



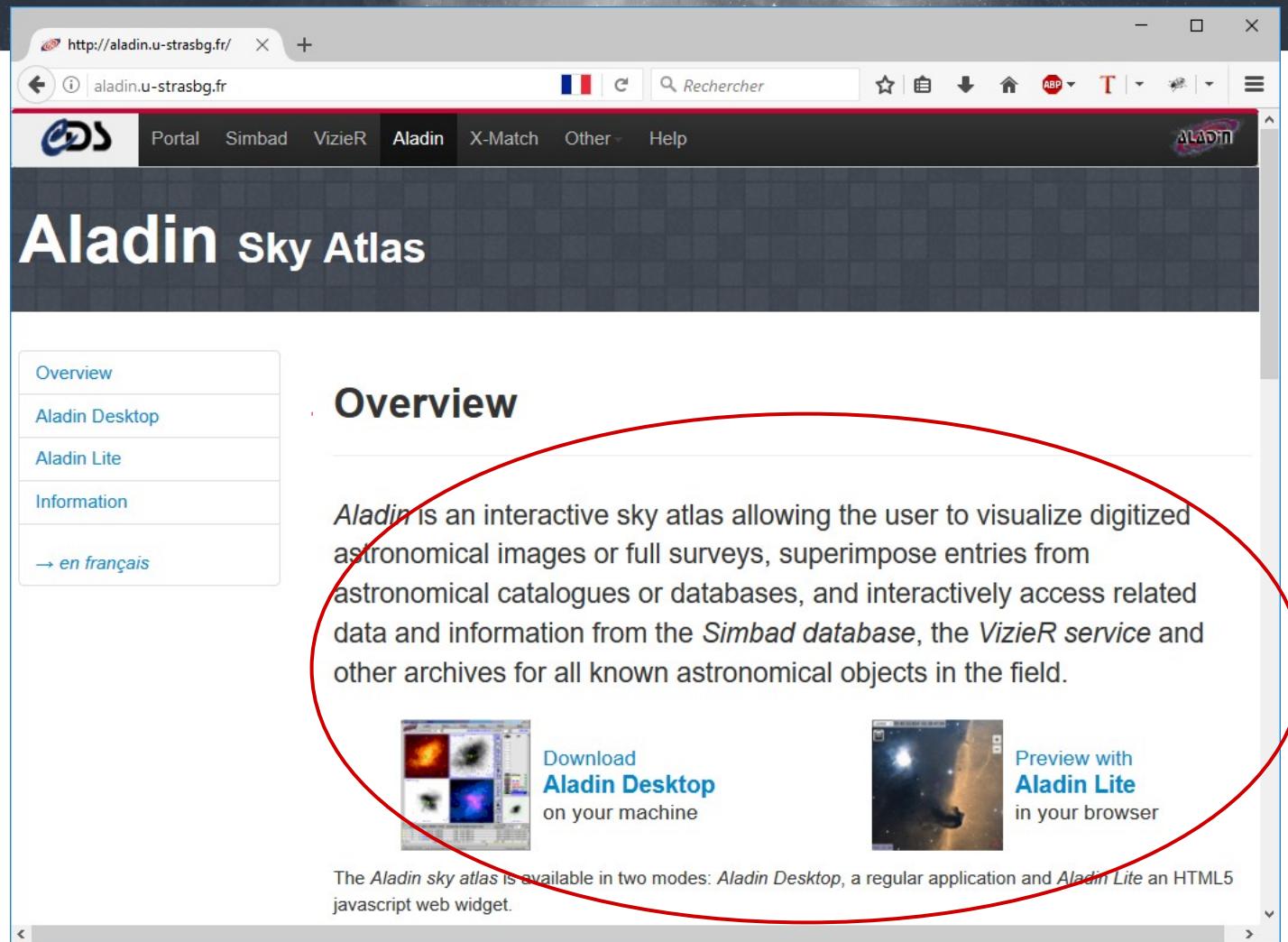
Aladin V10 and Aladin Lite

for ESFRI (and other) projects

Pierre Fernique, Thomas Boch, Chaitra (CDS)

Presented by François Bonnarel (CDS)

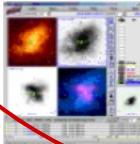
□ What is Aladin ?



The screenshot shows a web browser window displaying the Aladin Sky Atlas homepage. The URL in the address bar is <http://aladin.u-strasbg.fr/>. The page title is "Aladin sky Atlas". A red oval highlights the central text and download options.

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.

☐ Key dates

1993

Protos XWindows (C, C++)

1999

Applet (java)

2003

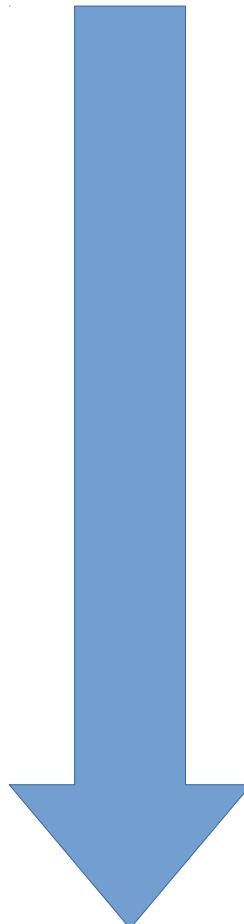
Standalone/Applet (java)

2013

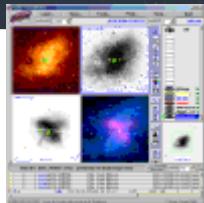
Aladin Lite (javascript)

2017

Aladin v10 (java)



□ Aladin Sky Atlas, one in two!



Aladin Desktop

- high level features **desktop**
- access images, catalogs, footprints
- **full range of functionalities**
- interoperable with VO tools
 - Aladin is a VO portal
 - used to validate most standards
- Used for observation preparation tools (APT, GuideCam)
- going all hierarchical now! (HiPS)



Aladin Lite

- **Web** HiPS visualizer
- preview mode
- embed in any webpage
- **easy appropriation**
- **highly used in wide range of sites/services**
- basic functions... but more and more!



Aladin Desktop V10

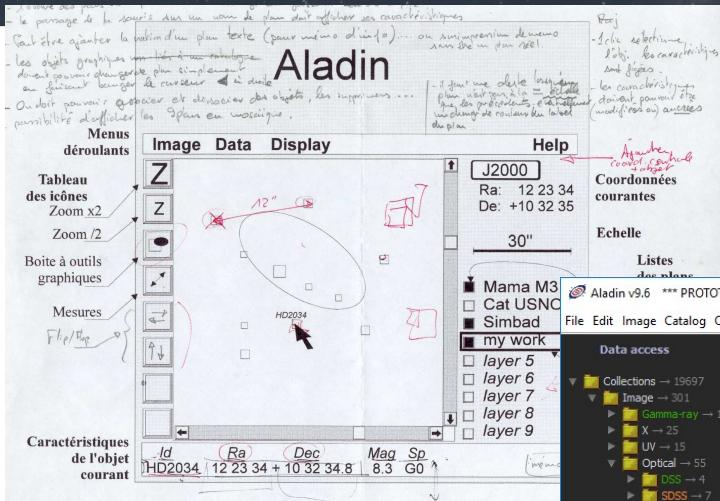
Main new features



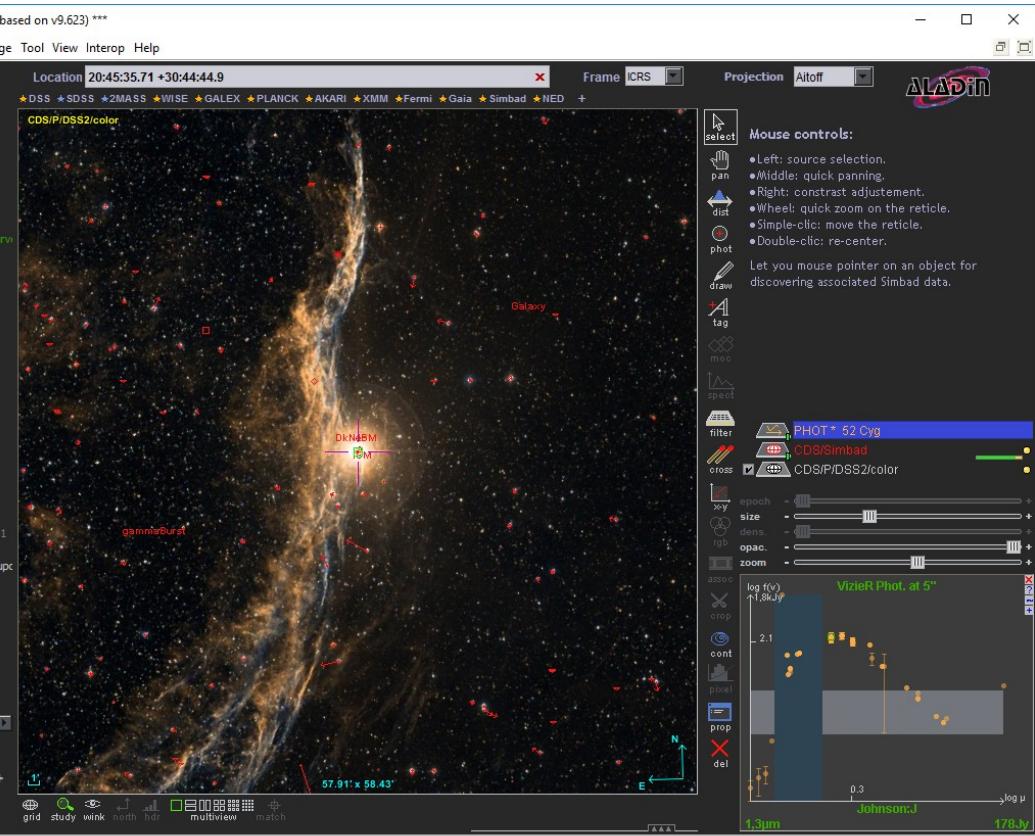
□ Key figures on Aladin Desktop

- 1) **Code:** **5MB jar**, 250k source lines, 500 classes
 - only based on CDS & JDK regular libraries (+ HEALPix lib)
 - 2 main developers (P. Fernique, T. Boch)
 - + dozen of contributors (recently Chaitra)
- 2) **Usage:** **1k sessions per day** for 150k http queries (HiPS tiles queries included)
- 3) **Language:** **85% en**, 10% fr, 2% de, 1% it, 1% es ..
- 4) **Java:** **75% 1.8**, 12% 1.7, 12% 1.6, 0.2% 1.5, ...

Aladin Desktop



Aladin v0 (1999)

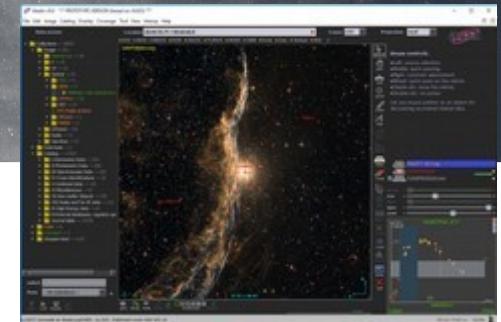


Aladin v10

□ Release v10

1) **Integration++:**

- IVOA protocols: SIAv2, TAP, Datalink/SODA, VO registry (via RegTAP), VOSpace, MOC, HiPS
- CDS advanced services: MocServer, Xmatch, query by MOC



2) **Desktop only**

=> no longer applet support, full screen

3) **New look & feel**

=> modernisation, simplification

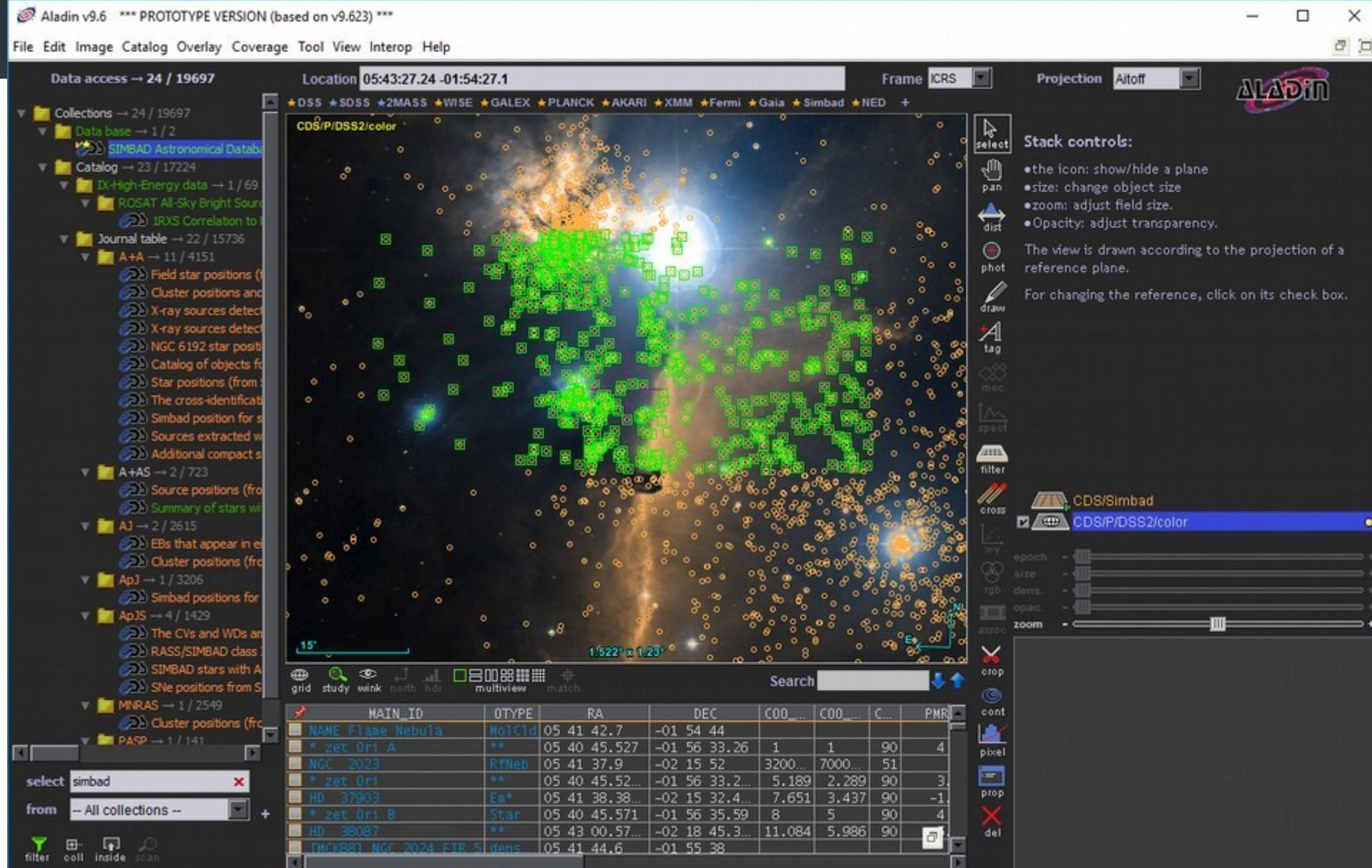


- The plan of the slide demo...

- 1) Load Simbad over DSS HiPS
- 2)**Load the region** (MOC) of the sky both observed by Chandra and XMM
- 3)**Load sources** from ARXA catalog **inside this region**
- 4)**Xmatch these sources** with MORX catalog
- 5)**Browse** XMM,GALEX surveys (HiPS) for each sources
- 6)Query ROSAT GAVO TAP **service** for one of them



Simbad over DSS color HiPS



Data access → 38 / 19697

Location 16:50:20.58 -68:31:35.0

★DSS ★SDSS ★2MASS ★WISE ★GALEX ★PLANCK ★AKARI ★XMM ★
CDS/P/DSS2/color

▼

- ▼ Collections → 38 / 19697
- ▼ Catalog → 38 / 17224
 - ▼ B-External databases, regular
 - AAVSO International Var...
 - The DENIS database (DE...)
 - Catalogue of Stellar Spe...
 - ESO Science Archive Cat...
 - The Washington Visual D...
 - General Catalogue of Vari...
 - Extragalactic Variables...
 - The Suspected Variab...
 - The GCVS Catalog (V...)
 - The PASTEL catalogue (S...
- Log of CFHT Exposures (C...
- CFHT Observations (C...)
- The CFHT Observati...
- HST Archived Exposures C...
- Merged log of HST O...
- HST WFPC2 associat...
- The HST logs observ...
- Asiago Supernova Catal...
- XMM-Newton Observatio...
- The Chandra Archive Log...
- Spectroscopically identif...
- IRAM Observation Logs (IP...
- List of observations ...
- The Plateau de Bure ...
- The Plateau de Bure ...
- Optically visible open dust...
- The Catalogue Data ...
- Removed clusters (V...)
- SB9: 9th Catalogue of St...
- Cataclysmic Binaries, LMXB
- Catalogue of Catacly...
- Catalogue of Low-Mass ...
- Catalogue of Related ...

select

from Log missions

2 data sets selected

 In view

+ Coverages:

 All Union Intersection

CDS/B/xmm/xmmlog, CDS/B/chandra/chandra

Load

Close



Query the region
simultaneously
observed by
Chandra & XMM

5°

23.47° x 24.78°

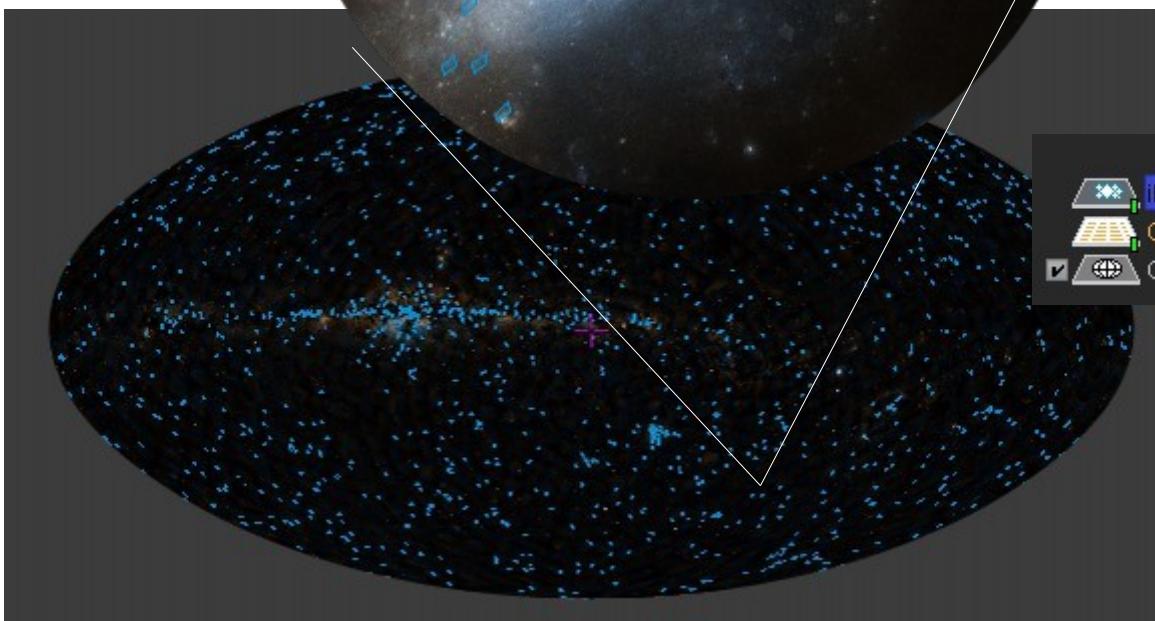
filter soft Inside

and study counts both both

multiview

multi

Chandra and XMM coverage intersection



- iMOCs
- CDS/Simbad
- CDS/P/DSS2/color

Access Data Tree filtering: Catalog only + X regime => query by region

Collection registry filter

Filter name store Delete

Global constraints Catalog constraints HiPS constraints

Keyword 

Data type Catalog Unsuperv... Image Cube
 Data base 

Sky fraction 

Regime Radio millimeter Infrared Optical
 UV EuV X-ray Gamma-ray
 visible 

Bib. year 

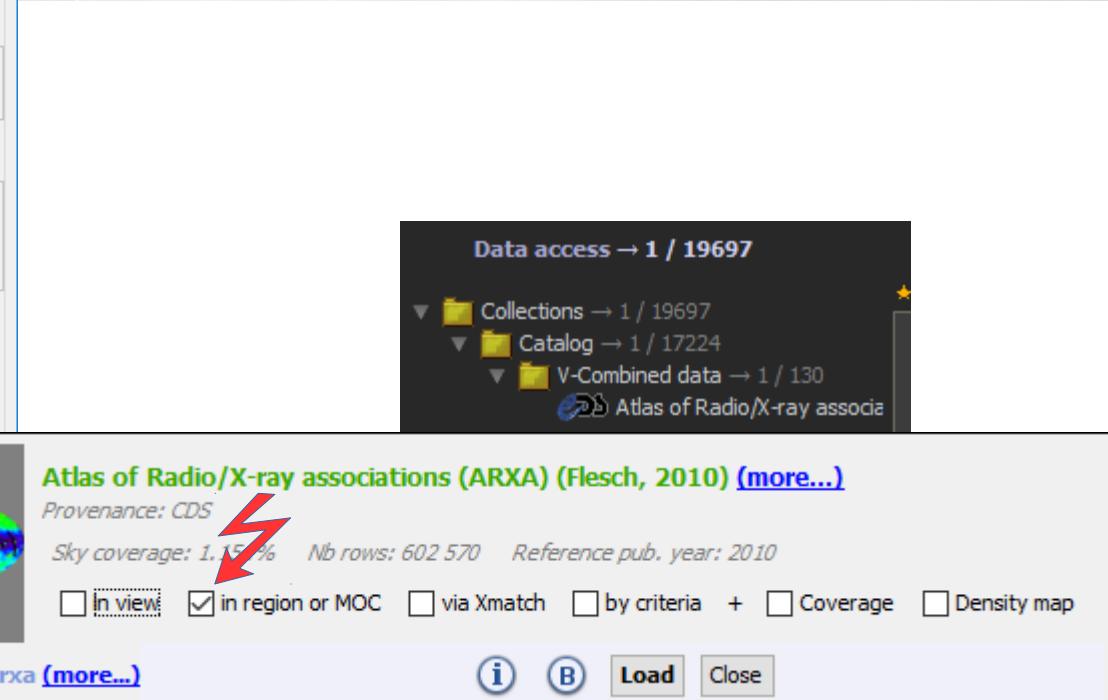
Authority CDS nasa.heas...
 irsa.ipac org.gavo.dc
 ov-gso wfau.roe...
 uk.ac.le... mast.stsci
 svo.cab ia2.inaf.it 

Obs. epoch .. 

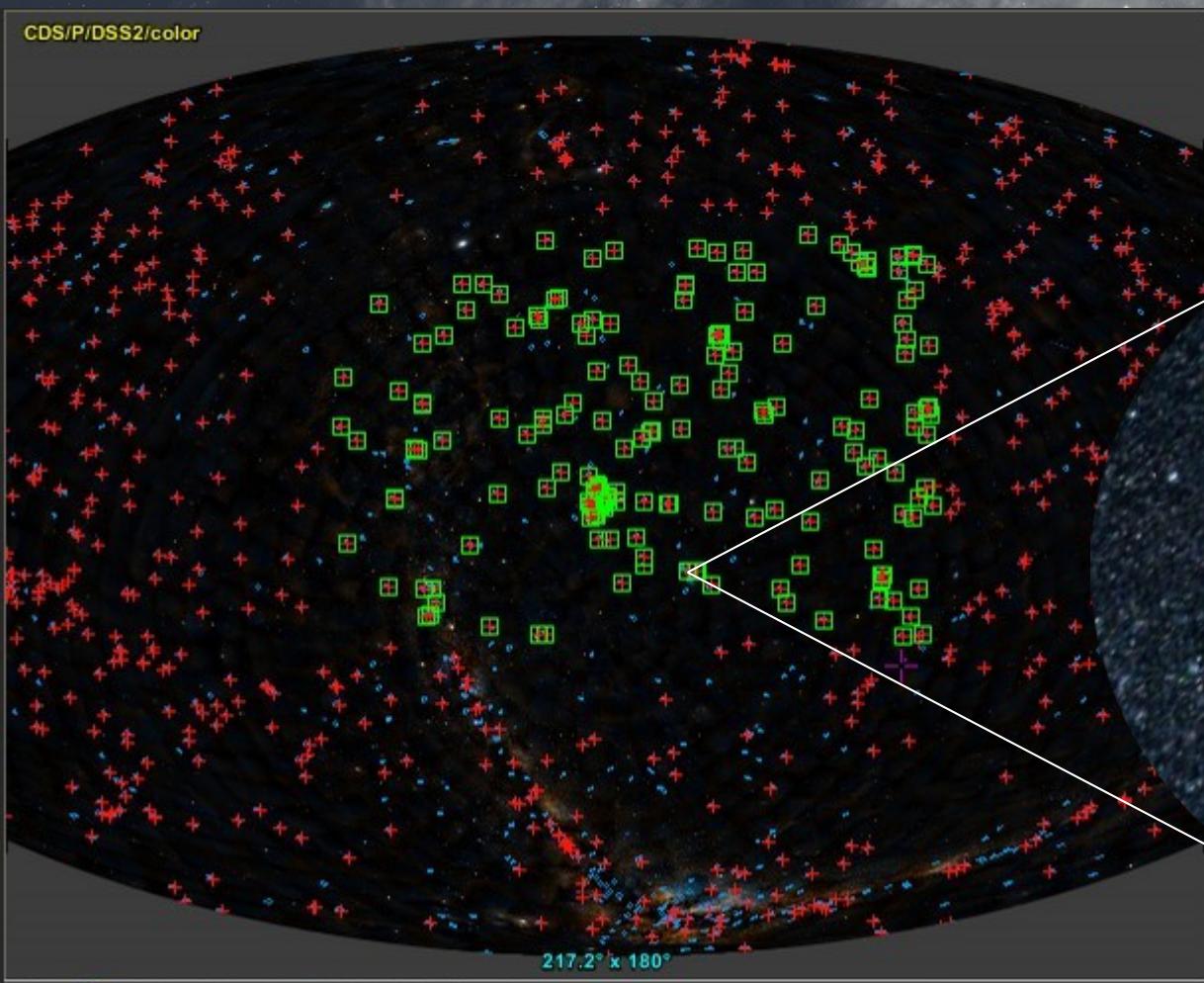
Protocol HIPS SIA SSA
 Cone search Progenitors 

corresponding filter expression
client_category=Catalog* && obs_regime=x-ray

Apply select ARXA
from -- My working list --



CDS/P/DSS2/color



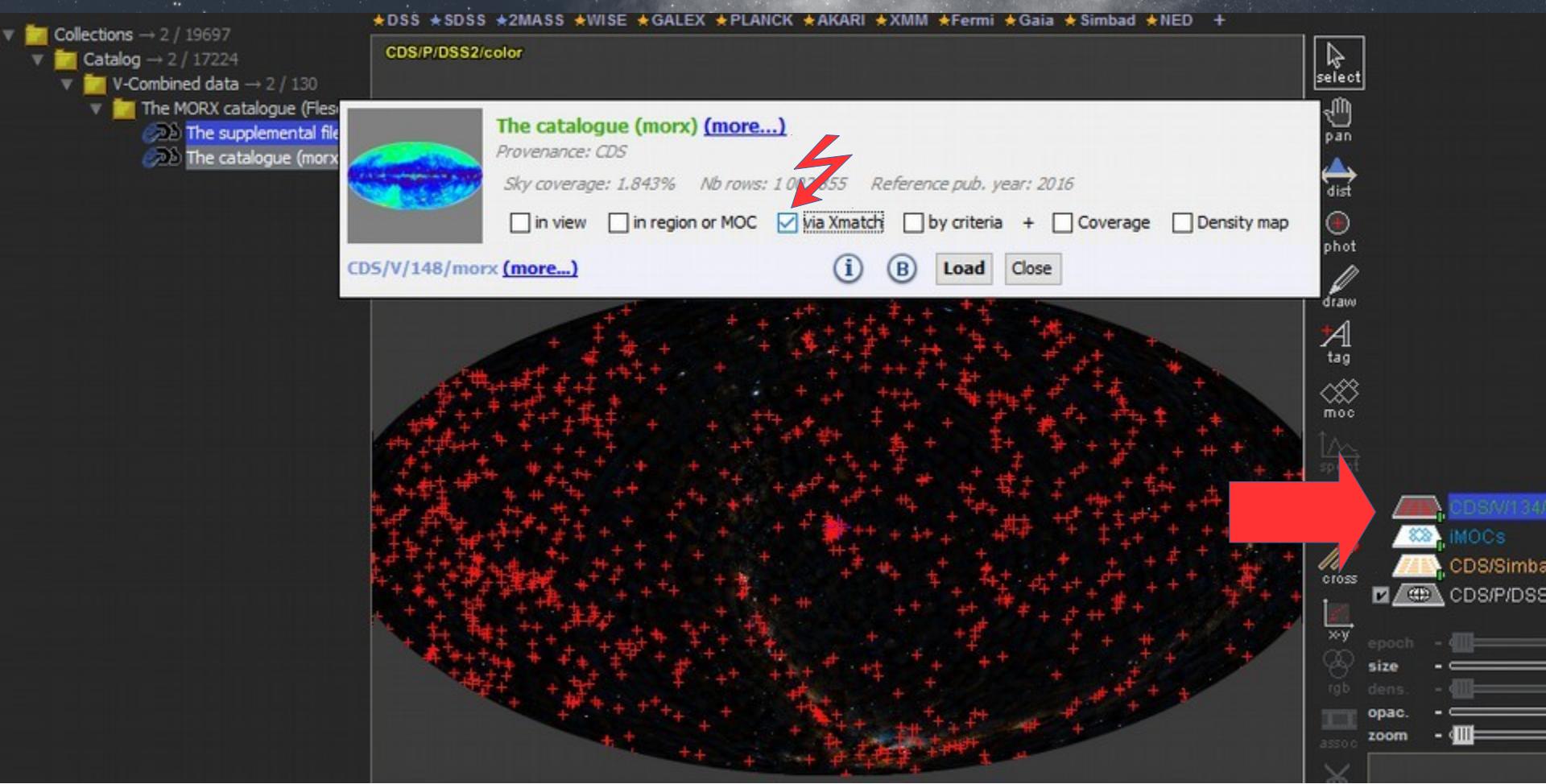
ARXA sources inside
the region

grid study wink north hdr multiview match

Search

RAJ2000	DEJ2000	Name	C1	Rmag	Bmag	z	p...	p...	p...	Q0	Rad	X
23 56 58.6	-34 45 16		X	18.8	20.1	NaN	13	75	1	Q0	Rad	X
23 56 59.2	-34 45 37		X	18.8	19.1	NaN	70	10	1	Q0	Rad	X
23 57 00.0	-34 44 49		X	19	20.3	NaN	45	29	4	Q0	Rad	X
23 57 00.8	-34 45 34	ESO 349-10	GRX	9.2	9.4	0.049	6	87	6	Q0	Rad	X
23 57 02.4	-34 45 21		X	17	18.3	NaN	27	58	0	Q0	Rad	X
23 58 56.8	-55 26 21		X	19.3	21.9	NaN	22	71	1	Q0	Rad	X
23 58 58.9	-55 26 35		X	NaN	22.8	NaN	88	5	1	Q0	Rad	X
23 59 00.1	-55 27 30	NGC 7796	GX	4.1	8.5	0.011	0	10	47	Q0	Rad	X
23 59 07.9	-30 37 40	1H 2351-...	BRX	16.8	17.9	0.165	24	72	0	Q0	Rad	X

Xmatching ARXA sources with MORX catalog



Resulting tables, sorted by magnitude

The screenshot shows a software interface for astronomical data analysis. On the left is a grayscale image of a galaxy with a purple crosshair and green square markers indicating specific regions of interest. Below the image is a table of results, and to the right is a 3D plot.

Table of Results:

RAJ2000	DEJ2000	Name	De...	Rmag	Bmag	Δ...	C...	R	...
51.5833334	-21.3386...	JO32620...	X		6.6	j	x	-	
334.0379...	-36.8437...	IC 5179	GRX	7.1	7.0	j	1	1	
59.904125	-67.6342...	NGC 1511	GRX	0.5	7.6	j	1	1	
198.849875	-16.3855...	NGC 5044	GRX	11.4	7.8	p	1	-	
191.28615	-0.46191	2MRS J12...	G2X		7.9	p	x	-	
182.6358...	39.4058334	NGC 4151	ARX	11.1	8.0	p	n	1	
179.63091	43.94702	2MRS J11...	GRX	11.2	8.0	p	n	1	
335.1861...	-24.6786...	NGC 7252	GRX	8.3	8.1	p	n	1	

Control Panel:

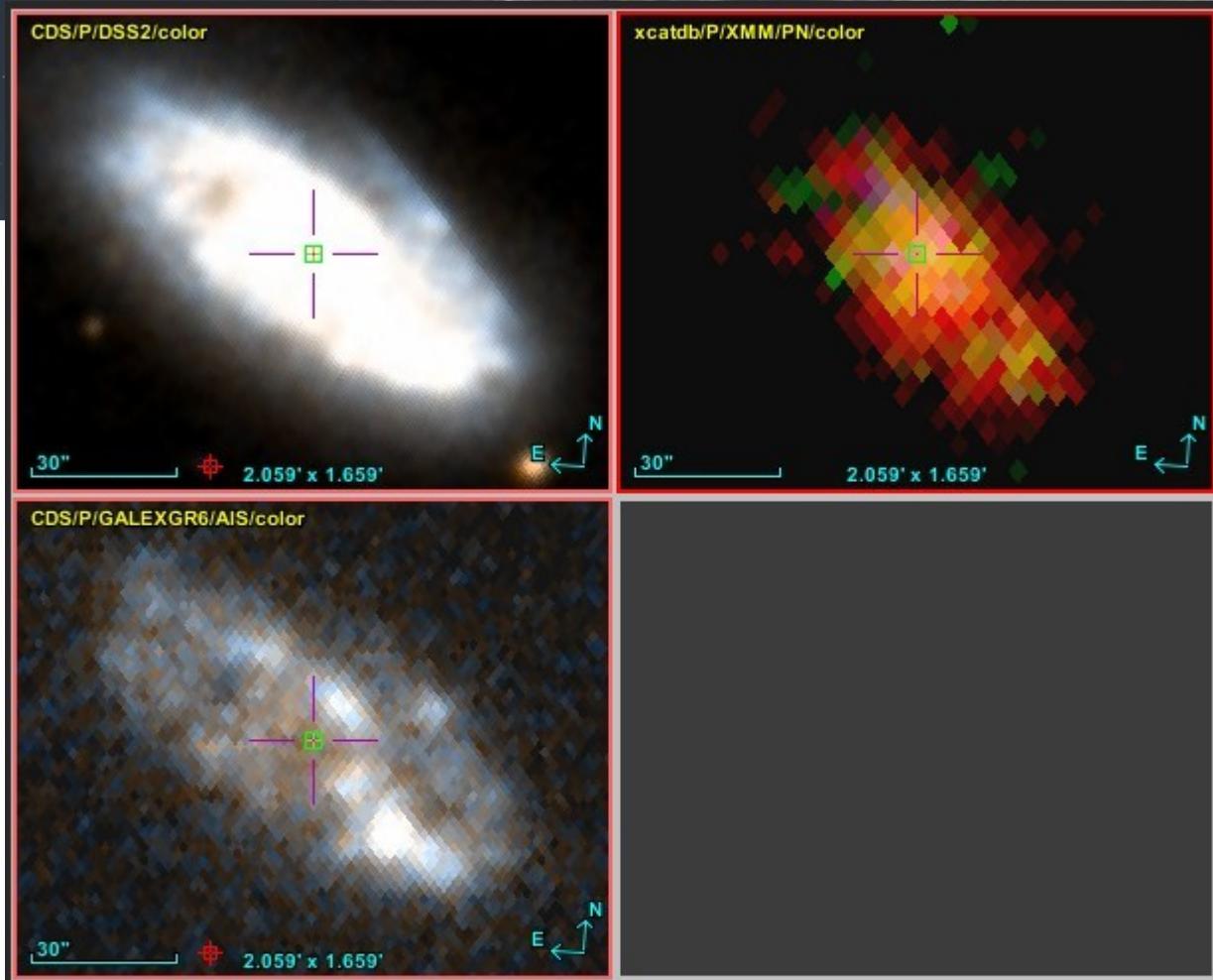
- dist
- phot
- draw
- tag
- moc

Search Bar: Search [yellow button] ↴ ↵

3D Plot: Frame: ICRS
+90
180
-180
-90

Bottom Status: 03:28:19.97 -21:20:18.8
4.117' x 3.325'

Generate X and UV thumbnail images for each source



[View A2] - CDS/P/GALEXGR6/AI: Search

	RAJ2000	DEJ2000	Name	De...	Rmag	Bmag	Δ	C...	R	
grid	51.5833334	-21.3386...	J032620...	X			6.6	j	x	-
study	334.0379...	-36.8437...	IC 5179	GRX	7.1	7.0	j	1	1	
wink	59.904125	-67.6342...	NGC 1511	GRX	0.5	7.6	j	1	1	
north	198.849875	-16.3855...	NGC 5044	GRX	11.4	7.8	p	1	-	
hdr	191.28615	-0.46191	2MRS J12...	G2X		7.9	p	x	-	
multiview	182.6358...	39.4058334	NGC 4151	ARX	11.1	8.0	p	n	1	
match	179.63091	43.94702	2MRS J11...	GRX	11.2	8.0	pm	n	1	
	335.1861...	-24.6786...	NGC 7252	GRX	8.3	8.1	p	n	n	

TAP query on ROSAT image catalog

Available data

- In view
- Out view

Command | 17:03:37.28 +78:43:07.8

DSS | SDSS | 2MASS | WISE | GALEX | PLANCK | AKARI | XMM | Fermi | Gaia | Simbad | NED | +

CDS/P/DSS2/color

Imagine your eye

looking through a stack of planes (below).
 Each plane contains its own data set: image, catalog, graphical overlays...
 You see the combination of them in the main panel.
 For accessing to other data, use the discovery tree in the left panel,
 or click & drag your own local files.

TAP access with org.gavo.dr/rosat/q/im

Mode

Générez, vérifiez et exécutez votre requête.

Table: rosat.images Set ra, dec

Select: Constraints: Add new Max rows:

All
 acref
 owner
 embargo
 mime
 accsize

Target: 21 35 01.83264+41 15 42.9711
 Radius: 69 CIRCLE Add

Ra= 323.75763 Dec= 41.26193 Radius= 1.15

Refresh query Check.. SYNC Async jobs>>

SELECT TOP 10 * FROM rosat.images WHERE CONTAINS(POINT('ICRS',
 centeralpha, centerdelta), CIRCLE('ICRS', 323.75763, 41.26193, 1.15)) = 1

Clear Submit Close

30° 2.92° x 1.863°

images Search

target	mime	accsize	centeralpha	centerdelta	imagefile	instid	dateobs	naxes	pixelsize	pixelscale
image/fits	334774	255.905319	78.718821	ROSAT HRI ROSAT ROSAT HRI - 199c ROSAT HRI	48073.564465	2	512 512	Fov		
application/fits	80326			ROSAT HRI - 199c ROSAT HRI	48073.564465					
image/fits	33431	255.905319	78.718821	ROSAT HRI ROSAT ROSAT HRI	48073.564465	2	512 512	Fov		
application/fits	338001			ROSAT HRI - 199c ROSAT HRI	48073.564465					
application/fits	300023			ROSAT HRI - 199c ROSAT HRI	48076.892294					

grid study wink north hdr multiview match

select

from -- all collections --

coll view scan filter

17:04:47.56 +78:44:10.4
 2.92° x 1.863°

5 sel / 10 src 936Mb

ROSAT image

Available data → 197 / 20647
inview outview

AT/XMM-Newton 13-hr Deep
AT 13-hour Field XMM-Newton
AT PSPC 400 Square Degree
AT Hard-Spectrum X-Ray Sour
AT Observation Log
AT Radio-Loud Quasars Catal
AT Radio-Quiet Quasars Catal
AT XUV Pointed Phase
AT PSPC Catalog of Clusters
AT Results Archive Sources fo
AT Complete Results Archive
AT Archival Data
AT North Ecliptic Pole Survey
AT North Ecliptic Pole Survey
AT Results Archive Sources fo
AT Results Archive Sources fo
AT Complete Results Archive
AT Complete Results Archive
AT Catalog WFC 2RE Sources
AT PSPC Survey of the Small M
AT PSPC Catalog of SMC X-Ra
e Angle ROSAT Pointed Survey
e Angle ROSAT Pointed Survey
AT Archival WFC EUV Data
AT Catalog PSPC WGA Source
→ 9 / 1204
e (by SIA) → 5 / 289
ia.heasarc → 4 / 73
OSAT High Resolution Image P
OSAT All-Sky X-ray Survey Ban
OSAT All-sky X-ray Background
OSAT Wide Field Camera: F
gavo.dc → 1 / 18
OSAT Survey and Pointed Imag
og (by CS) → 2 / 606
gavo.dc → 1 / 39
OSAT All Sky Survey Photon Ev
au.roe.ac.uk → 1 / 49
Rontgen Satellite Archive (ROS
t (by TAP) → 2 / 184
→ 1 / 13
OSAT Data Service
ia.heasarc → 1 / 31
OSAT Proposal Abstracts
Select ROSAT
com - all collections --

Command 20:22:21.48 +59:32:57.8

DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Gaia Simbad NED +

CDS/P/DSS2/color

1°

10.46° x 6.614°

Search

accfid	accref	mtime	accsize	centerAlpha	centerDelta	imageTitle	instid	dateObs	nAxes	pixelSize	pike	FoV
1	http://dc.zah.uu.se	image/fits	79923	308.724326	60.147849	ROSAT PSPCB R0	ROSAT PSPCB	48789.634838	2	512 512	FoV	
2	http://dc.zah.uu.se	image/fits	48577	308.724326	60.147849	ROSAT PSPCB R0	ROSAT PSPCB	48789.634838	2	512 512	FoV	
3	http://dc.zah.uu.se	image/fits	67536	308.724326	60.147849	ROSAT PSPCB R0	ROSAT PSPCB	48789.634838	2	512 512	FoV	
4	http://dc.zah.uu.se	image/fits	165229	308.724326	60.147849	ROSAT PSPCB R0	ROSAT PSPCB	48789.634838	2	512 512	FoV	
5	http://dc.zah.uu.se	image/fits	46684	308.722094	60.148821	ROSAT HRI	ROSAT HRI	49486.406559	2	512 512	FoV	
6	http://dc.zah.uu.se	image/fits	37058	308.712084	60.158819	ROSAT HRI	ROSAT HRI	49942.974504	2	512 512	FoV	
7	http://dc.zah.uu.se	image/fits	26250	308.752095	60.188818	ROSAT HRI	ROSAT HRI	50305.328389	2	512 512	FoV	

7 sel / 177 src 274Mb

Aladin V10 for large projects

- Projects data in HiPS will appear in discovery tree
- You can distribute your own HiPS and keep responsibility
- Query by MOC, CDS x-match available in Aladin
- Services in all kind of VO protocols can be queried from the discovery tree





Aladin Lite

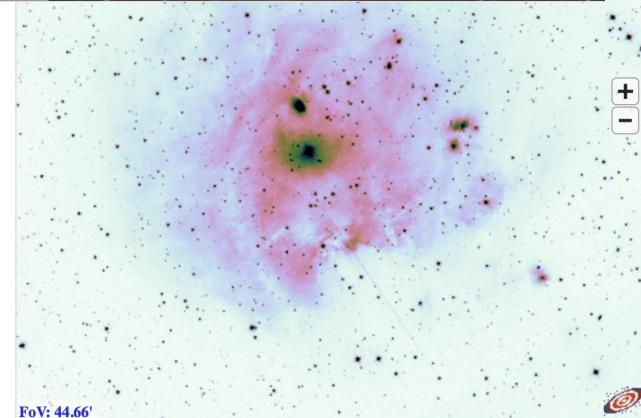
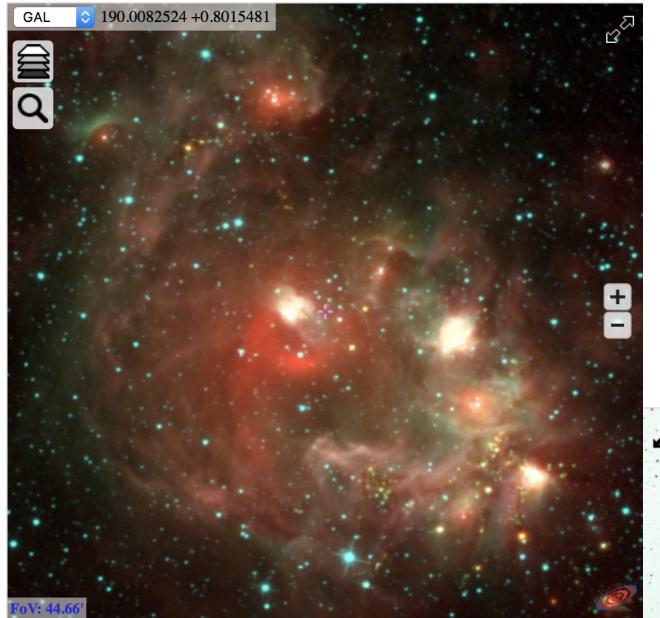
Current status, ongoing developments





Aladin Lite: A HiPS visualizer

- Interactive HiPS visualizer in the browser
- 300+ available HiPS can be visualized in Aladin Lite
- JPG or PNG tiles
FITS tiles not supported (yet?)
- Support for color maps
- No native support for FITS image display
 - FITS file is first converted to HiPS server-side





Easy embedding

Choose options:

Width	600	px
Height	400	px
Image survey	DSS colored	
Initial location	M 81	
Initial FoV	0.3	degrees

Then copy/paste the following code in your page:

```
<!-- include Aladin Lite CSS file in the head section of your page -->
<link rel="stylesheet" href="//aladin.u-strasbg.fr/AladinLite/api/v2/latest/aladin.min.css" />

<!-- you can skip the following line if your page already integrates the jQuery library -->
<script type="text/javascript" src="//code.jquery.com/jquery-1.9.1.min.js" charset="utf-8"></script>

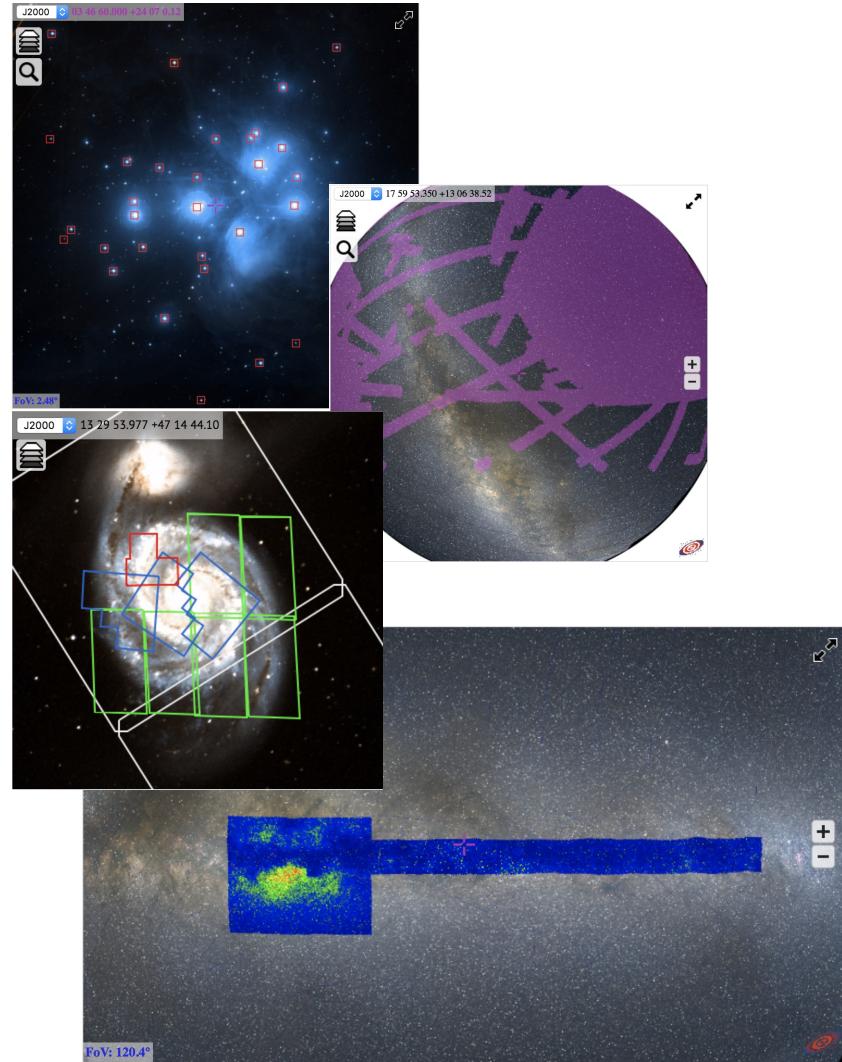
<!-- insert this snippet where you want Aladin Lite viewer to appear and after the loading of jQuery -->
<div id="aladin-lite-div" style="width:600px;height:400px;"></div>
<script type="text/javascript" src="//aladin.u-strasbg.fr/AladinLite/api/v2/latest/aladin.min.js" charset="utf-8"></script>
<script type="text/javascript">
    var aladin = A.aladin('#aladin-lite-div', {survey: "P/DSS2/color", fov:0.3, target: "M 81"});
</script>
```





Overlays: catalogues, footprints

- **Catalogues**
 - From URL
 - Progressive catalogues (HiPS)
 - programmatically
- **MOCs** (coverage maps)
 - From URL
 - From a list of HEALPix pixels
- **Footprints** (polygons and circles)
 - From STC-S description
 - programmatically
- **Image HiPS**
 - Overlay another HiPS on the base layer



□ Javascript API

- API allows to control Aladin Lite and make it a component of a larger application
- <http://aladin.unistra.fr/AladinLite/doc/API/>
Examples of API usage at
<http://aladin.unistra.fr/AladinLite/doc/API/examples/>



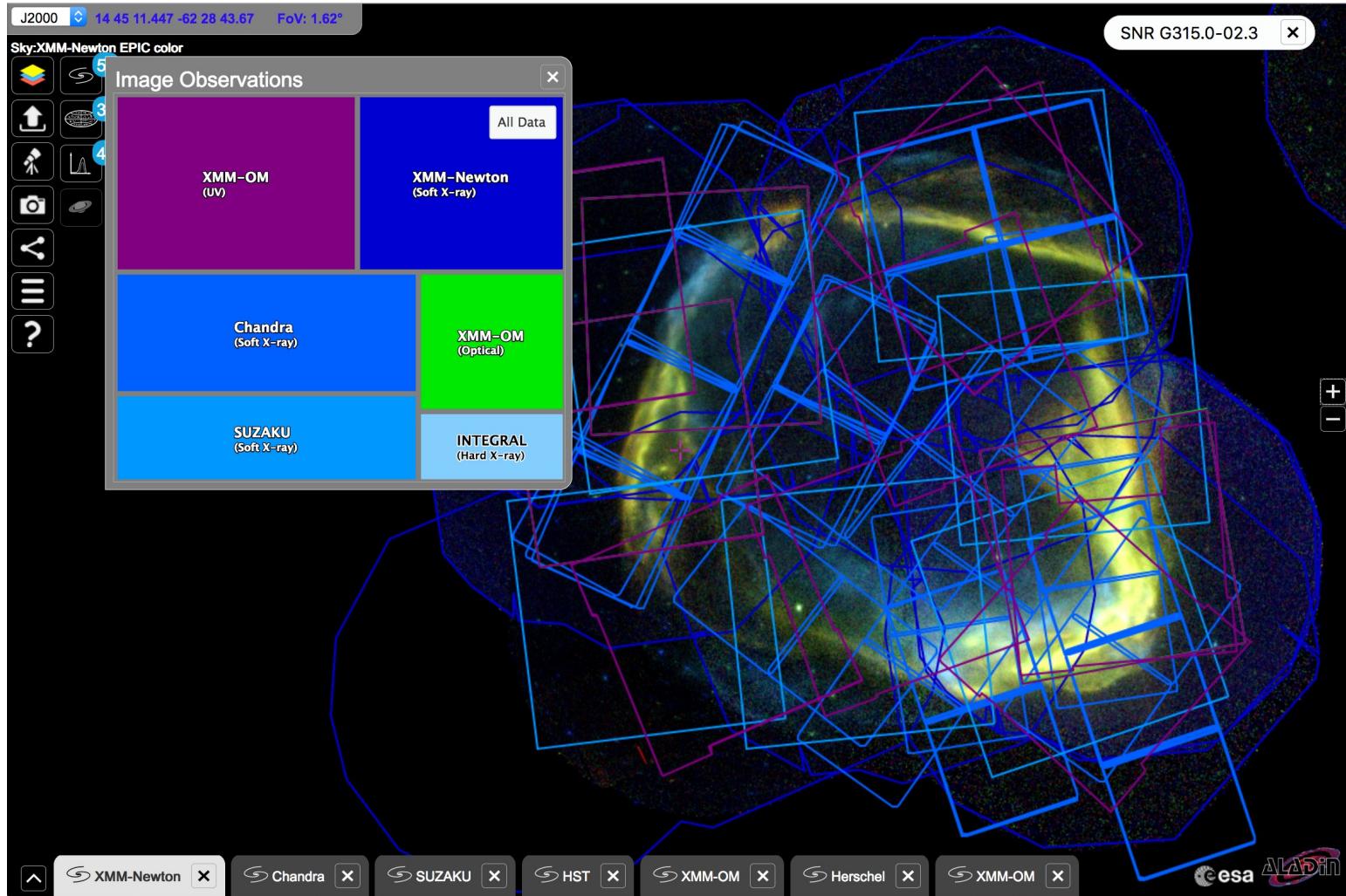
Who uses Aladin Lite?

- (*) [ESASky](#)
- (*) [ESO Phase3 archive search interface](#)
- (*) [Gaia archive visualization interface](#)
- (*) [LIGO Skymap viewer](#)
- (*) [ARChES Walker](#)
- (*) [MOPRA pointing](#)
- (*) [JUDO2](#)
- [Akari explore tool](#)
- [Cassis atlas of Spitzer spectra](#)
- (*) [GLIMPSE 360](#)
- (*) [CADE](#)
- (*) [ADS All Sky Survey](#)
- [Maser DB](#)
- [Webb Deep-Sky Society](#)
- [Galaxy of interactive stars](#)
- (*) [Gamma-Sky](#)
- [eHST](#)
- [DACE](#)
- http://www.tauceti.caltech.edu/kunal/cgi-bin/batch_marshall.py
- [UWISH2](#)
- [Olimpiadi italiane di astronomia](#)
- [ICRAR What's up](#)
- [NOAO Data Labs](#)
- [Planck Legacy archive](#)
- [SkyWatch](#)
- [EXOSS Citizen Science](#)
- [Giraffe archive](#)
- (*) [Astrodeep](#)
- (*) [XMM X-Class](#)
- [Clusterix SVO](#)
- [BlackCAT](#)
- [GALAH](#)
- [XMM Newton at IRAP](#)
- [Subaru Suprime cam](#)
- [Skymapper Skyviewer](#)
- [SETIquest](#)
- [ARI Gaia page](#)
- LEDA : [exemple](#)
- (*) [ALMA Science Archive](#)
- [IRAP RR Lyr Database](#)
- [Gaia Follow-Up Network for Solar System Objects](#)
- [Gaia Alerts](#)





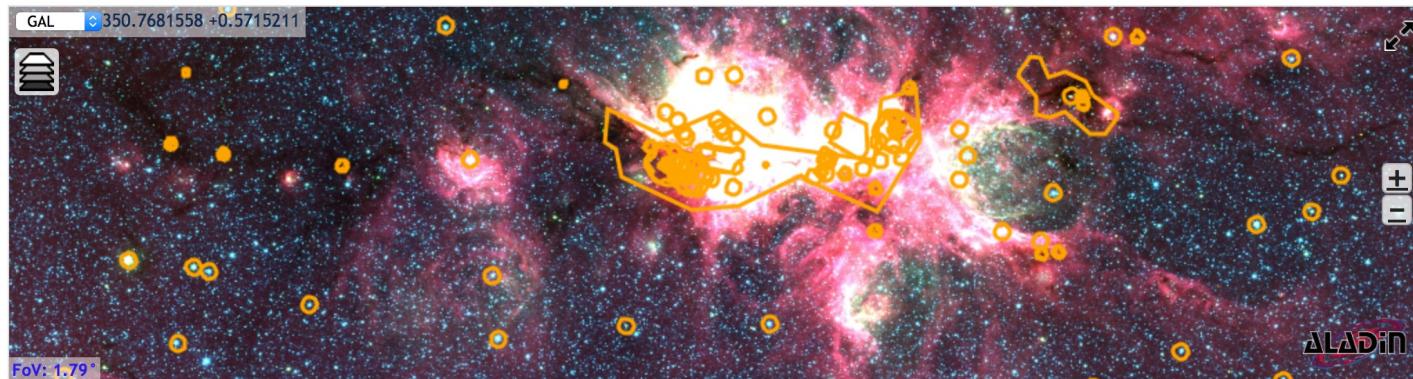
ESA Sky





ALMA

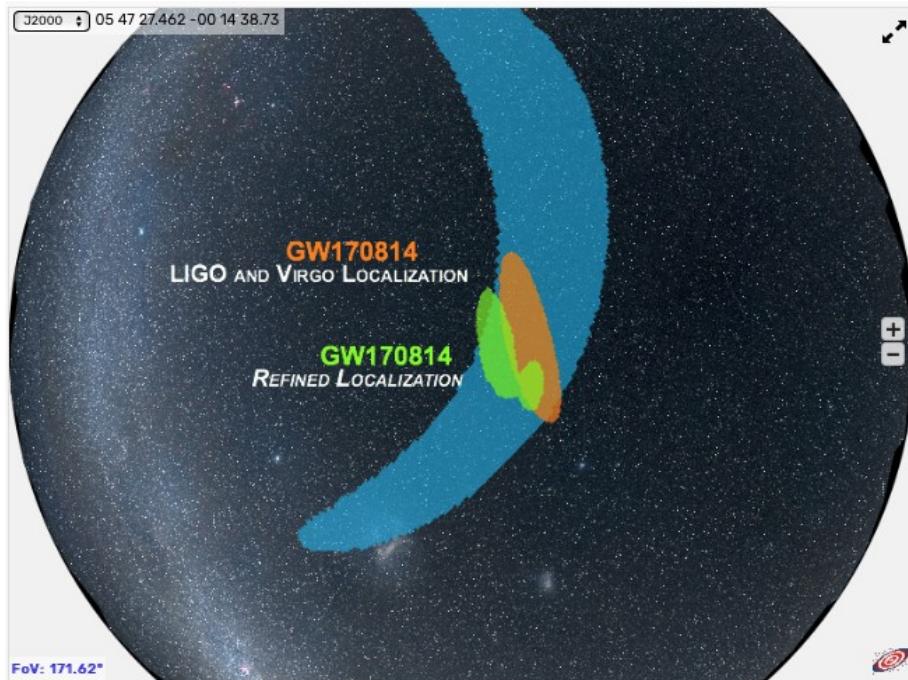
ALMA Science Archive Query

[Query Form](#)[Results Table](#)[Submit download request](#)[Close Viewer](#) [Results Bookmark](#) [Export Table](#) [Results Help](#)

More columns Showing 19687 of 19687 rows.							
	Project code	Source name	RA	Dec	Band	Integration	Release date
Filter:			H:M:S	D:M:S	seconds		
<input type="checkbox"/>	2011.0.00191.S	Fomalhaut b	22:57:38.68	-29:37:12.6	7	8709.120	2012-12-06
<input type="checkbox"/>	2011.0.00101.S	GRB021004	00:26:54.68	+18:55:41.6	7	3749.760	2012-12-06
<input type="checkbox"/>	2011.0.00131.S	R Scl	01:26:58.08	-32:32:36.4	7	738.319	2012-12-06
<input type="checkbox"/>	2011.0.00397.S	J030427.53-310838.3	03:04:27.53	-31:08:38.3	7	90.720	2012-12-20
<input type="checkbox"/>	2011.0.00397.S	J030629.21-335331.5	03:06:29.21	-33:53:31.5	7	90.720	2012-12-20
<input type="checkbox"/>	2011.0.00397.S	J035448.24-330827.2	03:54:48.24	-33:08:27.2	7	90.720	2012-12-20
<input type="checkbox"/>	2011.0.00397.S	J040403.61-243600.1	04:04:03.61	-24:36:00.1	7	90.720	2012-12-20



VIRGO



Using the skymap

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

Detection	Sky localisation	Label	Pop-up info
GW170814 - L1/H1 only	✓	■	■
GW170814 - L1/H1/V1	✓	✓	■
GW170814 - refined skymap	✓	✓	■
GW150914	■	■	■
GW151226	■	■	■
GW170104	■	■	■

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**



Latest developments (available in beta version)

- New listeners available:
 - positionChanged
 - zoomChanged
 - click
 - mouseMove
- Improvements in MOC display performance
- Density maps of all VizieR tables available as HiPS
- *ipyaladin*
 - Jupyter widget for integration of Aladin Lite in Python notebooks

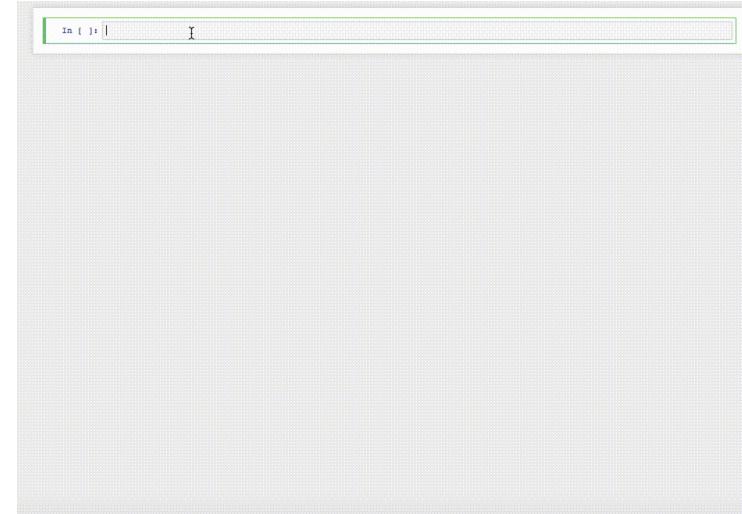


ipyaladin

- **A Jupyter widget for Aladin Lite**
- Features
 - Easy integration of Aladin Lite in Python notebooks
 - Control of field of view (target, zoom level, HiPS to display)
 - Linked views
 - Overlay VOTable, Astropy Tables, MOCs
 - Register callbacks triggered by action in widget view

```
In [4]: import ipyaladin.aladin_widget as ipyal
```

```
In [5]: aladin = ipyal.Aladin(target='orion', fov=4)
```





Ongoing developments (work in progress)

- Mirror management
- HTTPS support
 - Sesame, SIMBAD, HiPS tiles available in HTTPS
 - Still missing: HTTPS access to VizieR catalogues
- Footprints selection (ESASky/ESAC development)
- STC-S parsing improvement
- Mobile devices support (pinch to zoom)
- Source code on *github*
 - In a first time, contribution welcome from *close partners*
 - Currently released under GPL3 license



Aladin Lite for large projects

- As an Implementor :
 - Use Aladin Lite in your service web page in addition to your own functionalities
- As a Developer :
 - Add your own Aladin Lite code to the software to add more integrated functionality,
 - but please keep in touch with Aladin Lite developer (Thomas)

