The CDS reference services supporting Astronomy research

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Centre de Données astronomique de Strasbourg

hosted at the Observatoire astronomique de Strasbourg, Université de Strasbourg

since 1972 …

- Collect useful data on objects in electronic form
- Improve them by critical evaluation and combination
- Distribute the results to the international community
- Conduct research using the data

Status

- Supported as a French Research Infrastructure (via CNRS/INSU), plus international partners
  - *serving global astronomy community*

- ~36 staff: Scientists, Software Engineers, Documentalists
- Heavily used, VO-compliant, evolving
- Contributor to IVOA
- Certified - Data Seal of Approval

CDS services

Astronomical Objects :

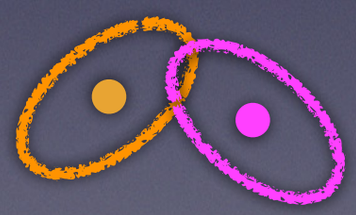
IDs, bibliography, measurements *(500 k queries/day)*

Catalogue Service :

Catalogues, published tables, observation logs, surveys, associated data *(300 k q/day)*

Visualisation and integration :

images, catalogues, VO portal, All-sky



X-Match : *Catalogue cross-match*

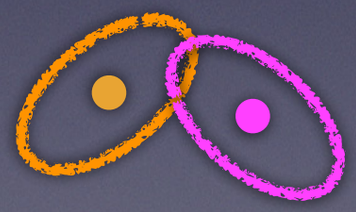
Portal : *Single entry point to all services*

CDS service software

Database ingestion software, PDF paper scanning - machine learning

Large catalogue processing, metadata management, many APIs

Java and Javascript - complex functions
HiPS-gen to make your own surveys



Fast algorithms, job management

Interactive facets, modular components

Supporting research by making information useable

- Add value - by homogeneous description of heterogeneous data
- Standardisation
  - Formats, conventions, VO protocols
- Metadata
  - Encodes a level of ‘meaning’ to the data
- Connections - literature, archives, tools

Interoperability

M 51

J2000 position : 13 29 52.698 +47 11 42.93

Object (Simbad)

Main ID
M 51

Object type
Seyfert 2 Galaxy

Morphological type
SABbc

z
0.001551073042671407

Magnitudes
B : 9.26
V : 8.36
R : 8.4
J : 6.401
H : 5.653
K : 5.496

More info in Simbad

Object (NED)

Main ID
MESSIER 051

Object type
Galaxy pair

Morphological type
SAbc **LINER**

z
0.002

More info in NED

Images

216 HiPS images available 0.20° around 13 29 52.698 +47 11 42.93 :

Wavelength : Gamma-ray X-ray UV Optical Infrared Radio Gas-line

Resolution : Low Medium High

Show : All HiPS CDS featured My favorites

Filter: 16 entries (filtered from 216 total records)
continuous update

	title	wavelength	Sky fraction	
☆	Fermi Color HEALPix survey	Gamma-ray	100 %	
☆	MAXI SSC all-sky image integrated for 4.5 years	X-ray	100 %	
☆	Swift-BAT 70-month all-sray hard X-ray survey image	X-ray	100 %	
☆	XMM-Newton stacked EPIC images	X-ray	5.06 %	
☆	False color X-ray images (Red=0.5-1 Green=1-2 Blue=2-4.5)Kev	X-ray	6.69 %	
☆	GALEX GR6 AIS (until March 2014)- Color composition	UV	79.79 %	
☆	DSS2 Blue (XJ+S)	Optical	99.56 %	
☆	DSS colored	Optical	100 %	
☆	DSS2 Red (F+R)	Optical	100 %	

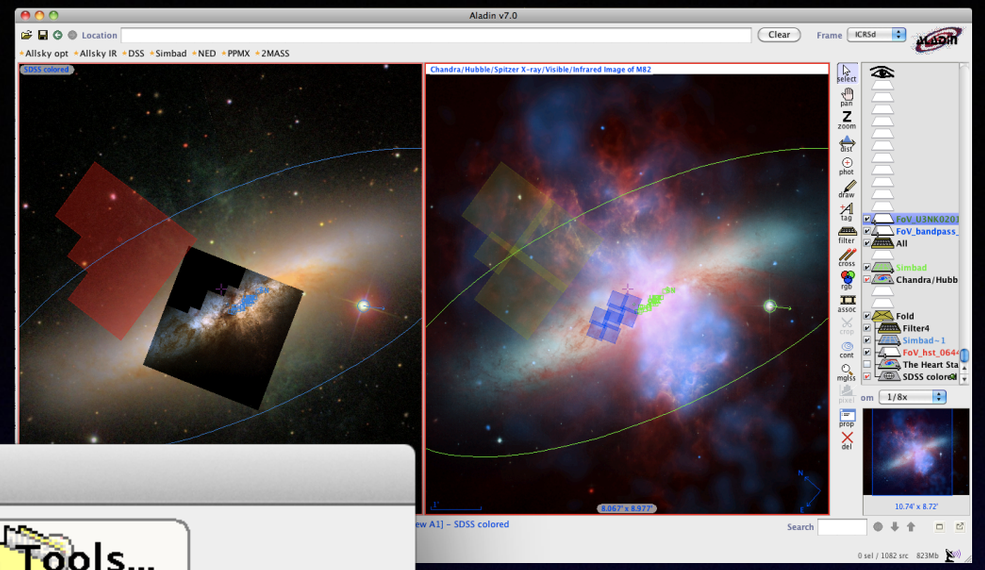
Aladin Lite

DSS colored

Digitized Sky Survey - STScI/NASA, Colored & Healpixed by CDS

Share Thumbnails Update

Access to data via Aladin



Server selector

Others

HiPS | File | all VO | Watch | FoV... | Tools...

Image servers

Aladin images
SkyView
UKIDSS
Sloan
DSS...
VLA...
Archives...
Others...

VizieR catalog service

Specify a target, and a catalog name or identification...

Target (ICRS, n.. 03 46 23.85 +23 55 39.5 | Grab coord

Catalog | Radius 3.627°

All columns
Whole catalog

Info. | Coverage (MOC)

... don't know which catalog ? Select the potentially interesting ones with words/keywords !

Author, free text...: hipparcos

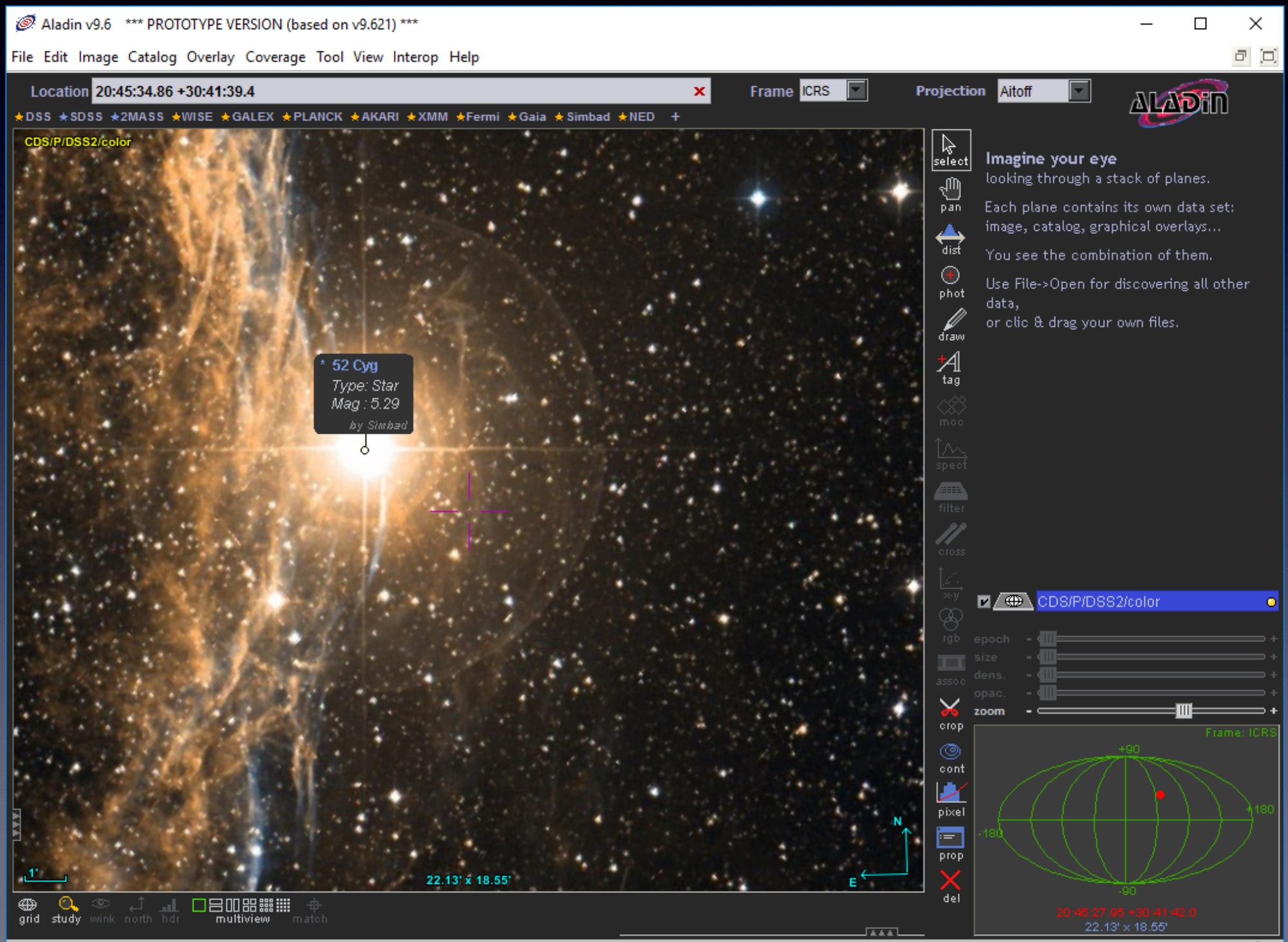
Wavelength	Mission	Astronomy
Radio	AKARI	Abundances
IR	ANS	Ages
optical	ASCA	AGN
UV	BeppoSAX	Associations
EUV	CGRO	Atomic_Data
X-ray	Chandra	Binaries:cataclysmic
Gamma-ray	COBE	Binaries:eclipsing
	Copernicus	Binaries:spectroscopic
	CoRoT	

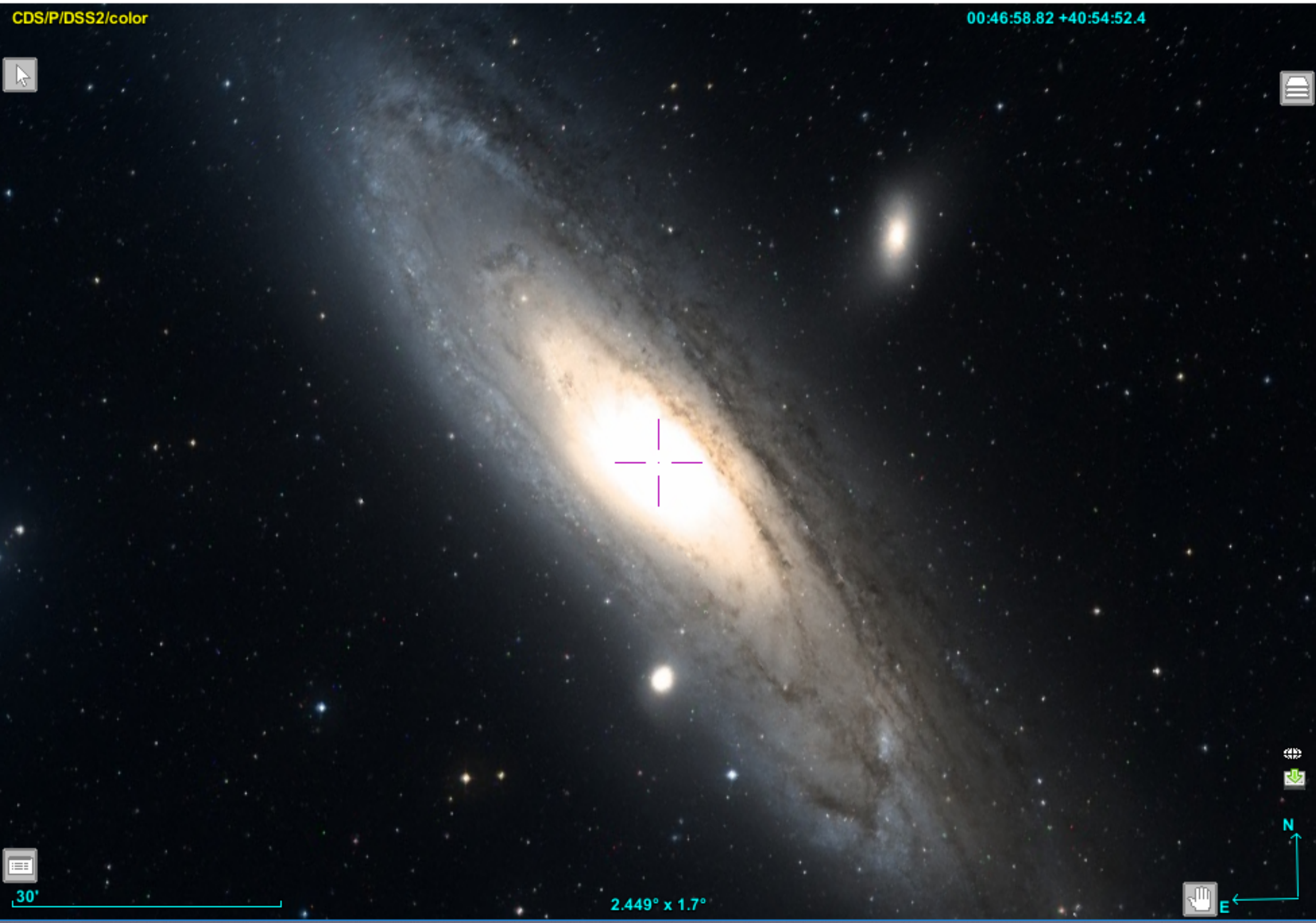
Catalog servers

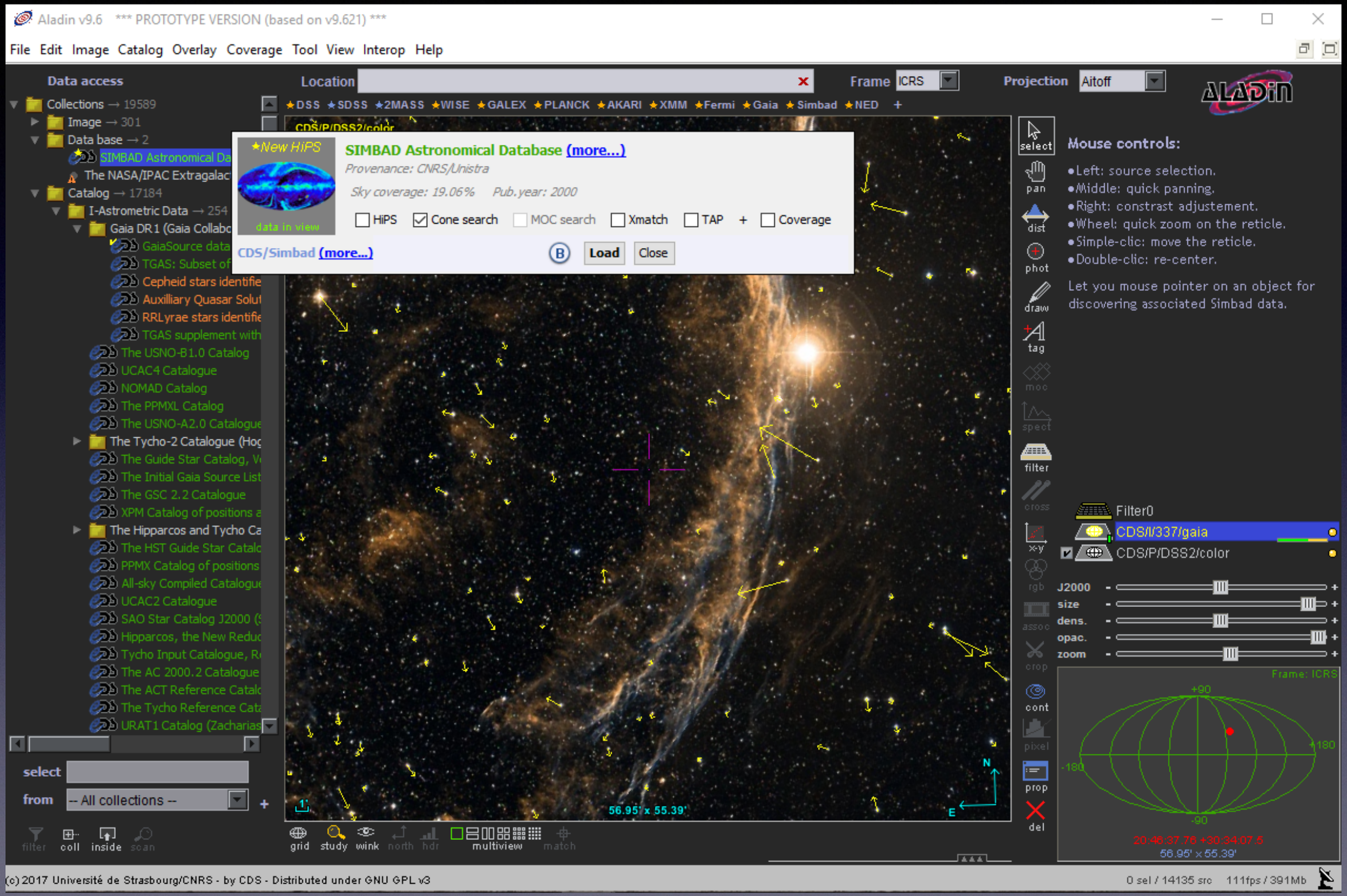
All VizieR
Surveys
Missions
SIMBAD
NED
SkyBot
Gaia
Others..

Reset | Clear | SUBMIT | Close

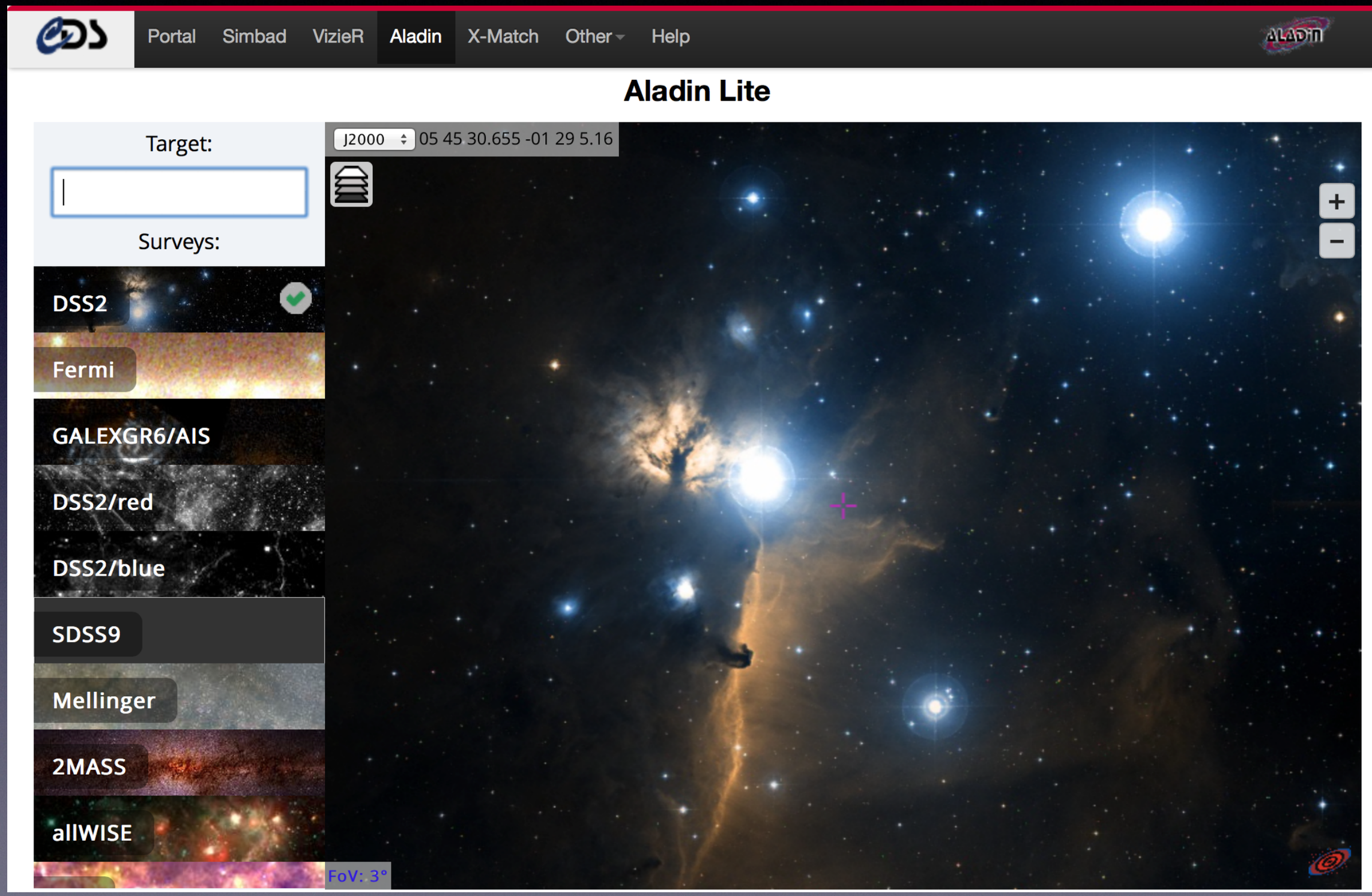
Aladin - *v10 prototype*




CDS/P/DSS2/color
00:46:58.82 +40:54:52.4
30'
2.449° x 1.7°
N
E


Aladin v9.6 *** PROTOTYPE VERSION (based on v9.621) ***
File Edit Image Catalog Overlay Coverage Tool View Interop Help
Data access
Location
Frame ICRS
Projection Aitoff
DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Gaia Simbad NED
CDS/P/DSS2/color
Collections → 19589
Image → 301
Data base → 2
SIMBAD Astronomical Da
The NASA/IPAC Extragalac
Catalog → 17184
I-Astrometric Data → 254
Gaia DR1 (Gaia Collabc
GaiaSource data
TGAS: Subset of
Cepheid stars identifie
Auxilliary Quasar Solut
RRLyrae stars identifie
TGAS supplement with
The USNO-B1.0 Catalog
UCAC4 Catalogue
NOMAD Catalog
The PPMXL Catalog
The USNO-A2.0 Catalogue
The Tycho-2 Catalogue (Hoc
The Guide Star Catalog, V
The Initial Gaia Source List
The GSC 2.2 Catalogue
XPM Catalog of positions a
The Hipparcos and Tycho Ca
The HST Guide Star Catalc
PPMX Catalog of positions
All-sky Compiled Catalogue
UCAC2 Catalogue
SAO Star Catalog J2000 (S
Hipparcos, the New Reduc
Tycho Input Catalogue, R
The AC 2000.2 Catalogue
The ACT Reference Catalc
The Tycho Reference Cata
URAT1 Catalog (Zacharias
New HiPS
data in view
SIMBAD Astronomical Database (more...)
Provenance: CNRS/Unistra
Sky coverage: 19.06% Pub.year: 2000
HiPS Cone search MOC search Xmatch TAP + Coverage
CDS/Simbad (more...)
Load
Close
select
pan
dist
phot
draw
tag
moc
spect
filter
cross
x-y
rgb
assoc
crop
cont
pixel
prop
del
Mouse controls:
Left: source selection.
Middle: quick panning.
Right: constrast adjustement.
Wheel: quick zoom on the reticle.
Simple-clic: move the reticle.
Double-clic: re-center.
Let you mouse pointer on an object for discovering associated Simbad data.
Filter0
CDS/I/337/gaia
CDS/P/DSS2/color
J2000
size
dens.
opac.
zoom
Frame: ICRS
+90
-180
+180
-90
20:46:37.76 +30:34:07.5
56.95' x 55.39'
select
from
-- All collections --
filter coll inside scan
grid study wink north hdr multiview match
1'
56.95' x 55.39'
N
E
(c) 2017 Université de Strasbourg/CNRS - by CDS - Distributed under GNU GPL v3
0 sel / 14135 src 111fps / 391Mb

Aladin Lite


Portal
Simbad
VizieR
Aladin
X-Match
Other
Help
Aladin Lite
Target:
Surveys:
J2000
05 45 30.655 -01 29 5.16
DSS2
Fermi
GALEXGR6/AIS
DSS2/red
DSS2/blue
SDSS9
Mellinger
2MASS
allWISE
FoV: 3°

Aladin Lite API example

AAS225 demonstration

SDSS DR9 band r image of APG 240 pair of galaxies, with an overlaid HST image and a WFPC2 footprint.

Javascript

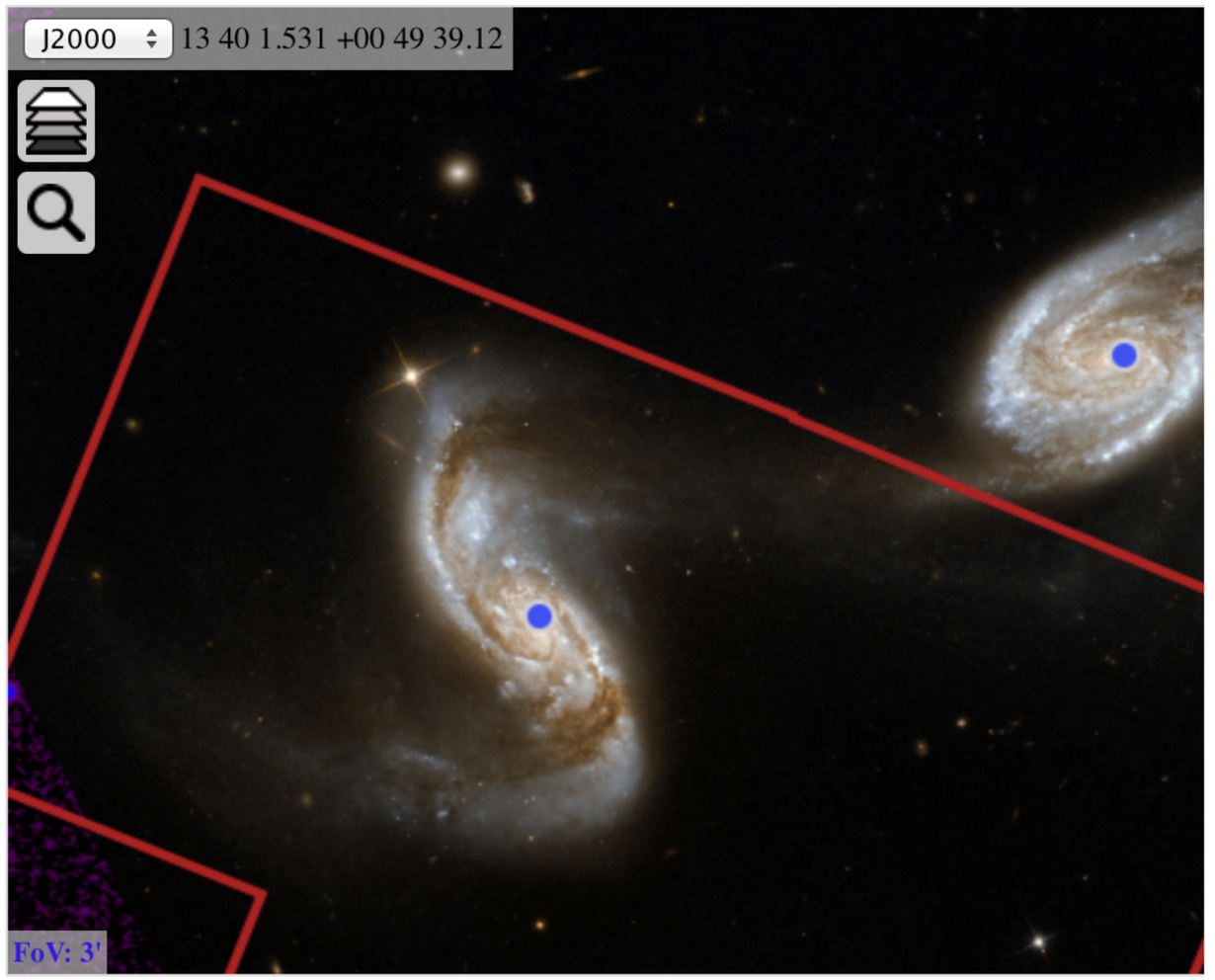
```
var aladin = A.aladin('#aladin-lite-div', {fov:0.15, tar
aladin.setBaseImageLayer(aladin.createImageSurvey('SDSS-
aladin.getBaseImageLayer().getColorMap().update('rainbow
var simbad = A.catalog({name: 'Simbad', sourceSize: 16,
aladin.addCatalog(simbad);
simbad.addSources([A.marker(204.97010833333336, 0.840016

 var overlay = A.graphicOverlay({color: '#aa2222', lineW
 aladin.addOverlay(overlay);

 overlay.addFootprints(A.polygon([[204.970214, 0.81206],

aladin.displayJPG('http://images.ipac.caltech.edu/stsci/
```

Result



Software Development

- Integrated team - Scientists and Engineers
  - interaction with scientific and data centre and data provider communities
- Freedom to innovate while also guided by strong scientific requirements
- Intern program - flow of motivated young developers, help test wide range of new tech

Software Development

- Development for a wide range of uses (including low-spec configurations)
- Interoperability - contribute to the astronomy e-Infrastructure
- Contribute and use shared components (TAP libraries, Aladin Lite, Hipsgen, HEALpix, FITS …)
- Sustainability - planning on 5-10 yr

Challenges and Opportunities

- Multi-wavelength, multi-messenger and time-domain astrophysics
- Changing modes of publication - data associated with publications
- Responding to the change in scale - *Big Data*
- New technologies - *not too soon, not too late*
- Bringing the code to the data
- Continued adaptation to meet community needs