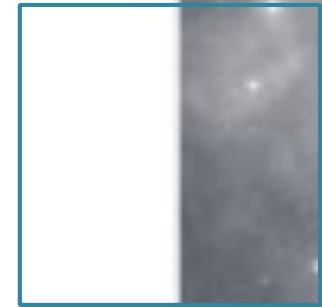


Visualisation tools at CDS

Montpellier TS2020 - II

Ada Nebot on behalf of the CDS team



□ Outline

- Aladin Desktop
 - HiPS
 - MOCS
 - T-MOCS
- Aladin Lite
 - Usage

Aladin



Portal Simbad VizieR **Aladin** X-Match Other Help



Aladin sky Atlas

[Overview](#)

[Aladin Desktop](#)

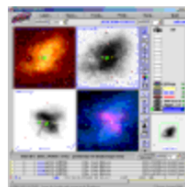
[Aladin Lite](#)

[Information](#)

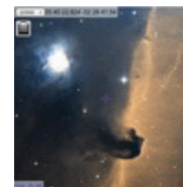
[→ en français](#)

Overview

Aladin is an interactive sky atlas allowing the user to visualize digitized astronomical images or full surveys, superimpose entries from astronomical catalogues or databases, and interactively access related data and information from the *Simbad database*, the *VizieR service* and other archives for all known astronomical objects in the field.



Download
Aladin Desktop
on your machine

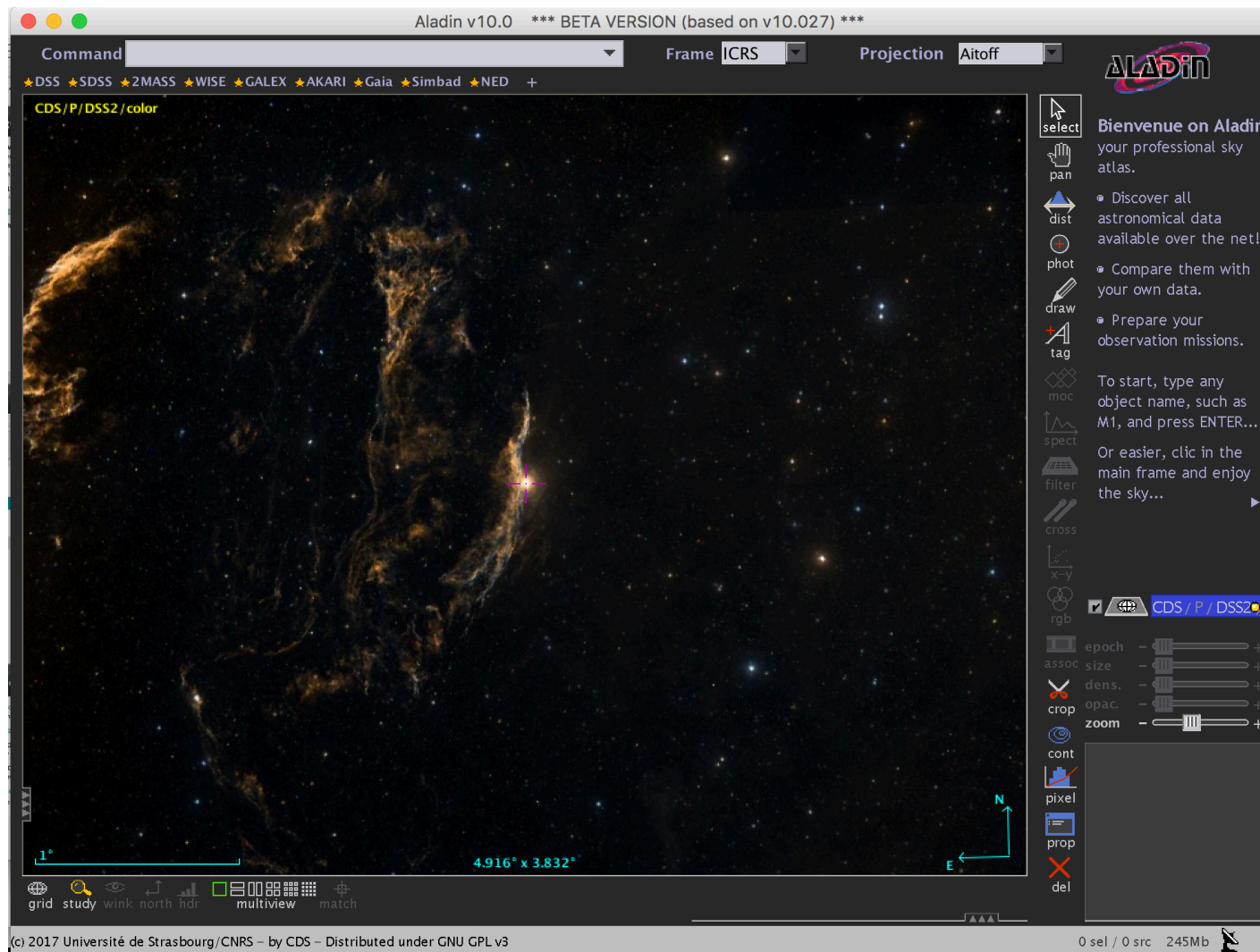


Preview with
Aladin Lite
in your browser

The *Aladin sky atlas* is available in two modes: *Aladin Desktop*, a regular application and *Aladin Lite* an HTML5 javascript web widget.

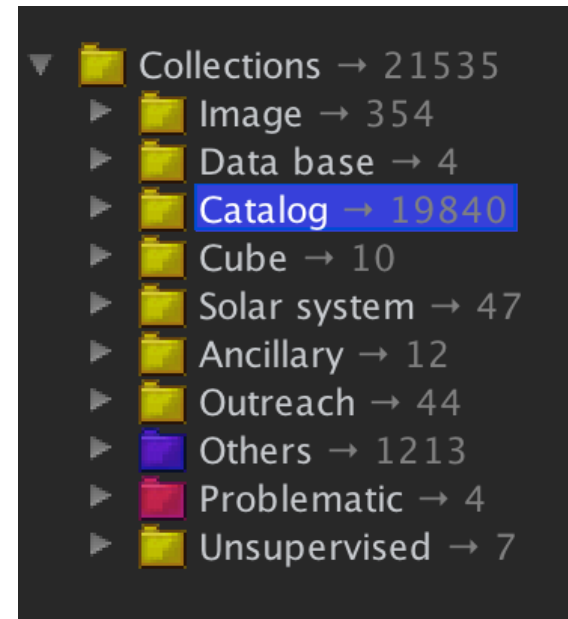
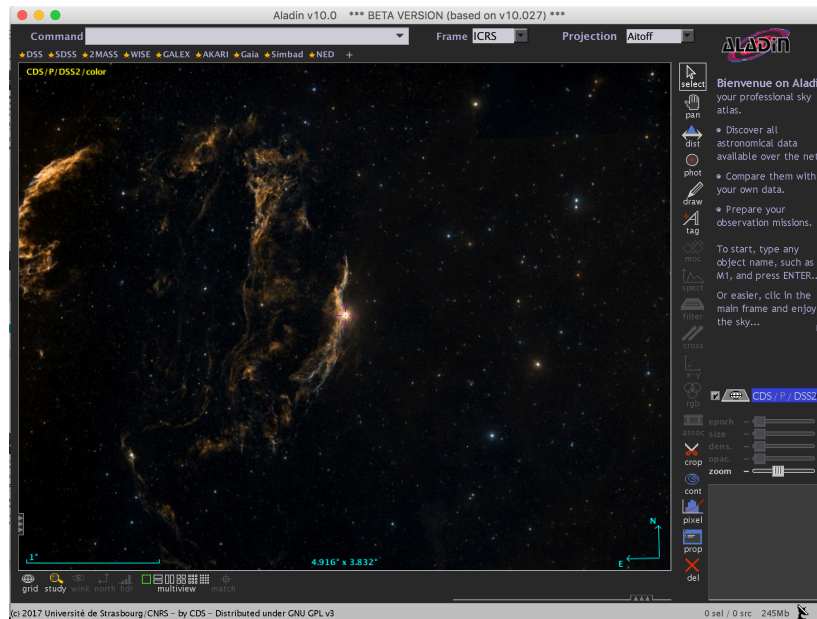
□ Desktop: New look & feel

Modern and compact layout



□ Desktop: New look & feel

Modern and compact layout

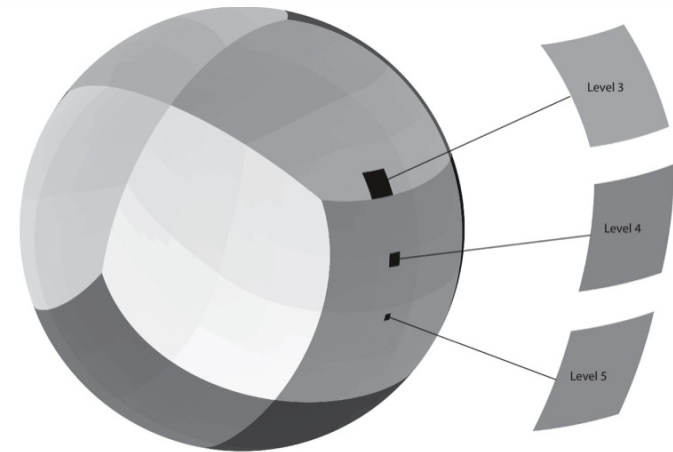


Access to ~22000 collections of images & catalogues

□ HiPS: Hierarchical Progressive Survey

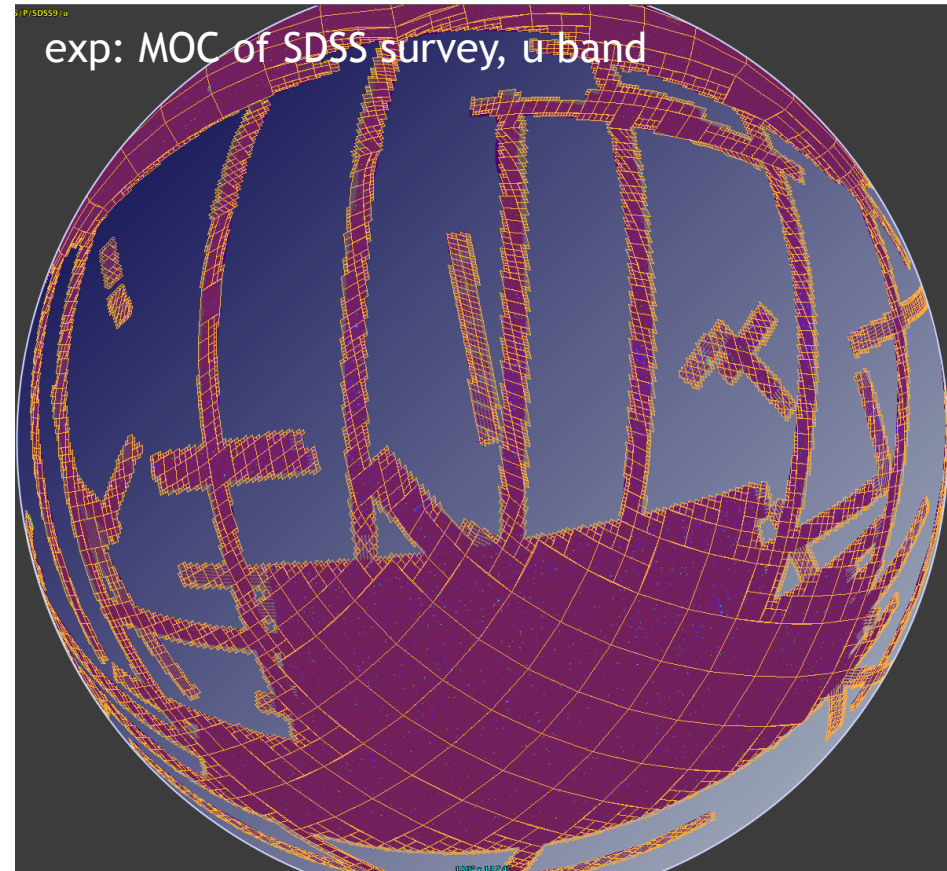
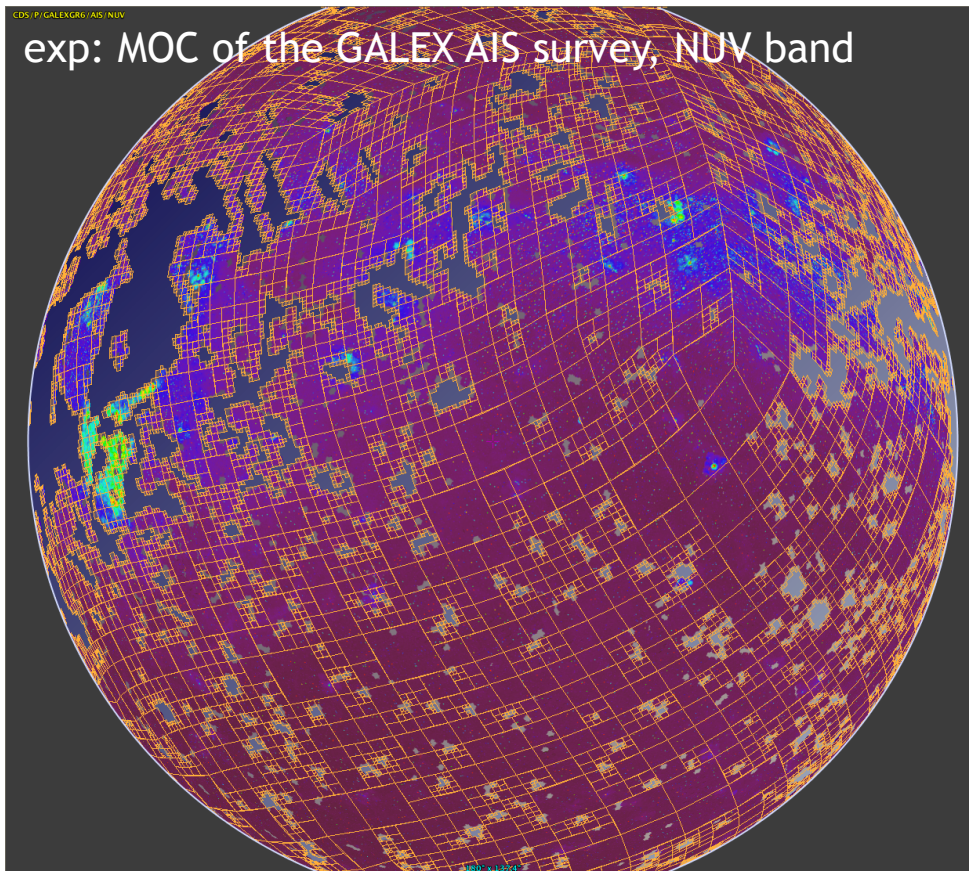


- based on HEALPix (allsky tessellation)
- Fernique et al (2015)
2015A&A...578A.114F
- Progressive display of a survey:
the more you zoom, the more you see
- Images survey, but also catalogs and cubes
- HiPS are build from an image collection
using HiPSgen



□ MOC: Multi-Order Coverage

- Sky coverage of a data set



- Logical operations (intersections, unions, ...)
- Query by MOC (*"I would like data from catalog XXX in the YYY fields"*)

Discovery data tree

All VO collections available based on MOCserver

yes
no

Filter

Aladin v10.0

Available data → 319 / 20233

Command [] Frame ICRS Projection Aitoff

ALADIN

Welcome to Aladin, your professional sky atlas.

Data discovery tree filter

Filter name [] Save Delete

Global constraints Dedicated to catalog Spatial **Technical**

Access mode

Protocol ? HiPS SIA(1&2) SIA2 SSA
 TAP Cone Search MOC HiPS progenitors

HiPS dedicated constraints

Order ? []

Pixel formats ? FITS tile HiPS only color HiPS only

expression & MOC generated by the filter

MOC [] Display it

→ Filter activated → matching collections: 319

Apply the filter Reset Close

(c) 2017 Université de Strasbourg/CNRS - by CDS - T

Discovery data tree

Access data (HiPS & MOC)

The screenshot displays the Aladin v10.0 interface. On the left, a 'Discovery data tree' shows a hierarchy of collections, with 'XMM' selected. The main window shows a sky image with a HiPS grid overlay. A tooltip for 'X-ray images on band 0.5-1KeV' is visible, providing details like 'Sky coverage: 2.264%' and 'HiPS pixel scale: 3.221\". The right sidebar contains a 'Bienvenue on Aladin' message and various tool icons like 'tag', 'moc', 'spect', 'filter', 'cross', 'x-y', 'rgb', 'epoch', 'assoc', 'dens.', 'crop', 'zoom', 'cont', 'pixel', 'prop', and 'del'. The bottom status bar shows '0 sel / 0 src 250fps / 545Mb'.

□ Query data by regions (MOC)

Sources within the region

Aladin v10.0 *** BETA VERSION (based on v10.027) ***

Available data → 158 / 20235

Command [] Frame ICRS Projection Aitoff

select xmm
from -- all collections --

Access selector

Autoclassification of the variable 3XMM sources (Farrell+,... (more...))
Copyright: CDS
Sky coverage: 0.00447% Nb rows: 2,876 Reference pub. year: 2015

Access mode Whole data in view by region or MOC by CDS Xmatch by criteria

derived prod. coverage

CDS/J/ApJ/813/28/table4

Load

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0 sel / 0 src 225fps / 576Mb

Query data by X-match (CDS Xmatch)

Sources within 5 arc seconds

Aladin v10.0 *** BETA VERSION (based on v10.027) ***

Available data → 4 / 20235

Command [] Frame ICRS Projection Aitoff

Collections → 4 / 20233

- Catalog → 4 / 17676
 - VizieR → 4 / 17676
 - IX-High-Energy data → 4
 - XMM-Newton Serendip
 - The 3XMM-DR6
 - The XMM-Newton 2
 - XMM-Newton Serendip
 - The 3XMM-DR4
 - XMM-Newton Serendip
 - The 3XMM-DR5

CDS/P/DSS2/color

Access selector

The 3XMM-DR6 Catalog, "slim" version (xmm3r6s) (more...)

Copyright: CDS

Sky coverage: 0.6734% Nb rows: 468,440 Reference pub. year: 2016

Access mode in view by region or MOC by CDS Xmatch by criteria

derived prod. coverage density map

CDS/IX/50/xmm3r6s

Load

RAJ2000	DEJ2000	3XMM	P(AGN)	P(CV)	P(GRB)	P(ST...)	P(ULX)	P...
314.2696	30.9858	J205704.7+305909	0.008	0.225	0.004	0.462	0.074	0
314.2729	30.9781	J205705.5+305841	0.229	0.64	0	0.04	0	0
314.2792	31.1939	J205707.0+311138	0.223	0.584	0	0.064	0.001	0
314.3146	31.0111	J205715.5+310040	0.007	0.288	0.005	0.445	0.043	0
314.3321	31.0067	J205719.7+310024	0.005	0.274	0.009	0.459	0.036	0
314.3329	31.0461	J205719.9+310246	0.007	0.251	0.002	0.467	0.034	0
314.3383	31.0033	J205721.2+310012	0.011	0.2	0.001	0.498	0.038	0
314.3625	31.1414	J205727.0+310829	0.007	0.139	0.011	0.549	0.06	0

select xmm slim

from -- all collections --

coll. view scan filter

20 45 39.75360 +

20:45:39.75 + 30:43:11.0

5.804° × 4.867°

(c) 2017 Université de Strasbourg/CNRS - by CDS - Distributed under GNU GPL v3

28 sel / 2602 src 200fps / 570Mb

Query data by criteria (TAP)

Select sources using ADQL

The screenshot displays the ALADIN web interface. The main window shows a star field with a grid overlay. A modal window titled "TAP access with CDS/IX/50/xmm3r6s" is open, allowing users to construct and execute queries. The query window includes a table selector (set to "IX/50/xmm3r6s"), a "Set ra, dec" button, and a "Select" dropdown (set to "All"). It also features a "Constraints" section with "Add new" and "Max rows" (set to 9999). The "Target" field contains coordinates "20 45 44.25782 +30 41 53.4725". The "Radius" field is set to "32.18'" and "CIRCLE". The "Ra=" field contains "Ra= 311.4344075833333 Dec= 30.698186805555554 Radius=".

The query window also includes a "Refresh query" button, a "Check.." button, a "SYNC" dropdown, and an "Async jobs>>" button. The query text is displayed in a scrollable area:

```
SELECT TOP 9999 * FROM "IX/50/xmm3r6s" WHERE CONTAINS(POINT('ICRS',  
RAJ2000, DEJ2000), CIRCLE('ICRS', 311.4344075833333, 30.698186805555554,  
0.5363333333333333)) = 1
```

Buttons for "Clear", "Submit", and "Close" are at the bottom of the query window. The background interface shows a sidebar with "Collections" and "Available data" lists, a "Command" field, and various tool icons like "select", "pan", "dist", "phot", and "draw".

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□ Target history controller

Come back to a previous target

Aladin v10.0 *** BETA VERSION (based on v10.027) ***

Available data → 20233 / 2023

Command [] Frame ICRS Projection Aitoff

★DSS ★SDSS ★2MASS ★WISE ★GALEX ★AKARI ★Gaia ★Simbad ★NED +

select
pan
dist
phot

30'

3.881° x 3.14°

Adjust the visib Search

RAJ2000	DEJ2000	3XMM	P(AGN)	P(CV)	P(GRB)	P(ST...)	P(ULX)	P
311.8779	30.0617	J204730.7+300342	0.105	0.32	0.001	0.264	0.011	
311.8946	30.0181	J204734.7+300105	0.13	0.65	0	0.077	0	
311.8975	30.0756	J204735.4+300432	0.138	0.328	0.002	0.218	0.025	
311.9079	30.0661	J204737.9+300358	0.01	0.214	0.004	0.505	0.065	
311.9146	30.2164	J204739.5+301259	0.14	0.22	0.005	0.337	0.061	
311.9237	30.0925	J204741.7+300533	0.194	0.261	0.001	0.242	0.043	
311.9271	30.0806	J204742.5+300450	0.099	0.302	0	0.272	0.03	

select
from -- all collections -- +
coll. view scan filter

52 Cyg
M51
20:45:39.75 +30:43:11.0 ICRS
20 45 39.75360 +30 43 10.9920 ICRS
311.41564 +30.71972 ICRS
4C -01.61
20 45 41.10960 +30 42 52.3440 ICRS
311.42129 +30.71454 ICRS
311.42336 +30.71276 ICRS
311.42801 +30.70876 ICRS

52 Cyg
20:45:41.61 + 30:42:45.9
3.881° x 3.14°

(c) 2017 Université de Strasbourg/CNRS - by CDS - Distributed under GNU GPL v3 7 sel / 2602 src 292fps / 685Mb

□ Related to time...

- Detection of catalogues containing temporal measurements
- Visualisation of time series data: new window in Aladin
- Cross-talk between the classical view and the Time view panels

Aladin v10.0 *** BETA VERSION (based on v10.089) ***

Available data → 21535 / 21538

Command [] Frame ICRS Projection Aitoff

DSS SDSS 2MASS WISE GALEX AKARI Gaia Simbad NED +

DSS2 color

1° 14.93° x 6.029°

20 Vmag [mag] ? Intensity mean V-band magnitude

15

-08-04 1996-11-12 1997-02-20 1997-05-31 1997-09-08 1997-12-17 1998-03-31

recno	n.Star	Field	OGLE	Mode	RAJ2000	DEJ2000	<Imag>	<V>
3131	3131	LMC186.8	31889	10	05 46 02.33	-71 11 29.7	16.367	17
3137	3137	LMC186.6	14164	F	05 46 10.80	-71 00 06.0	15.796	16
3145	3145	LMC185.6	72479	10	05 46 21.93	-70 21 08.9	17.143	17
3149	3149	LMC186.7	12693	10	05 46 24.39	-71 06 35.4	16.671	17
3164	3164	LMC185.1	93	10/20	05 46 43.79	-70 40 51.0	16.58	17
3175	3175	LMC185.1	140	10/20	05 47 12.54	-70 41 12.6	16.351	17
3193	3193	LMC185.2	10585	F	05 47 34.70	-70 31 14.3	15.967	16
3194	3194	LMC186.4	36	F	05 47 35.22	-70 51 27.5	16.166	17
3264	3264	LMC126.3	462	10	05 00 22.29	-68 37 29.9	18.043	17

select from -- all collections --

coll. sort view scan filter

ALADIN

Welcome to Aladin, your professional sky atlas.

- Discover all astronomical data available over the net!
- Compare them with your own data.
- Prepare your observation missions.

To start, type any object name, such as M1, and press ENTER...

Or easier, clic in the main frame and enjoy the sky...

CDS/J/AcA/3 CDS/P/DSS2

epoch size dens. opac. zoom cont. pixel prop. del.

[View A2] - CDS/J/AcA/ Search

148 sel / 3375 src 348Mb

□ Related to space...

- Can we have a tool to manipulate time fast, interoperable, multi-resolution... ? We have the MOC in space (S-MOC)...

Aladin v10.0 *** BETA VERSION (based on v10.089) ***

Available data → 21535 / 21538

Command [] Frame ICRS Projection Aitoff

DSS SDSS 2MASS WISE GALEX AKARI Gaia Simbad NED +

DSS2 color

1° 14.93° x 6.029°

<Vmag> [mag]: ? Intensity mean V-band magnitude

recno	n_Star	Field	OGLE	Mode	RAJ2000	DEJ2000	<Imag>	<Vmag>
2974	2974	LMC177.4	85602	10/20	05 42 13.62	-70 09 13.6	17.072	17
2977	2977	LMC176.1	27271	10	05 42 15.88	-70 05 40.7	17.476	18
2987	2987	LMC177.1	71229	10	05 42 25.27	-70 38 45.0	16.786	17
2992	2992	LMC184.8	734	10	05 42 30.54	-70 04 38.2	17.429	17
3023	3023	LMC185.6	450	10/20	05 43 02.81	-70 22 48.8	17.921	18
3081	3081	LMC185.7	56178	10/20	05 44 37.41	-70 28 53.2	18.161	18
3107	3107	LMC185.6	20638	F	05 45 27.48	-70 25 24.5	16.869	17
3145	3145	LMC185.6	72479	10	05 46 21.93	-70 21 08.9	17.143	17
3364	3364	LMC176.3	462	10	05 00 22.29	-68 37 29.9	18.04	17

05/06/2018

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36 sel / 3375 src 356Mb

□ Related to time... T-MOC

- Can we have a tool to manipulate time fast, interoperable, multi-resolution... ? We have the MOC in space (S-MOC)... We build T-MOC

Aladin v10.0 *** BETA VERSION (based on v10.089) ***

Available data → 21535 / 21538

Command [] Frame [ICRS] Projection [Aitoff]

DSS SDSS 2MASS WISE GALEX AKARI Gaia Simbad NED +

DSS2 color

14.93° x 6.029°

<Vmag> [mag] ? Intensity mean V-band magnitude

5-10-09 1997-02-20 1998-07-05 1999-11-17 2001-03-31

grid study wink north hdr multiview match [View A2] - CDS/J/Ac/ Search

recno	n_Star	Field	OGLE	Mode	RAJ2000	DEJ2000	<Imag>	<V
604	0604	LMC129.3	90	10	04 59 56.30	-70 25 49.6	14.941	15
780	0780	LMC123.4	14441	F	05 03 03.41	-66 43 39.5	15.045	15
796	0796	LMC124.3	9914	F	05 03 22.18	-67 28 21.3	15.487	16
1190	1190	LMC112.7	20132	F	05 11 13.99	-69 59 31.8	14.908	15
1319	1319	LMC110.3	16431	10	05 14 32.27	-68 39 25.2	14.469	15
1571	1571	LMC104.5	27415	10	05 19 02.45	-70 13 31.3	15.592	16
2413	2413	LMC171.3	97	F	05 34 02.54	-70 59 38.8	15.343	16
2523	2523	LMC174.7	38	F	05 35 53.87	-68 39 34.0	14.428	16
2709	2709	LMC173.4	57	10	05 38 14.94	-67 45 39.9	15.104	16

05/06/2018

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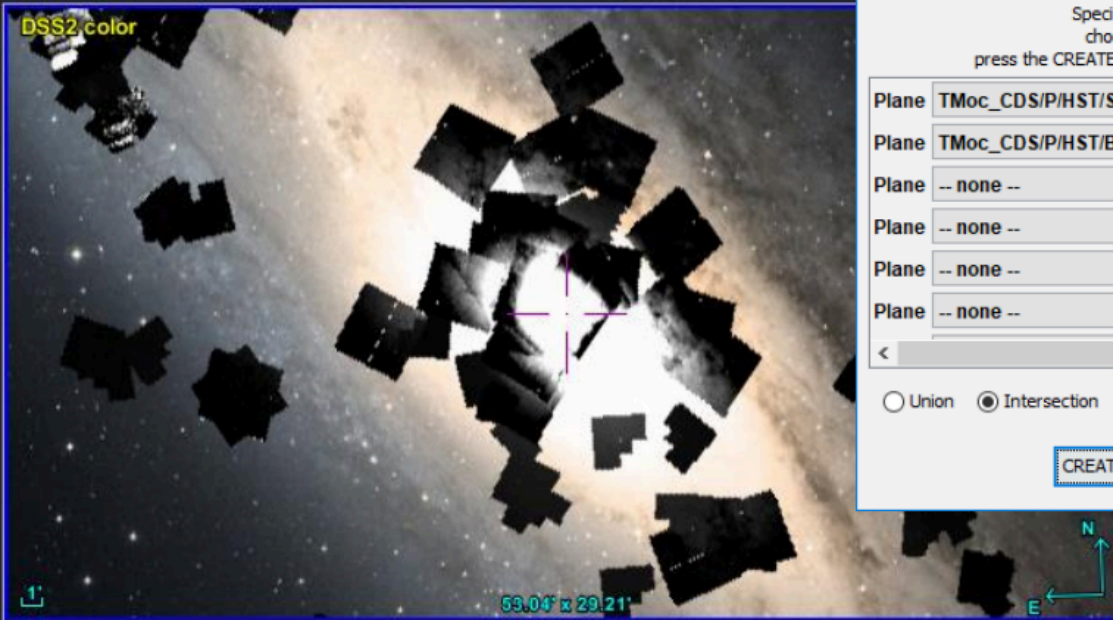
19 sel / 3375 src 296Mb

Available data → 408 / 21355

● in view ● out view

Command [x] Frame [x]

DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Gaia



Time graph

HST-B includes the following filters: F450W, F439W, F438W,...

Provenance: Canadian Astronomy Data Centre
 Coverage: 9.059°² 3.7µm/8.1THz .. 5.2µm/57.7THz 1994-01-25 .. 2017-03-05 Res: 50.29mas

Access mode & derived prod. progressive + space cov. time cov. Links to orig.img.

Image .data in view

CDS/P/HST/B

Load



MOC operations

Specify one or two MOC planes, choose a MOC operation and press the CREATE button to generate the resulting MOC.

Plane TMoc_CDS/P/HST/SDSSg - "00 00 00.00000 +00 00 00.00000"

Plane TMoc_CDS/P/HST/B - "00 00 00.00000 +00 00 00.00000"

Plane -- none --

Plane -- none --

Plane -- none --

Plane -- none --

Plane -- none --

Union Intersection Subtraction Difference Complement

CREATE Reset Close ?

filter

cross

key

rgb

epoch

size

dens.

opac.

zoom

- TMoc_CDS/P/HST/R
- TMoc_CDS/P/HST/SDSS
- TMoc_CDS/P/HST/V
- TMoc_CDS/P/HST/SDSS
- TMoc_CDS/P/HST/B
- CDS/P/HST/B
- CDS/P/DSS2/color

M31

00:42:44.33 +41:16:07.5
53.04' x 29.21'

select HST

from -- all collections --

coll. sort view scan filter

Aladin v10.0 *** BETA VERSION (based on v10.089) ***

Available data → 21535 / 21538

● in view ● out view

Command

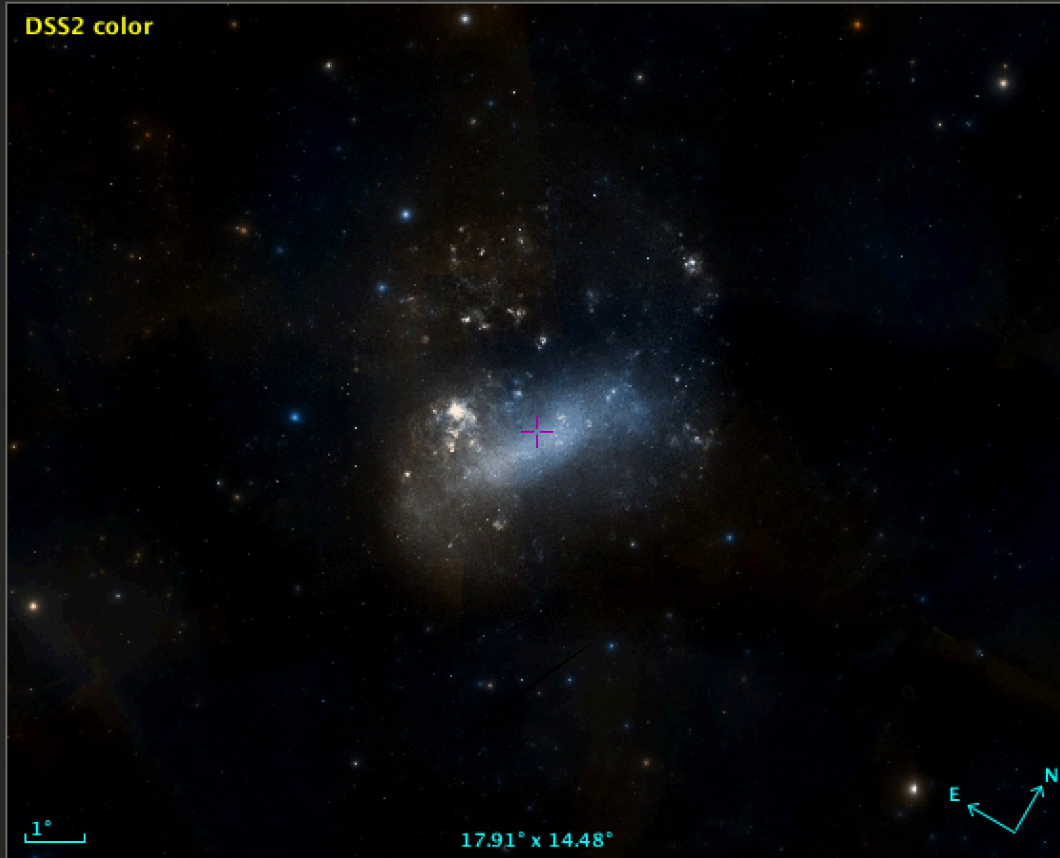
Frame ICRS

Projection Aitoff



DSS SDSS 2MASS WISE GALEX AKARI Gaia Simbad NED +

DSS2 color



grid study wink north hdr multiview match

- Collections → 21535
 - Image → 354
 - Data base → 4
 - Catalog → 19840
 - Cube → 10
 - Solar system → 47
 - Ancillary → 12
 - Outreach → 44
 - Others → 1213
 - Problematic → 4
 - Unsupervised → 7

- select
- pan
- dist
- phot
- draw
- tag
- moc
- spect
- filter
- cross
- x-y
- rgb

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- Compare them with your own data.
- Prepare your observation missions.

To start, type any object name, such as M1, and press ENTER...

Or easier, clic in the main frame and enjoy the sky...

CDS / P / DSS2

assoc epoch size dens. opac. zoom

crop cont

pixel prop del

LMC

05:23:07.87 -69:29:26.2 17.91° x 14.48°

select from -- all collections --

exp. sort view scan filter

☐ Aladin Lite

- A lightweight sky atlas in the browser

[Aladin Lite](#) / [Documentation](#)

[Overview](#)

[Embedding in a web page](#)

[Javascript API](#)

[Features](#)

[Usage](#)

[Source code](#)

[Integration in Python notebooks](#)

[Integration in mobile apps](#)

[Plugins](#)

[Release notes](#)

[Contact](#)

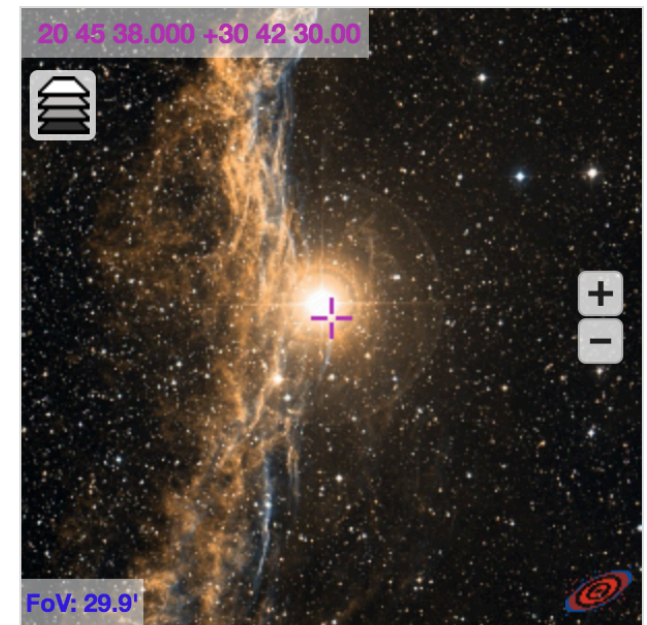
Overview

Aladin lite is a lightweight version of the [Aladin Sky Atlas](#), running in the browser and geared towards simple visualization of a sky region.

It allows one to visualize image surveys (JPEG multi-resolution HEALPix all-sky surveys) and superimpose tabular (VOTable) and footprints (STC-S) data.

Aladin lite is powered by the HTML5 canvas technology, currently supported by any modern browser

Aladin lite is [easily embeddable on any web page](#) and can also be controlled through a [Javascript API](#).



□ Aladin Lite usage

Aladin Lite has been integrated in the main CDS services:

- On the SIMBAD page for an individual object, it provides an interactive preview image (see [example for Messier 1](#)).
- The VizieR results page features a *start Aladin Lite* button to visualize the positions of listed sources (see [example](#))

Outside CDS, Aladin Lite is used in several projects:

- [ESA Sky](#) allows for discovery and access of data observed by ESA space missions
- [GW170814 interactive skymap](#) displays the localisation on the sky of the gravitational wave event jointly detected by LIGO and Virgo observatories, and announced in September 2017.
- [HEASARC Xamin system](#) for discovery and data retrieval
- [Skymap Viewer](#) shows probability contours for gravitational wave events from LIGO/Virgo
- [JVO Portal v2](#)
- [Gamma Sky](#), a portal to gamma-ray sky (developed by C. Deil and A. Voruganti)
- [SETI](#) uses Aladin Lite to display targets currently observed (development by J. Richards)
- [J-PLUS Early Data Release](#)
- [CEFCa images navigator](#) and [images tours](#)
- [ARCHES Walker](#), an Outreach tool showcasing astronomical objects in different wavelengths ([ARCHES project](#))
- [MOPRA Radio Telescope Pointing and Status](#)
- [JUDO2](#) (JAXA Universe Data Oriented)
- [Akari explore tool](#)
- [CASSIS atlas of Spitzer Infrared Spectra](#)
- [GLIMPSE 360](#)
- [CADE](#) (*Centre d'Analyse de Données Etendues*) uses Aladin Lite to provide previews of the HEALPix maps they publish ([Example for CGPS data](#))
- [ADS All-Sky Survey](#) makes use of Aladin Lite to display heatmaps of SIMBAD objects cited in the literature.

If your project is using Aladin Lite, we would be happy to have it listed here. [Drop us a line!](#)

Aladin Lite usage

Interactive Detection Skymap

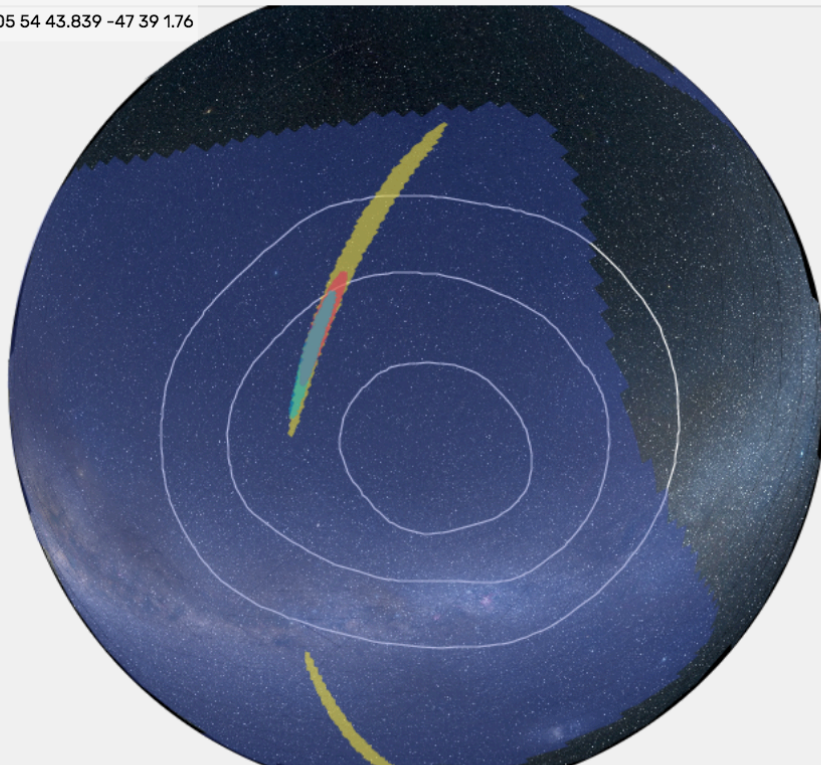
<http://www.virgo-gw.eu/skymap.html>

[Return to the Virgo homepage](#) [Go to the LIGO Open Science Center](#)

The interactive skymap shows the localizations of the various gravitational-wave detections in the sky and helps to understand the importance of multimessenger astronomy.

[Tweet](#) [Share](#)

J2000 05 54 43.839 -47 39 1.76



FoV: 180°

Using the skymap

Click on the various options below to display information relating to each detection.

Detection	Sky localisation	Label	Pop-up info
GW170817 - H1 only	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GW170817 - L1/H1 only	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GW170817 - L1/H1/V1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GW170817 - Refined skymap	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GW170817 - (GRB170817A) Initial Fermi GBM localization	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GW170817 - (GRB170817A) Final Fermi GBM localization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GW170817 - SSS17a/AT2017gfo Transient sky position	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GW170814 - H1/L1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GW170814 - H1/L1/V1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GW170814 - Refined skymap	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
GW170608 - Refined LIGO localization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Backgrounds

If you want to see the extension of these sky regions through the constellations you can select an artistic background image Constellations.

You can also select various background images at different wavelengths, combining the electromagnetic data with the gravitational-wave information: Mellinger (default) WISE 2MASS DSS color XMM Fermi

□ Aladin Lite usage

<https://losc.ligo.org/s/skymapViewer/aladin/index.html#GW150914:LALI>

Skymap Viewer

A sky atlas for understanding LIGO-Virgo skymaps. Help [here](#), or watch a [video about Skymap Viewer](#). Plenty simulated skymaps [here](#). If you do not see the big dark sky map, look below and widen your browser. Zoom with the + and - at the right of the sky.



This is **OBSERVED** (real) data

GW150914:LALI

50% area = 149.0 sq deg

90% area = 616.4 sq deg

[json](#)

Observation Targets ?

GLADE (Galaxy List for the Advanced Detector Era) (Dalya+ 2016)

Gravitational Wave Galaxy Catalogue (White+ 2011)

MCXC Meta-Catalogue X-ray galaxy Clusters (Piffaretti+, 2011)

Planck catalogue of Sunyaev-Zeldovich sources (Planck collab 2015)

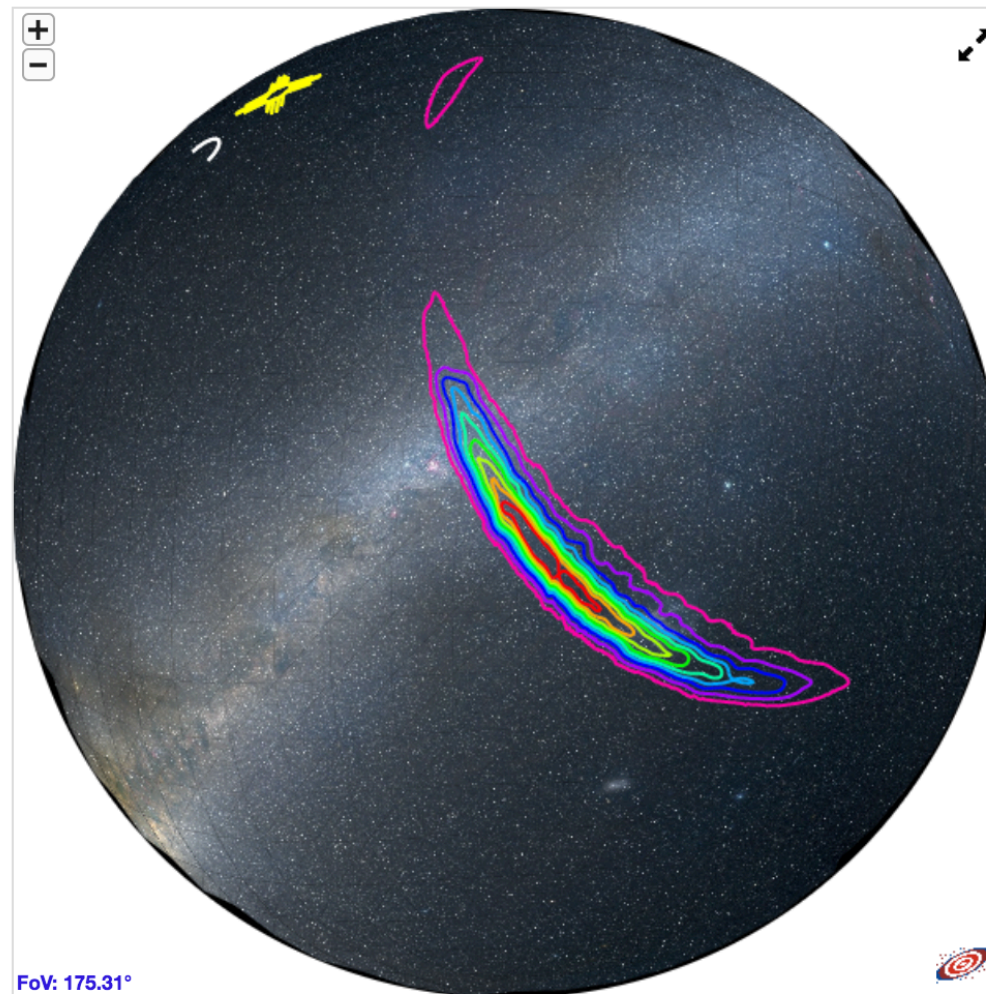
RASS-SDSS galaxy cluster survey. V. (Popesso+, 2007)

WISEXSCOS Photometric Redshift Catalogue (Bilicki+, 2016)

X-ray emission of RASS Abell clusters (Ledlow+, 2003)

- Choose one or more catalogs above
- Double-click in any Target square for source information (pink box above) and a centered display for zooming
- Make Target squares [smaller larger](#)
- Observation priorities as a [table](#)

Zoomable Multiwavelength Sky



□ What next?

- Query by T-MOC
- Merge spacial and temporal coverage:
 - S-MOC +T-MOC—> ST-MOC
 - Query by ST-MOC
- Proto available for tests, explorations, ...

<http://aladin.u-strasbg.fr/java/AladinBeta.jar>