

# Aladin & planetary surfaces

Other Use cases with Aladin are available here (and pages below): [VESPA-CDS surface meeting](#)

## 3D map of surface features

(Updated Aug 2017 with Aladin v9.6 and java 1.8, Stéphane Erard)

Use case by Sébastien Derrière, CDS (June 2015), enlarged with comments and implementation notes

Summary : Build a 3D spherical HiPS of Io, and overplot surface features from USGS catalogue.  
This is an extension of Use Case #28 of Aladin Beta Test page (requires Aladin v9 and up):  
<http://aladin.u-strasbg.fr/java/Demo/AladinDemo.gm>

### Step-by-step:

- Planetary maps are available, for example from here:

<http://laps.noaa.gov/albers/sos/>

or here

<ftp://pdsimage2.wr.usgs.gov/pub/pigpen/>

In this example, we work with Io:

[ftp://pdsimage2.wr.usgs.gov/pub/pigpen/io/io\\_global\\_images.zip](ftp://pdsimage2.wr.usgs.gov/pub/pigpen/io/io_global_images.zip)

- extract io\_bjj\_Odd.tif, convert to jpg

In the terminal, type:

```
> convert io_bjj_Odd.tif io_bjj_Odd.jpg
```

- Load jpg image in Aladin as local file

Image size is 2880 x 1440

In the Frame drop menu (next to Location field), select Planet (will plot Lon-Lat coordinates, E-handed)

- Tie a coordinate frame to the image:

Click Image > Astrometrical calibration

And use parameters:

Central pixel = 1440.0 720.0

Pixel angular size = 7.5' (= 360/2880\*60)

Projection = CARTESIAN

Rotation = 0°

RA symmetry = False (default value, this is essential)

- Build a HiPS (Hierarchical Progressive Survey) from the image:

Tool > Generate a HiPS based on... > current image

It will plot after computation. Then overplot grid (Comm-G or bottom left icon), pan around, zoom in/out...

Projection is normally set to Spherical, but you can play with this also

Longitudes should be correctly set, ie increasing towards the east, but may display as xxE and xxW in the two hemispheres.

- Add catalogue features (*but see alternative below*):

Download USGS planetary nomenclature from

[ftp://pdsimage2.wr.usgs.gov/pub/pigpen/nomenclature/nomenclature\\_all\\_feb2004.zip](ftp://pdsimage2.wr.usgs.gov/pub/pigpen/nomenclature/nomenclature_all_feb2004.zip)

Extract nomenclature\_all\_feb2004.dbf

and convert to csv (e.g. using <http://dbfconv.com/>)

Remove EOL character <NULL> from csv file in TextMate or another handy editor

Load it in TOPCAT as csv file

- Select Io features only by creating a subset:

Click on red/violet icon (subsets), add a filter (Plus icon) with parameters (name: io, expression: SA=="io")

Then select "Row subset" io in TOPCAT main window

=> 221 lines out of 8395 in io subset

Broadcast to Aladin via SAMP (Interop > Send table to...)

- Right-click the catalogue plane in Aladin, select Column Information...

Define source for coordinates carefully by clicking the Coo column and selecting a value in the drop list:

LATITUDE (col 16) => DE

LONG360 (col 18) => RA

(we're telling Aladin to handle these columns as its usual DEC and RA, respectively)

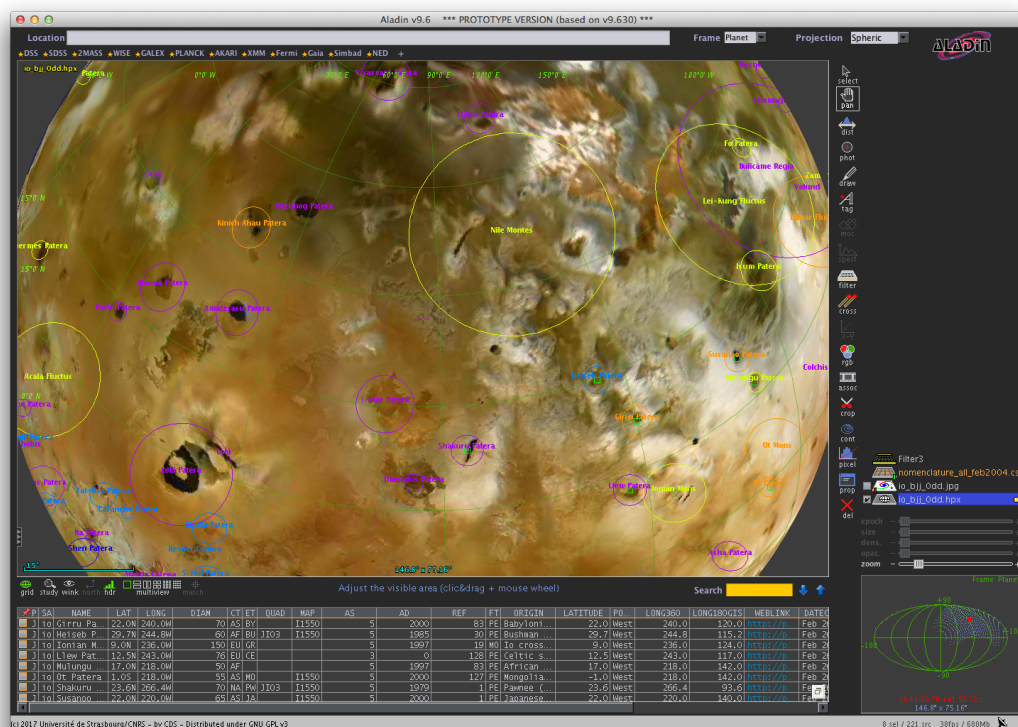
- Create a dedicated filter in Catalog > Create new filter:

Select Advanced mode, and type / copy:

```
{
# scale is 113.3 arcsec/km
draw ellipse(113.3*${DIAM}, 113.3*${DIAM}, 0) rainbow(${AD},1979,2003)
draw ${NAME} rainbow(${AD},1979,2003)
}
```

Clicking Apply will display names and sizes of surface features, color-coded according to year of discovery  
Play with the 3D model in Pan mode

- Double click on nomenclature in Aladin's stack to see the catalogue
- Clicking an item will center it on the map
- The feature under your pointer in the list or map in Aladin will be highlighted in the original TOPCAT table.



Alternative (from [Trent Hare](#)):

- Use more recent USGS catalogue from here:  
<https://planetarynames.wr.usgs.gov/SearchResults?target=IO>

and click the CSV link at the bottom of the page to retrieve file.  
You may have to remove initial blank lines before entering TOPCAT

- Adapt the filter to this catalogue names as:  

```
{
# scale is 113.3 arcsec/km
draw ellipse(113.3*${Diameter}, 113.3*${Diameter}, 0) rainbow(${Approval_Date},1979,2007)
draw ${Feature_Name} rainbow(${Approval_Date},1979,2007)
}
```

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- Application by [Mikhail Minin](#) with Aladin Lite:

<http://epn1.epn-vespa.jacobs-university.de:8080/MARS/>

I guess we would like very much to have a Long/Lat option to plot the coordinates (in addition to J2000 and GAL).

E Long are the basic option.

## Message from [Pierre Fernique](#) 10/3/2016

(copied from VESPA Slack: <https://vespa-epn.slack.com/messages/jra2-tools/>)

the method described by Sebastien Derriere can already be improved a little bit like this:

1) put one or several images of the planet (jpg or png) in a folder (yourFolder)

2) for each file, you will associate a xxx.hhh calibration file (same prefix name but .hhh extension).

These calibration files will contain the WCS header (\*)

3) use Aladin/Hipsgen with this syntax: `java -jar Aladin.jar -hipsgen in=yourFolder color=true`

4) your HiPS will be generated in yourFolderHiPS directory that you can load directly in Aladin, and/or publish on your apache HTTP server.

With this method, you will be able to create and publish deep HiPS (at any resolution) rather than just a low resolution planet map.

Notice that you can already display your HiPS in various projections (SINUS, AITOFF, MOLLWEIDE, AITOFF, CAR, ...)

via the Propertie button in Aladin.

I will keep you informed of our progress in the Aladin code (inversion of longitude, ellipsoide projection...).

Do not hesitate to signal the various problem that you see

(\*) The WCS header is presently sky oriented and you will have to adapt WCS to your image collection.

For instance, if you take this unique image <http://i.stack.imgur.com/ojwD8.jpg> (the earth in cartesian projection), you may use this following calibration file ojwD8.hhh:

```
NAXIS1  = 2048
NAXIS2  = 1024
CRPIX1  = 1024.0
CRPIX2  = 512.0
EQUINOX = 2000.0
CRVAL1  = 0.0
CRVAL2  = 0.0
CTYPE1  = RA---CAR
CTYPE2  = DEC--CAR
RADECSYS= FK5
CD1_1   = -0.185546875
CD1_2   = -0.0
```

Result:

[blocked URL](#)