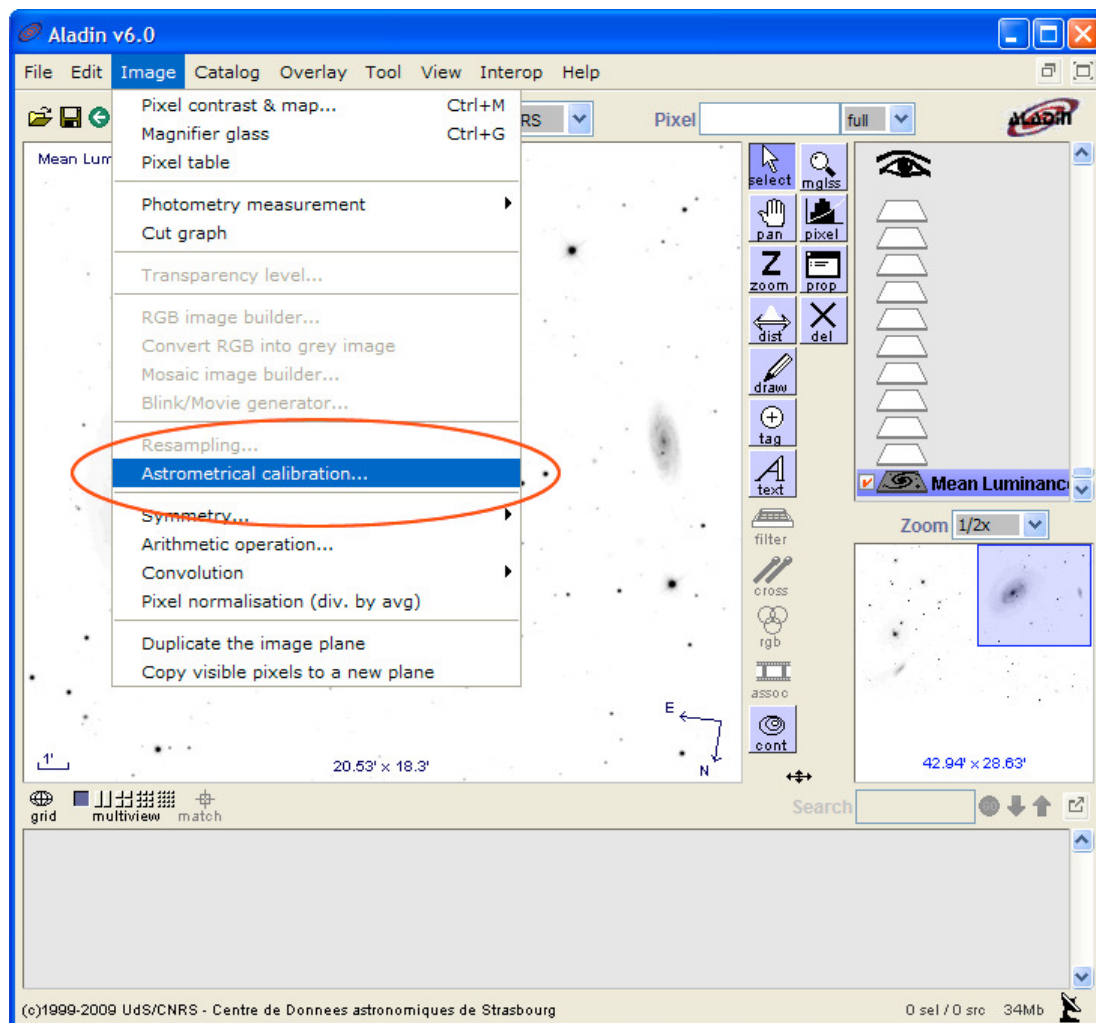
Aladin is available in three modes--a Java Standalone application, a Java applet interface and a simple previewer. The author recommends downloading the standalone version, from URL... <http://aladin.u-strasbg.fr> .

## Loading And Calibrating The Jpeg Image

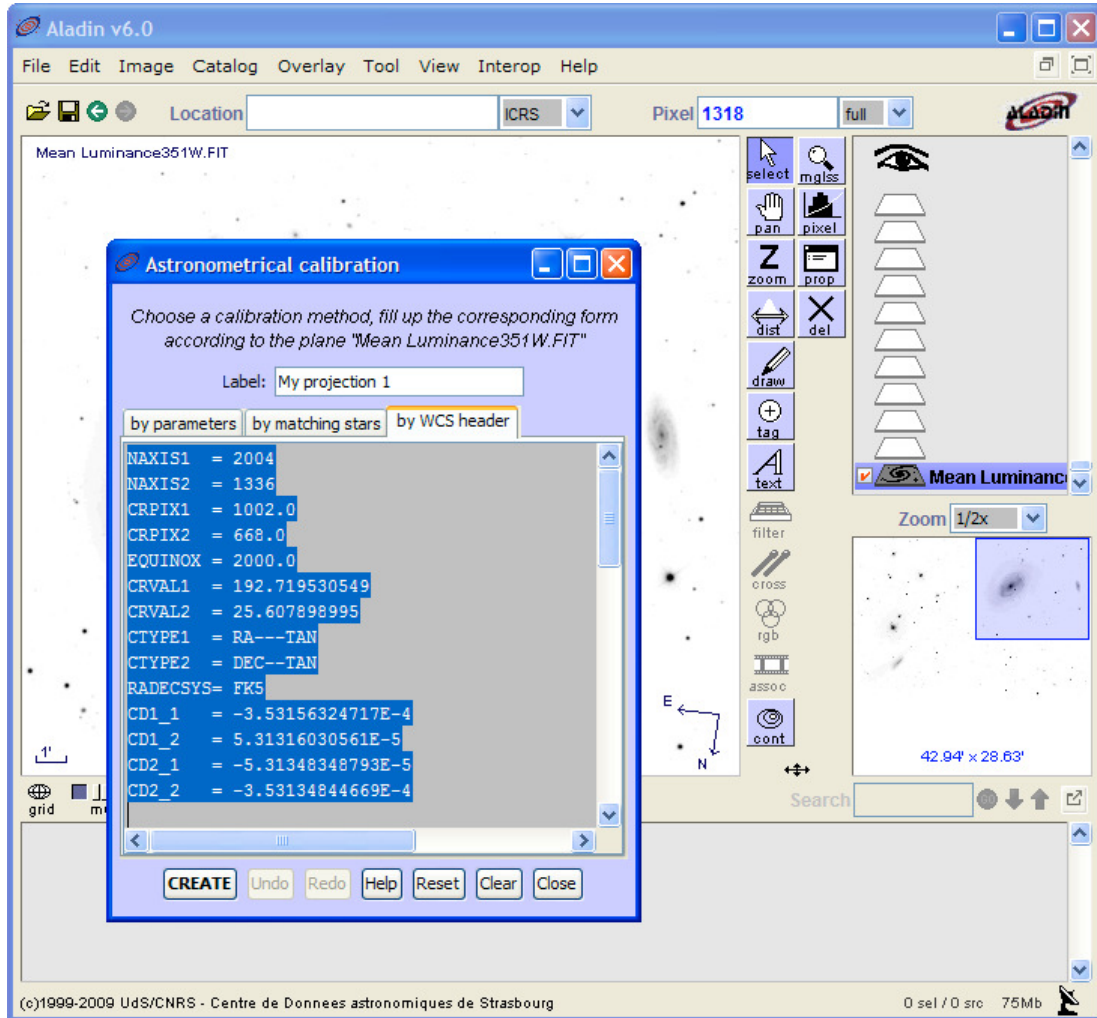
- Execute Aladin and drag and drop your plate-solved FITS image onto the opening screen. Aladin reads the WCS data and determines the location, rotation and image scale. Note that Aladin flips the image vertically.
- Now you can either jump ahead, to *the Overlay Astronomical Objects From Catalogs* section, or continue for instructions to add your color JPEG image.



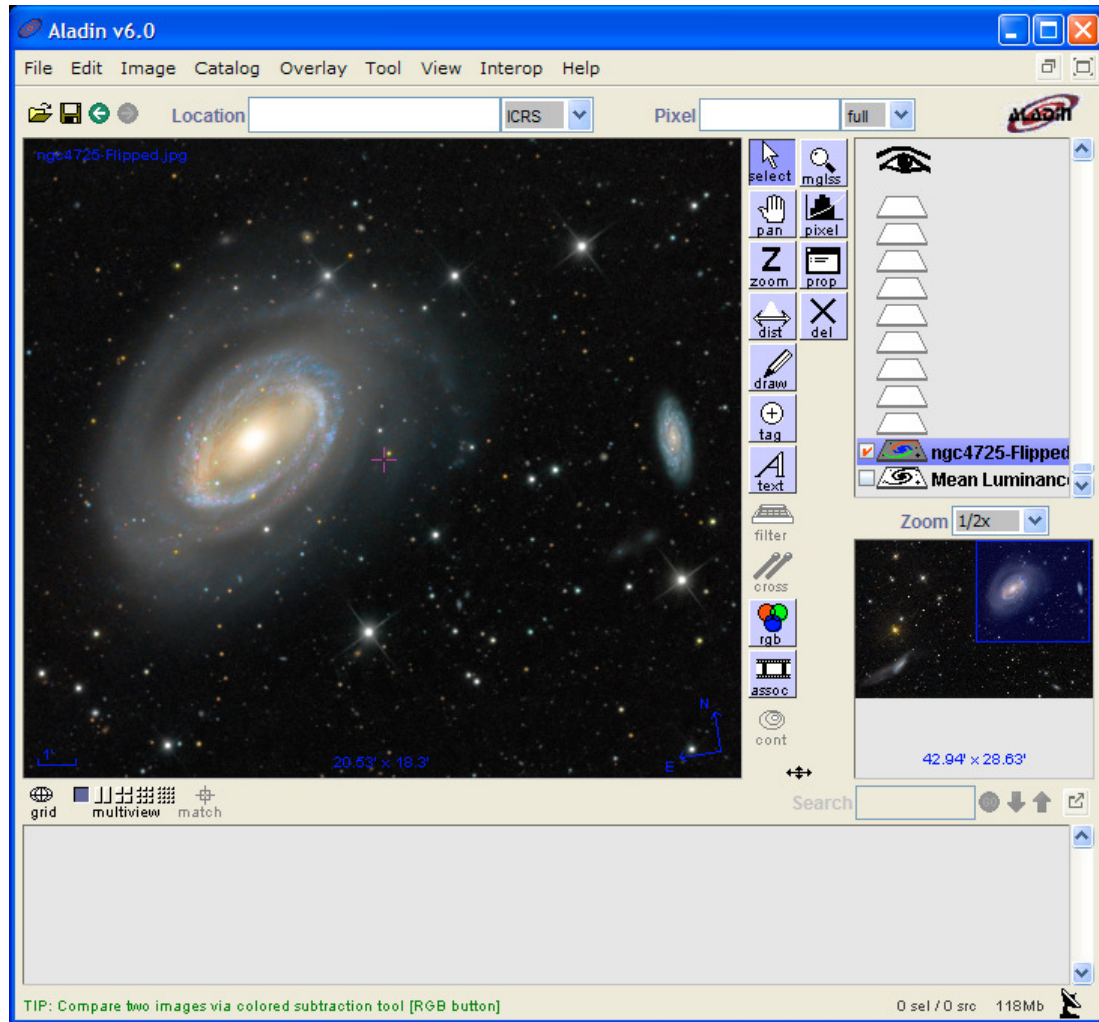
- Get the WCS data to calibrate the JPEG image.
  1. Under the Image menu item, open the *Astrometrical Calibration* window.



2. Select the *by WCS header* tab.
3. Click inside the text box and use *Ctrl-a* followed by *Ctrl-c*, to select all the text and place it on the clipboard.
4. Close the *Astronomical Calibration* window.

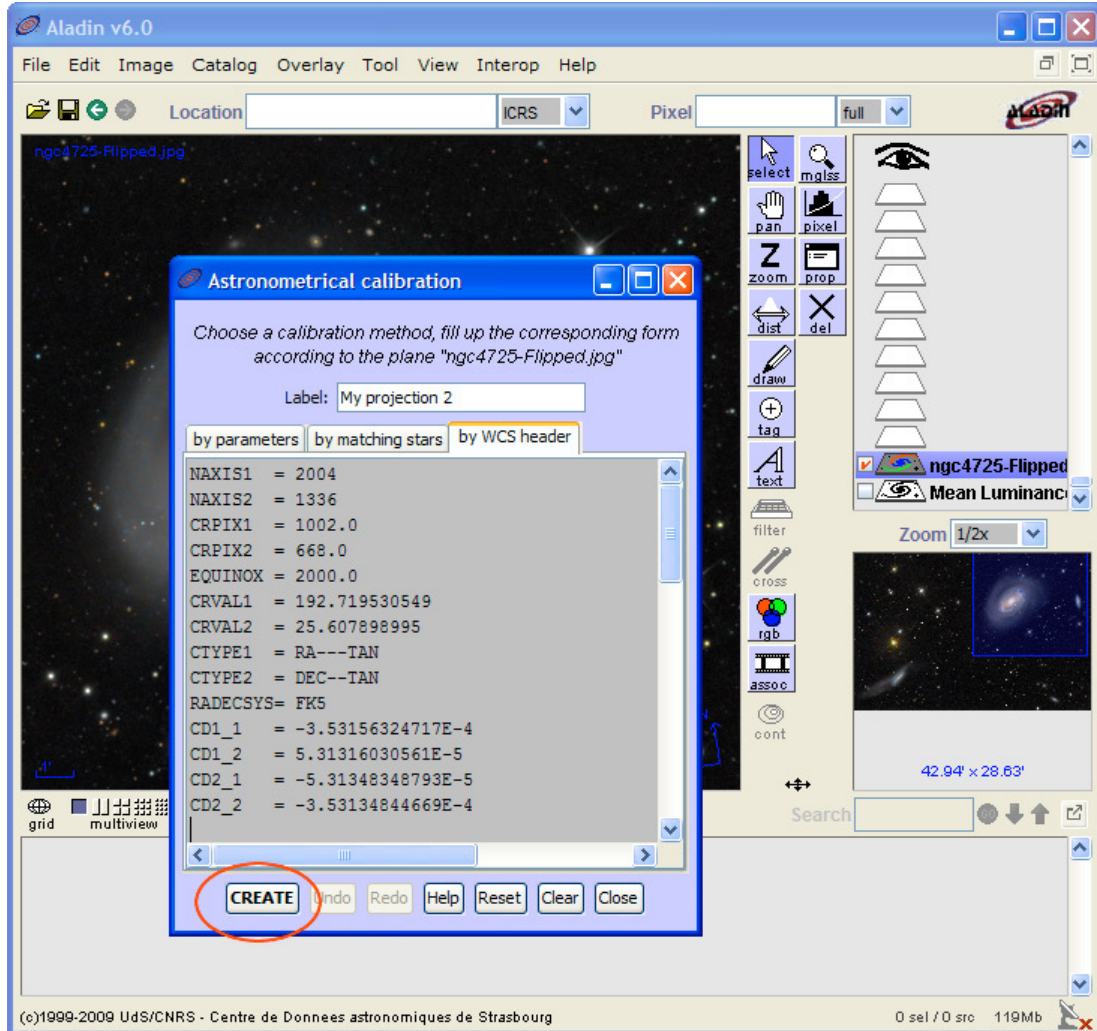


- Load the JPEG image and apply the Astronomical Calibration
  1. The JPEG image must be an exact match with the FITS image.
  2. Save the JPEG flipped, vertically, relative to the FITS.
  3. Drag and drop the JPEG onto the Aladin window.





4. Under the Image menu item, open the *Astronomical Calibration* window.
5. Select the *by WCS header* tab.
6. Click inside the text box and use *Ctrl-a*, followed by *Ctrl-v*, to select and replace the WCS data with that from the clipboard.
7. Finally, click the *CREATE* button and close the window.





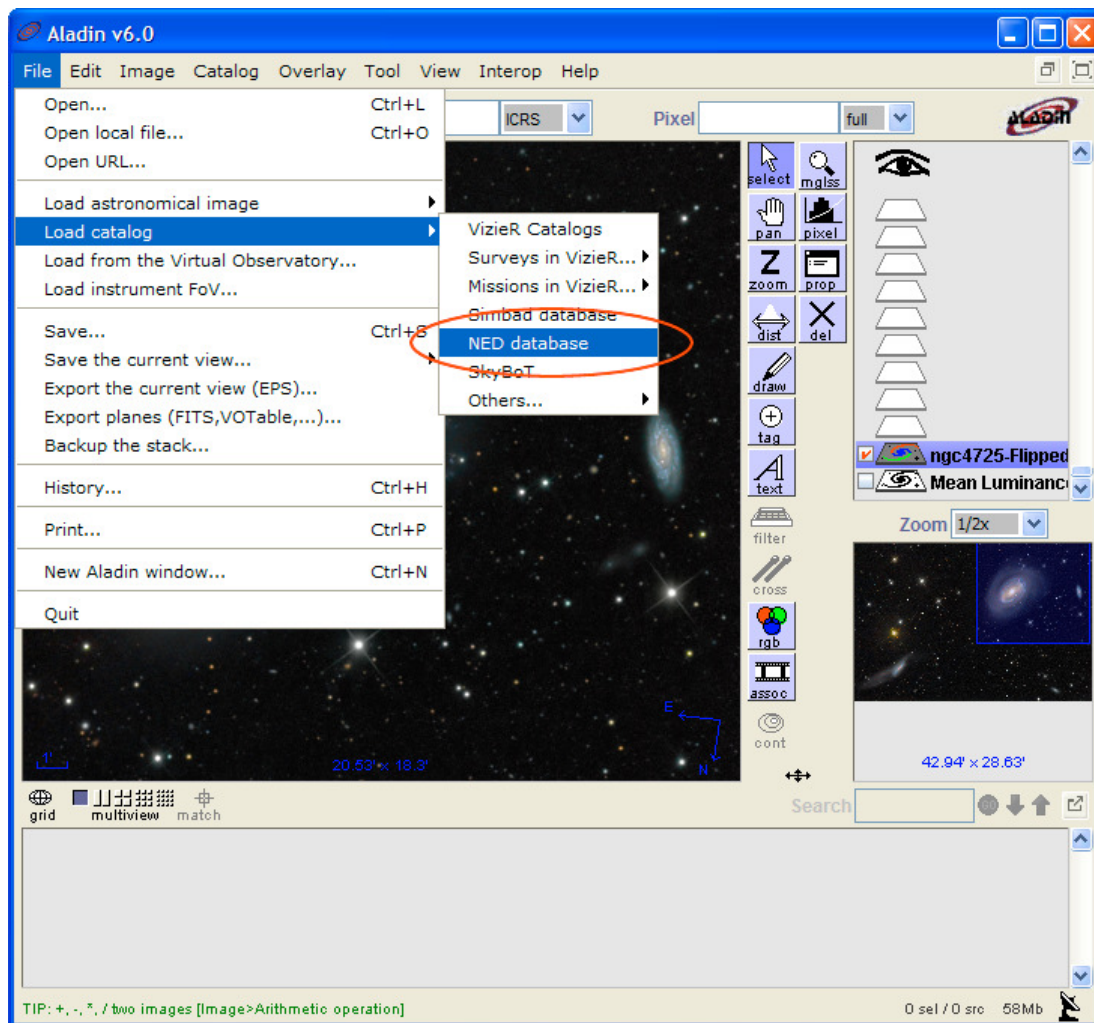
## Overlay Astronomical Objects From Catalogs

Now that the WCS data is associated with the JPEG image, you may overlay data from various catalogs. The two most interesting are the NED and SIMBAD.

The NASA/IPAC Extragalactic Database (NED) is the world's largest database of multiwavelength data for extragalactic objects. The contents span the entire observed spectrum from gamma rays through radio frequencies.

The SIMBAD astronomical database provides basic data, cross-identifications, bibliography and measurements for astronomical objects outside the solar system. The SIMBAD database is operated at CDS, Strasbourg, France.

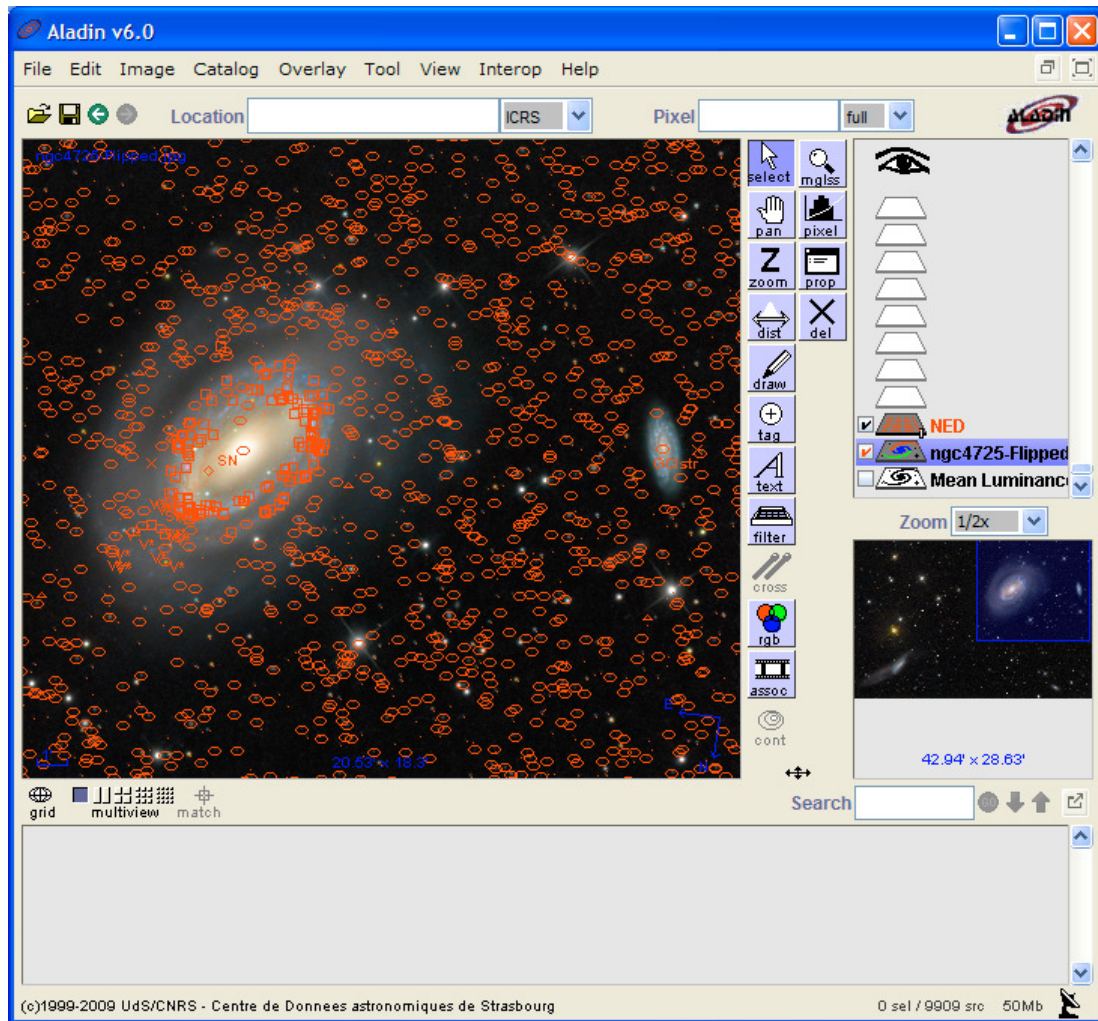
- Overlaying the NED database



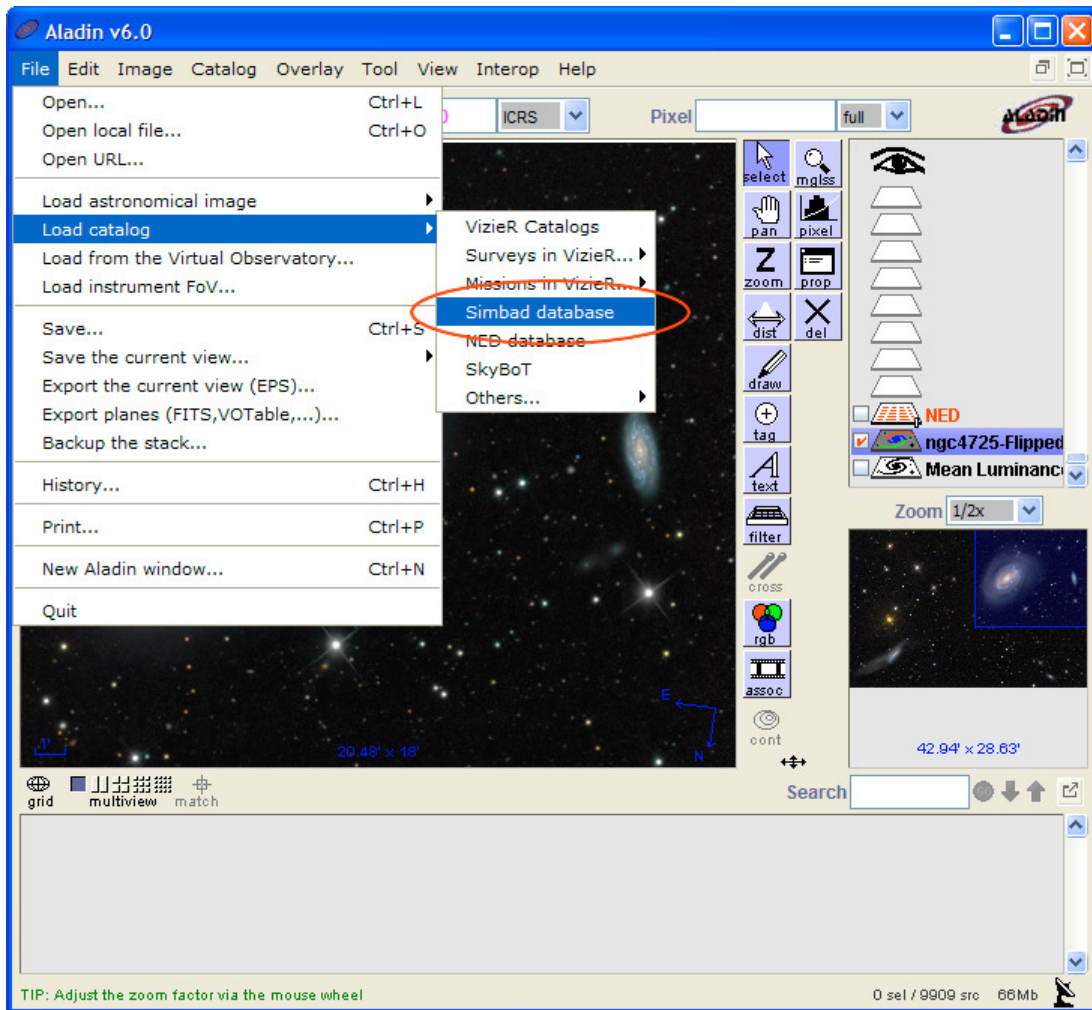
After waiting a bit, we get the result shown below. The download is sometimes slow. It can be faster to just delete the NED plane, wait a few minutes, and restart it. Under user preferences, select a different registry site for improved download speed.

In the image below, all of the small red ellipses indicate the positions of background galaxies. Galaxies as faint as magnitude 22 are easy to identify. Other extragalactic objects may include galaxy groups and quasars.

Within the large galaxy, Aladin identifies many HII regions and a few x-ray sources. In nearby galaxies, other objects may include planetary nebulae, star clusters, reflection nebulae and much more.

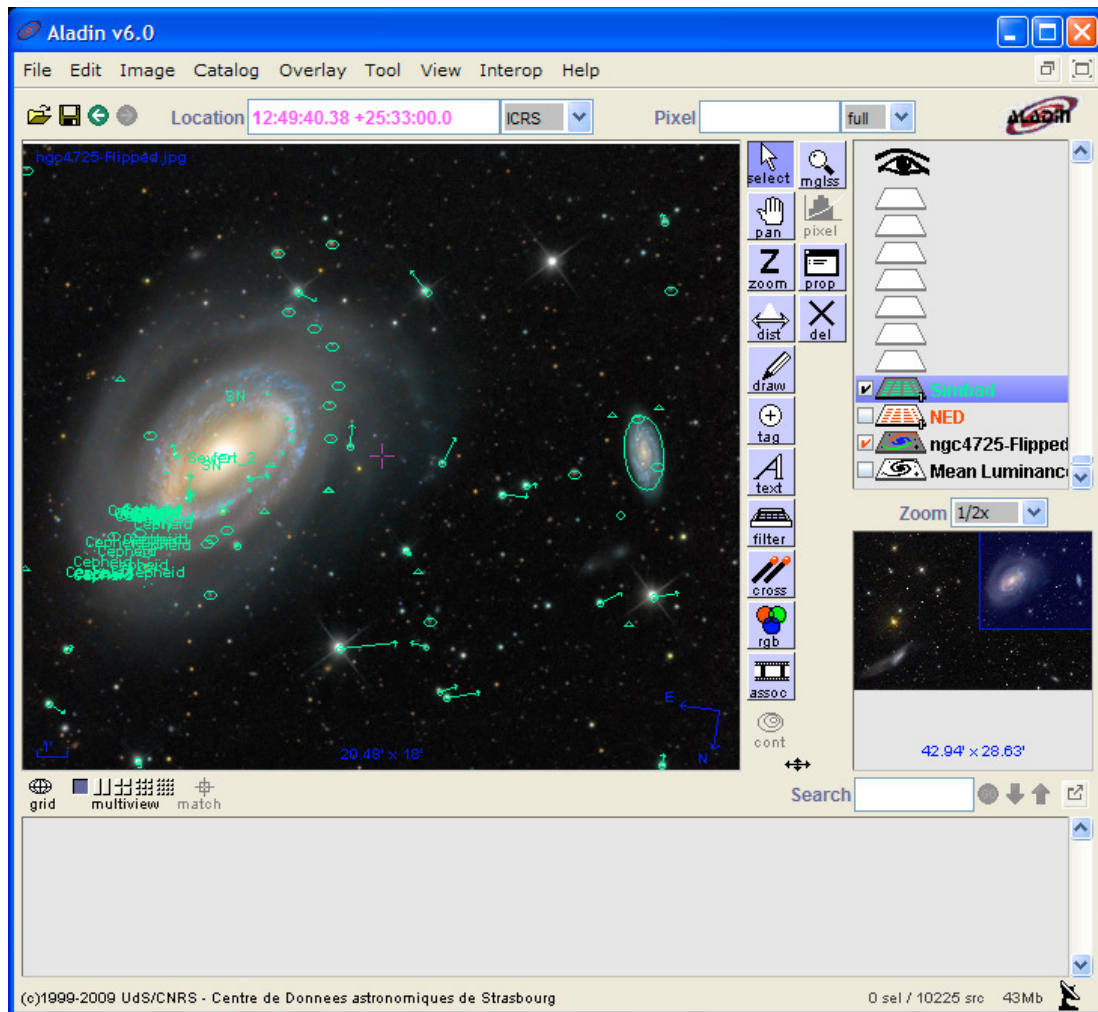


- Overlaying the SIMBAD database



The SIMBAD data identifies fewer objects and loads much faster. To see only the SIMBAD data, toggle off the check box to the left of the NED plane.

In the image below, the program identifies several background galaxies and adds arrows showing the proper motion of the foreground stars. Also, within the large galaxy, Aladin shows several Cepheid variable Stars, HII regions and radio sources.



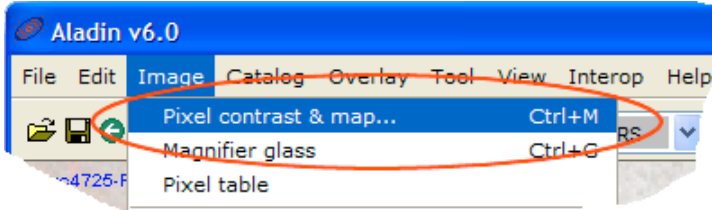


## 5. Aladin Tip & Tricks

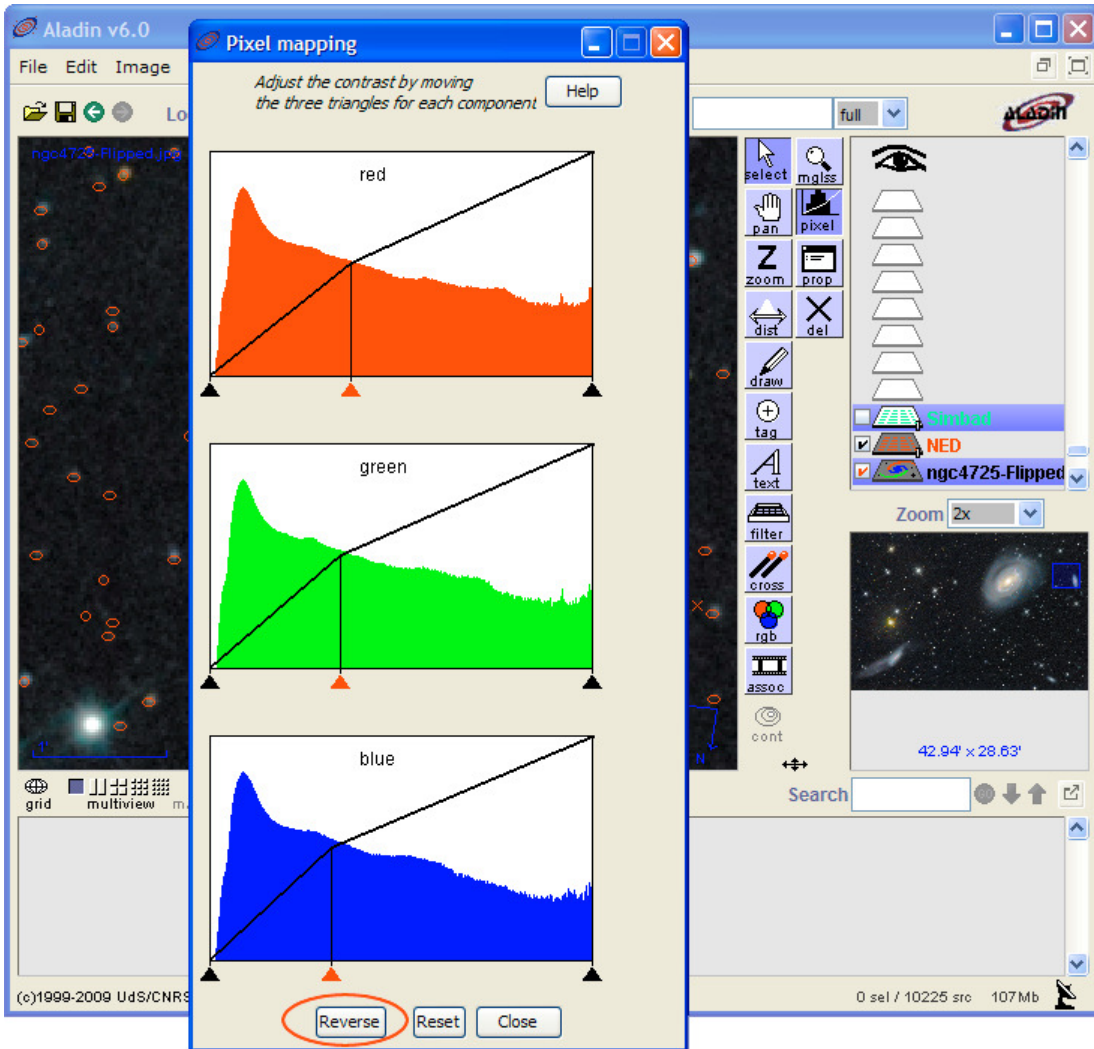
### Inverting the Color

In the past, astronomers used negative plates to identify faint objects. That practice continues today, by simply inverting the color in digital images. Here's how to do it with Aladin.

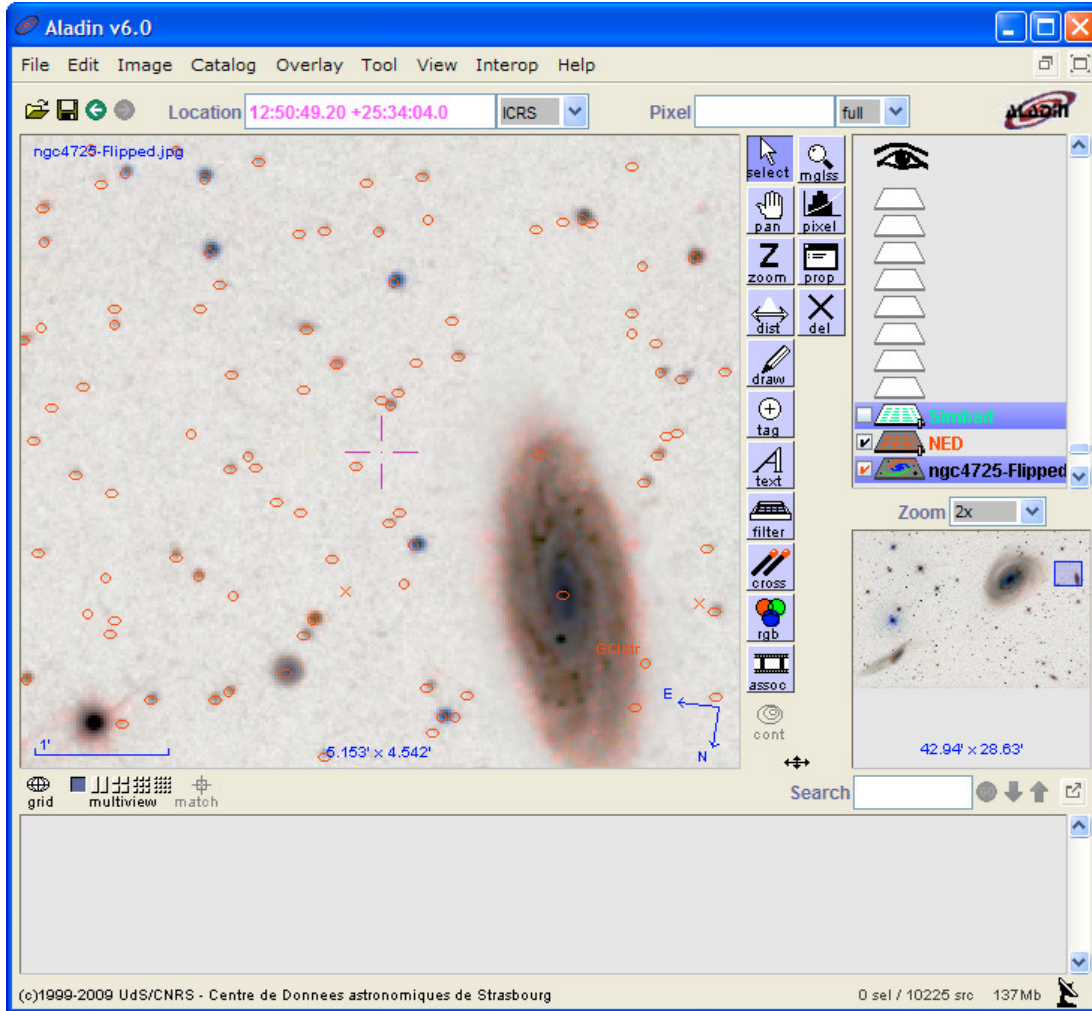
1. Select *Image/Pixel contrast & map*.



2. Just click the *Reverse* button and close the window.



Now it is much easier to see the very faint objects. By toggling the NED data on and off, you may easily determine the faintest magnitude of reliably-identified galaxies.

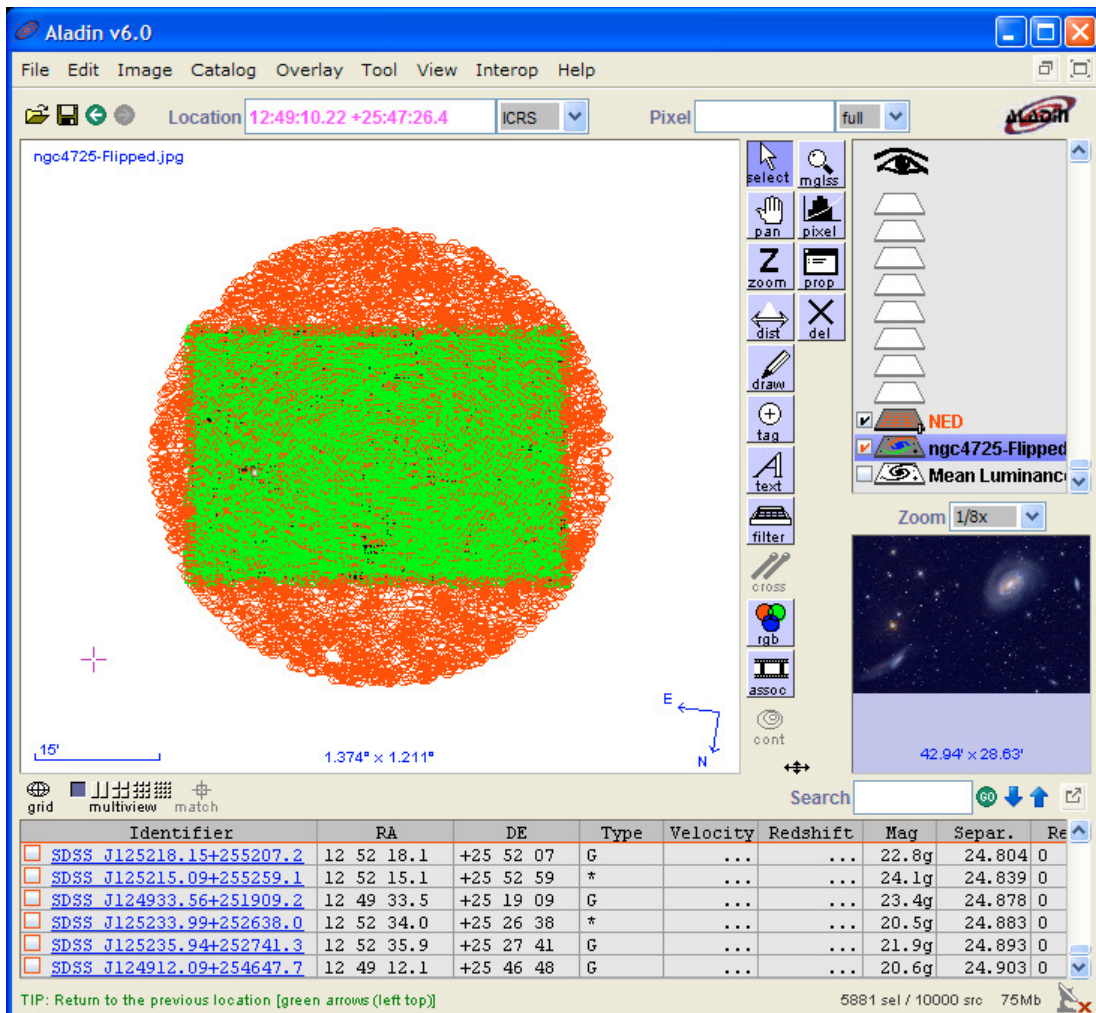




## Counting The Galaxies

With relatively modest equipment, amateur astronomers can produce images with thousands of background galaxies. The Aladin user easily determines the magnitude of the faintest visible galaxies. Anything dimmer may or may not be background noise. Instead of just referring to the galaxies as "faint fuzzies," the astronomer can identify them and state a reasonable count.

1. Zoom out the Aladin window, to see the entire image. Then select the whole image, by dragging a selection rectangle, with the mouse.



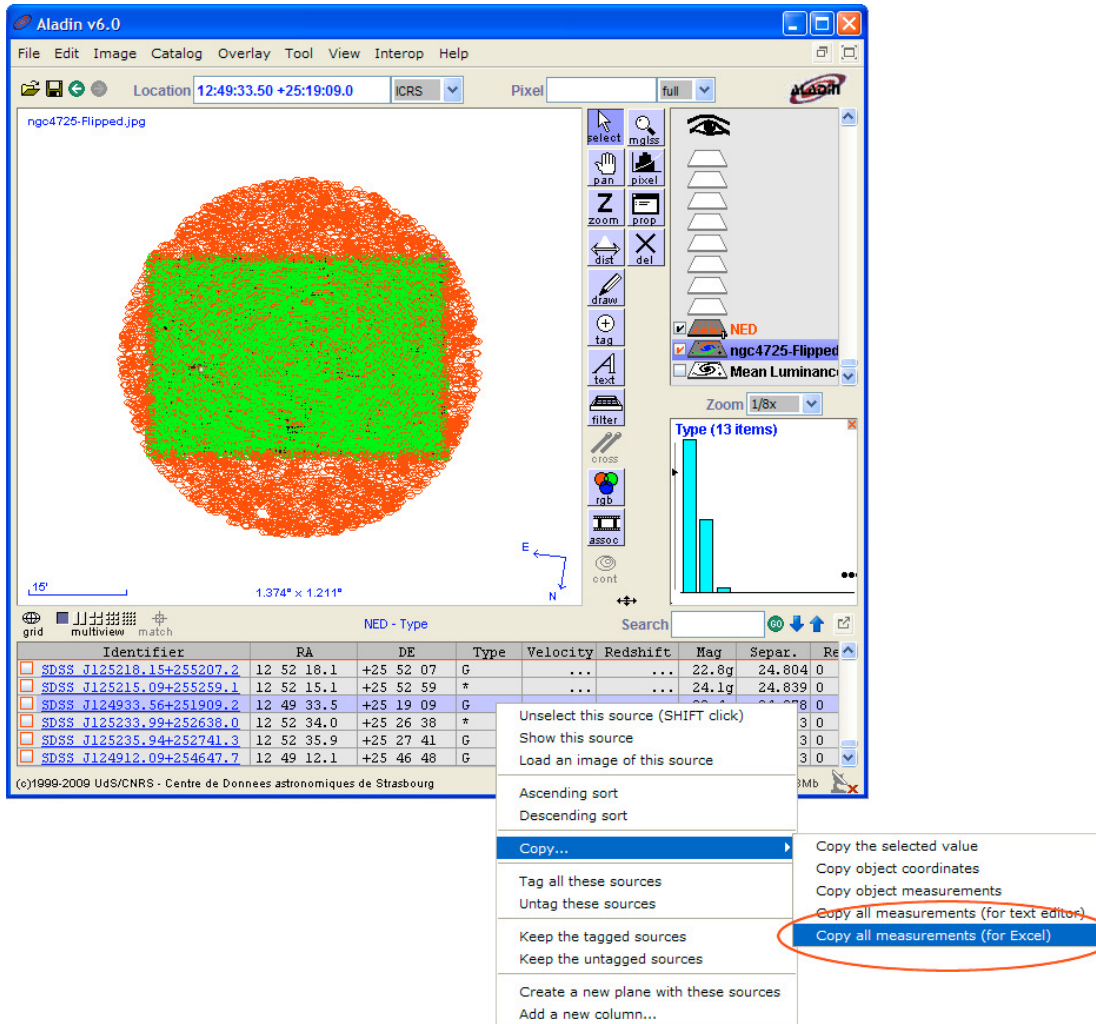
The screenshot shows the Aladin v6.0 software interface. The main window displays a galaxy field with a selection rectangle. The selection rectangle is a green rectangle centered on the field, surrounded by a red circular selection. The interface includes a menu bar (File, Edit, Image, Catalog, Overlay, Tool, View, Interop, Help), a toolbar with various tools (select, pan, zoom, dist, draw, tag, text, filter, cross, rgb, assoc, cont), and a search bar. The search bar contains the text "ngc4725-Flipped.jpg". The main window shows a large field of galaxies with a red circular selection and a green rectangular selection. The selection rectangle is labeled "1.374° x 1.211°". The zoom level is set to "1/8x". The interface also shows a small inset window with a zoomed-in view of the selected area, labeled "42.94' x 28.63'".

Identifier	RA	DE	Type	Velocity	Redshift	Mag	Separ.	Re
<input type="checkbox"/> <a href="#">SDSS J125218.15+255207.2</a>	12 52 18.1	+25 52 07	G	...	...	22.8g	24.804	0
<input type="checkbox"/> <a href="#">SDSS J125215.09+255259.1</a>	12 52 15.1	+25 52 59	*	...	...	24.1g	24.839	0
<input type="checkbox"/> <a href="#">SDSS J124933.56+251909.2</a>	12 49 33.5	+25 19 09	G	...	...	23.4g	24.878	0
<input type="checkbox"/> <a href="#">SDSS J125233.99+252638.0</a>	12 52 34.0	+25 26 38	*	...	...	20.5g	24.883	0
<input type="checkbox"/> <a href="#">SDSS J125235.94+252741.3</a>	12 52 35.9	+25 27 41	G	...	...	21.9g	24.893	0
<input type="checkbox"/> <a href="#">SDSS J124912.09+254647.7</a>	12 49 12.1	+25 46 48	G	...	...	20.6g	24.903	0

TIP: Return to the previous location [green arrows (left top)]

5881 sel / 10000 src 75Mb

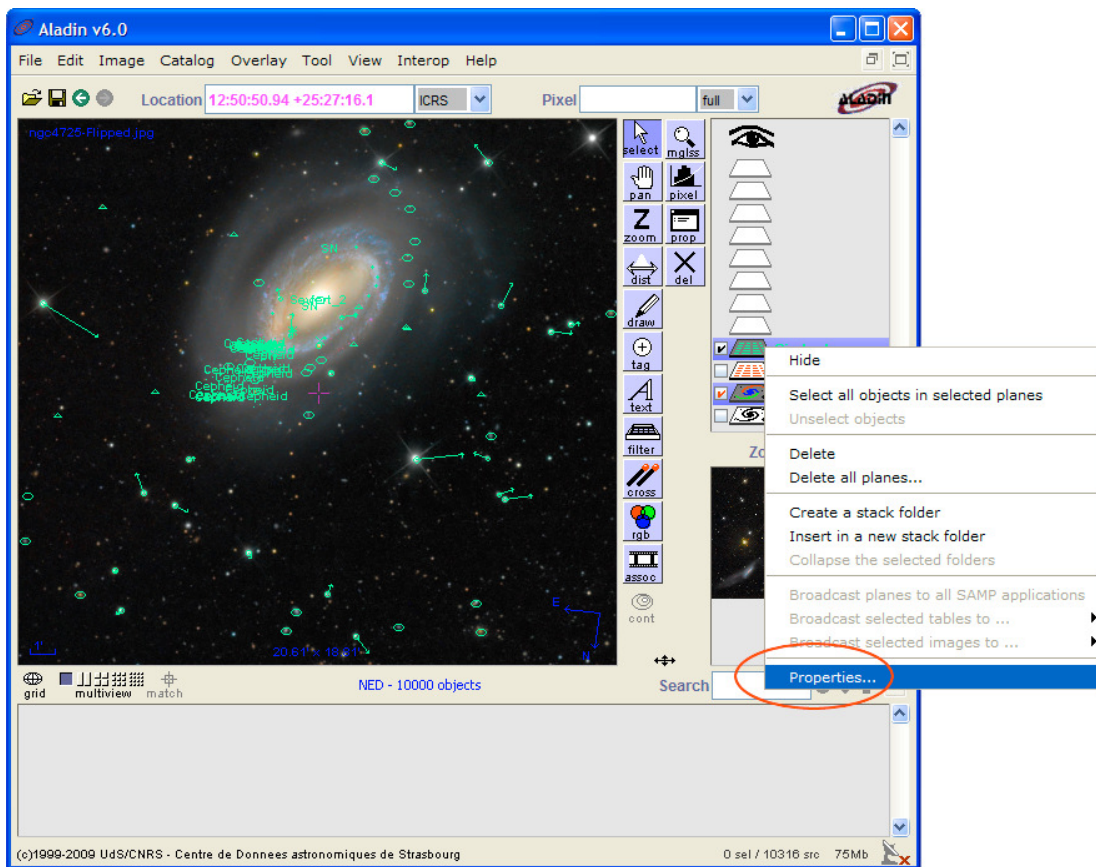
- Right click anywhere in the Measurement Window, at the bottom, and select *Copy all measurements (for Excel)*.



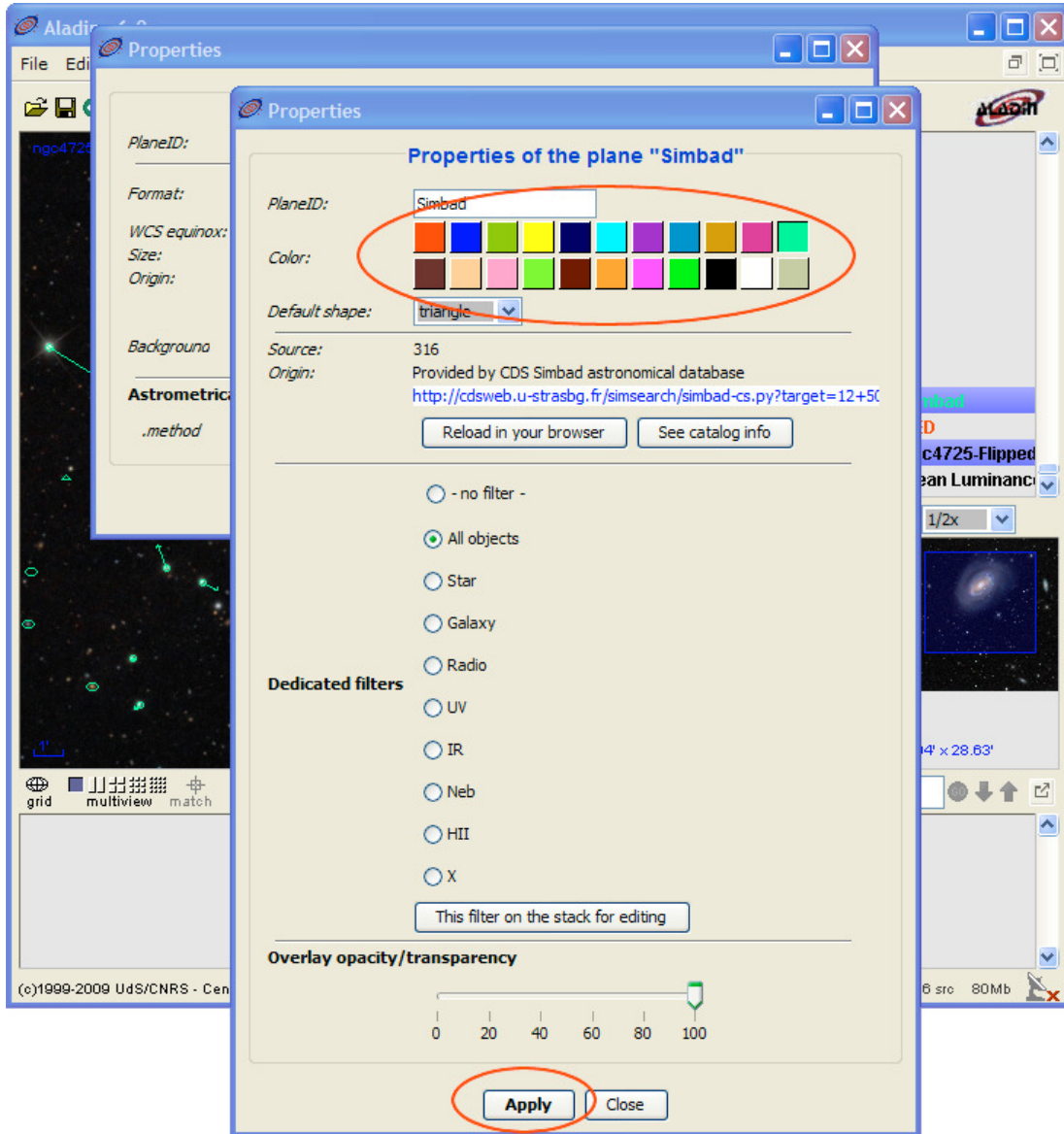
- Now paste the data into your favorite spreadsheet and sort it by object type and magnitude. Since you previously found the dimmest magnitude for reliably-identified galaxies, you may now easily see how many of these the image contains. The example image has at least 3,000 galaxies to magnitude 23.0, with many fainter ones visible.

## Modifying the Object Symbol Colors

1. Right click on the desired plane and select *Properties*.



2. Select the desired color, click *Apply* and close the window.



## **6. Closing Comment**

This document just scratches the surface of Aladin's features. The author encourages you to study the extensive online documentation.

It all starts at this URL... <http://aladin.u-strasbg.fr/>

end of document