

# SKA data visualization prototyping using Aladin



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M.Allen, M.Baumann, T.Boch,  
***F.Bonnarel***, C.Bot, P.Fernique



# SKA SRC network prototyping

- SKA SRC network role to produce advanced science data, archive and distribute to the community comes in complement to SKAO observation and data processing.
- Presentations by Yan Grange (2022-10-19 6:30) and Jesus Salgado + Rosie Bolton (2022-10-20 20:30) to know more about SKA, SKAO and SKA SRC network
- Current phase in SKA SRC network is prototyping
- International Agile teams work on science platforms, cloud computing, A&A, etc.
- Orange team works on visualization.



# Orange team : SKA visualization prototyping

- Tools involved in the prototyping :
  - VisiVO : proposed by INAF = Italian SRC
  - CARTA : proposed by South African SRC
  - Yafits (Observatoire de Paris) proposed by French SRC
  - Aladin (Lite + Desktop) proposed by French SRC
- Work started end of may : match the tools to the use cases provided by the science team
  - First demo September 7th (→ this presentation)
  - Workshop planned November 21st



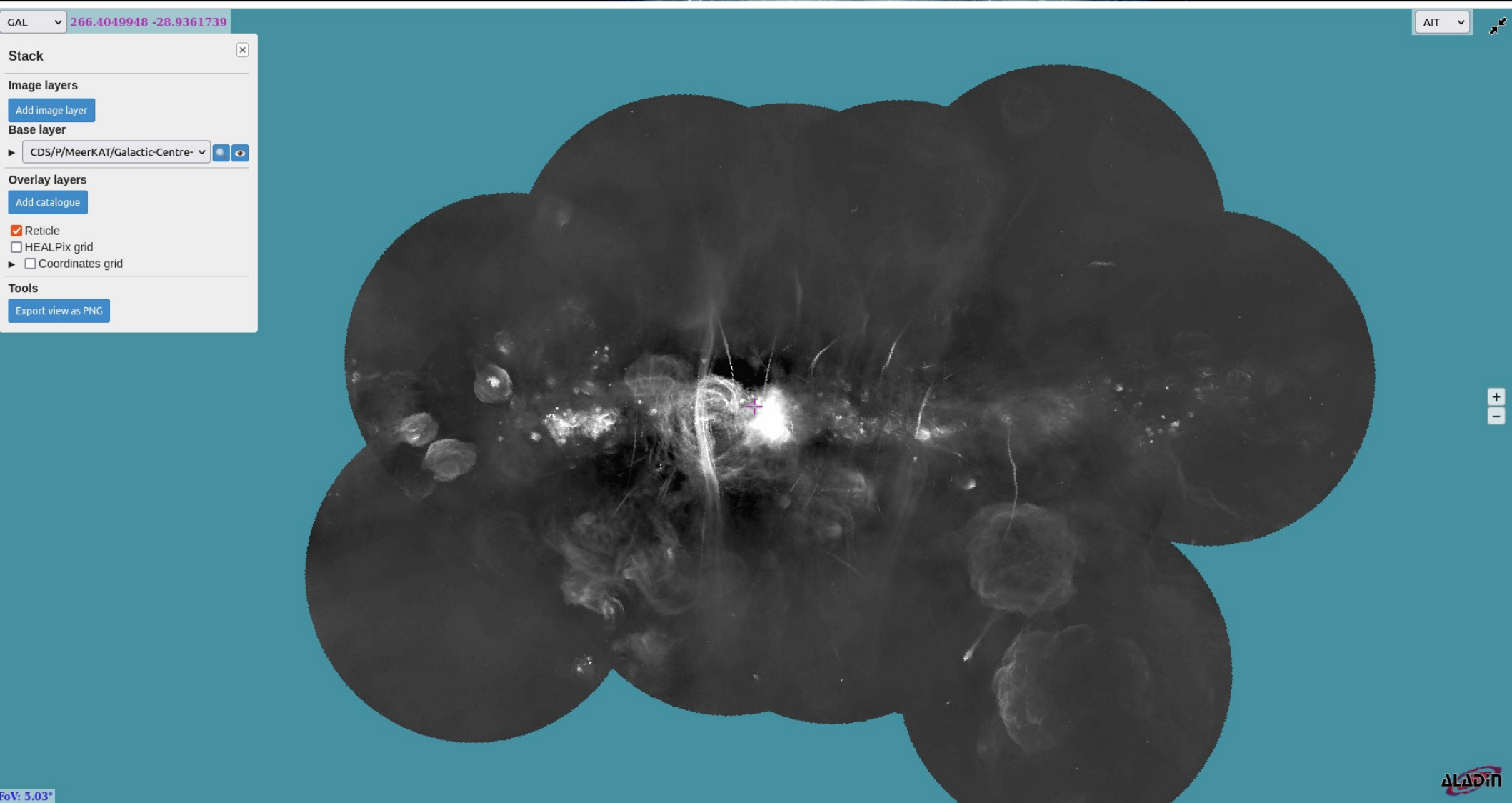
# 2D maps multi-resolution discovery and visualization (continuum, moment 0, velocity maps, etc.)

- For pathfinder data (Meerkat, ASKAP, LOFAR LOTSS ... )
- For simulated data (SDC 1, 2 , 3)
- *Our solutions are based on HiPS format (easy to transform Maps into HiPS*
  - **ADASS talk : 50 years of CDS, 30 years of Aladin project: status and perspectives of the HiPS ecosystem**  
**T.Boch 2022-10-31, 11:45-12:00 (UTC)**
- *The tool here is AladinLite version 3 :*
  - **ADASS talk : Aladin Lite v3 release: Instructions to embed it into your own applications!**  
**M.Baumann 2022-11-04, 16:15-16:30 (UTC)**





# Meerkat galactic center mosaic discovery and multi resolution display



# Meerkat galactic center mosaic changing the color map

Stack

Image layers

Add image layer

Base layer

CDS/P/MeerKAT/Galactic-Centre-

Color map  Color

magma

Reverse

Stretch Linear

Format PNG

Min cut 0

Max cut 255

Opacity

Overlay layers

Add catalogue

Reticule

HEALPix grid

Coordinates grid

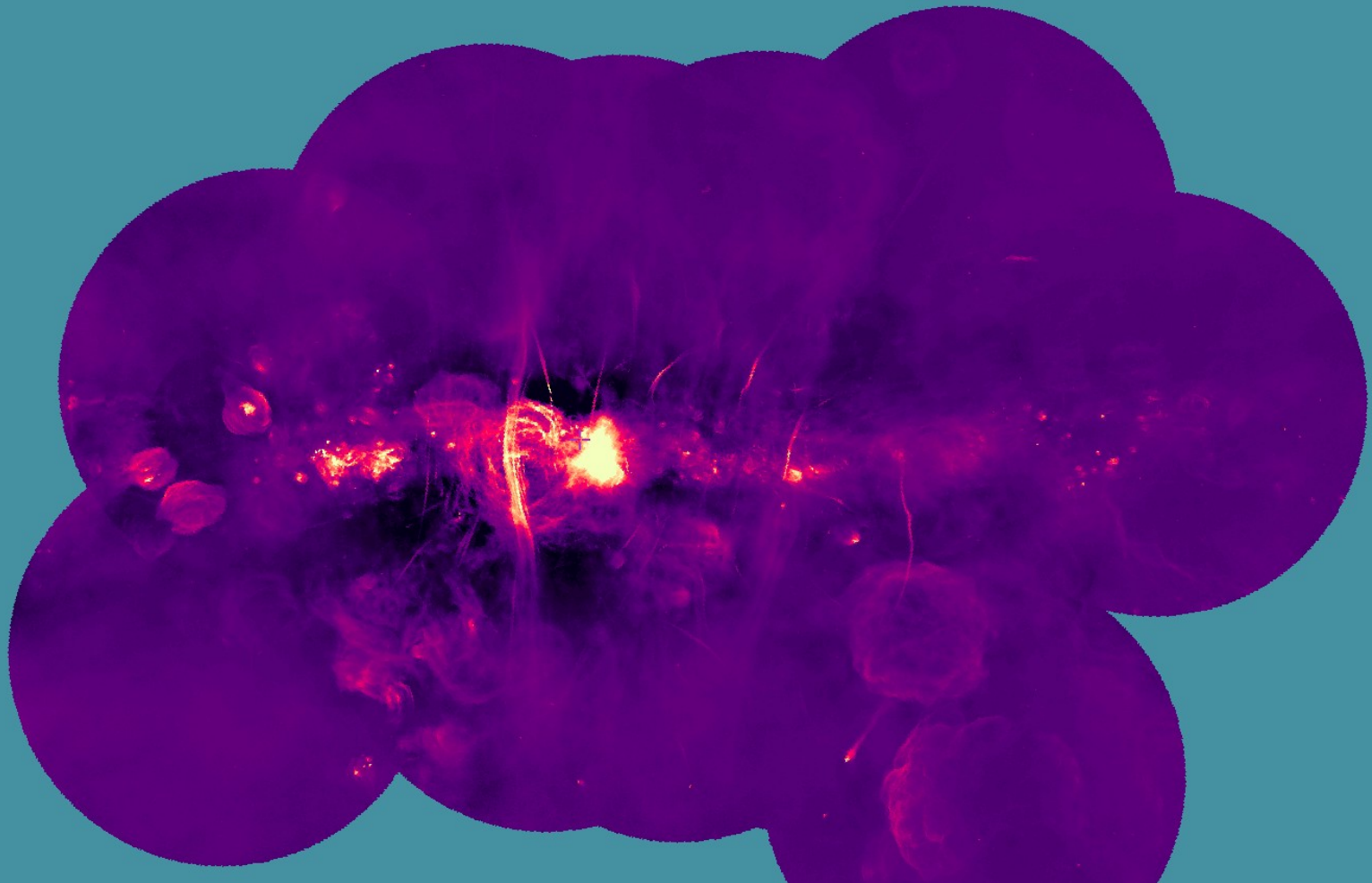
Color

Opacity

Label size

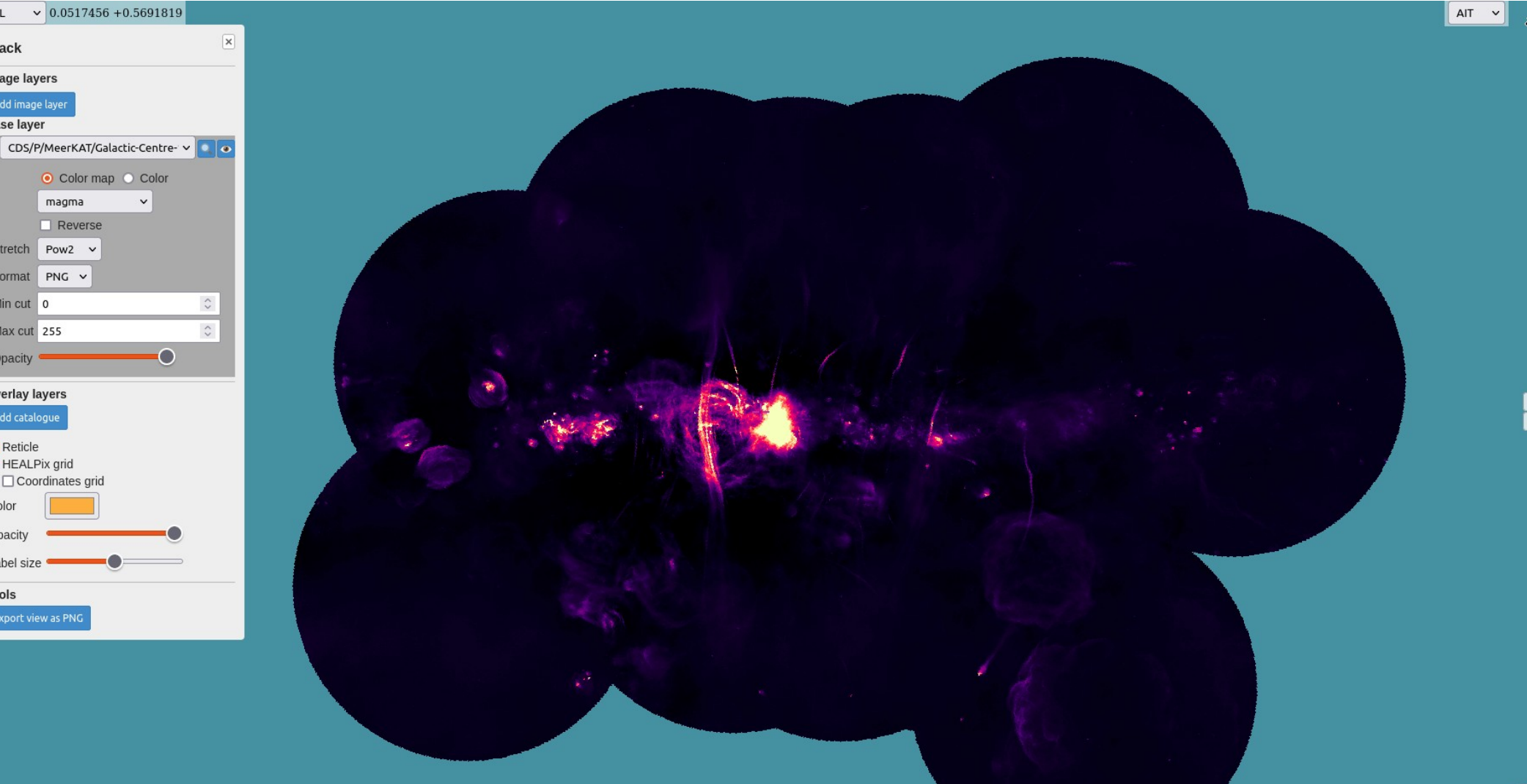
Tools

Export view as PNG





# Meerkat galactic center mosaic changing the lookup table



# Meerkat galactic center mosaic changing the cuts

Stack

Image layers

Add image layer

Base layer

CDS/P/MeerKAT/Galactic-Centre

Color map  Color

magma

Reverse

Stretch Pow2

Format PNG

Min cut 6

Max cut 149

Opacity

Overlay layers

Add catalogue

Reticle

HEALPix grid

Coordinates grid

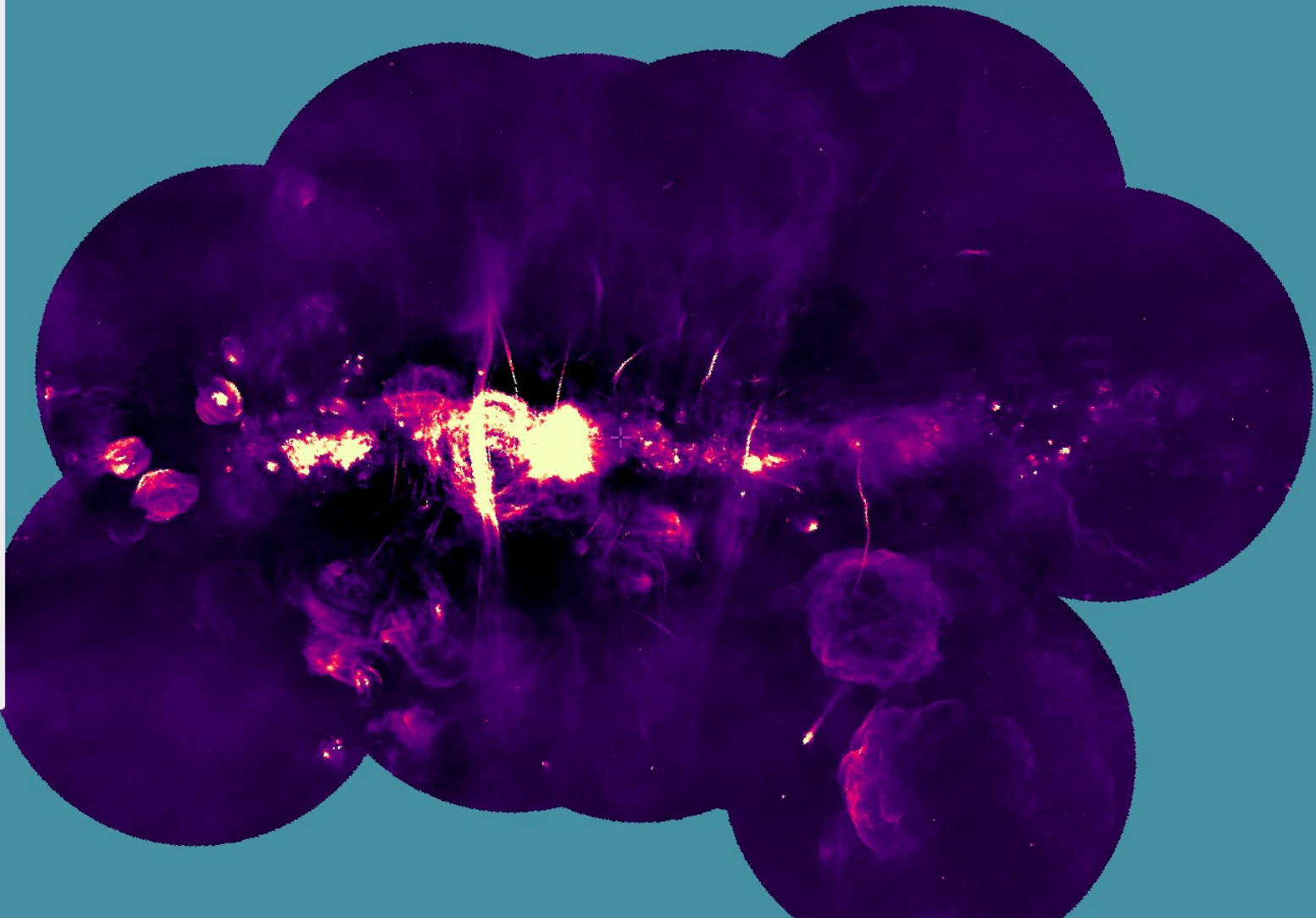
Color

Opacity

Label size

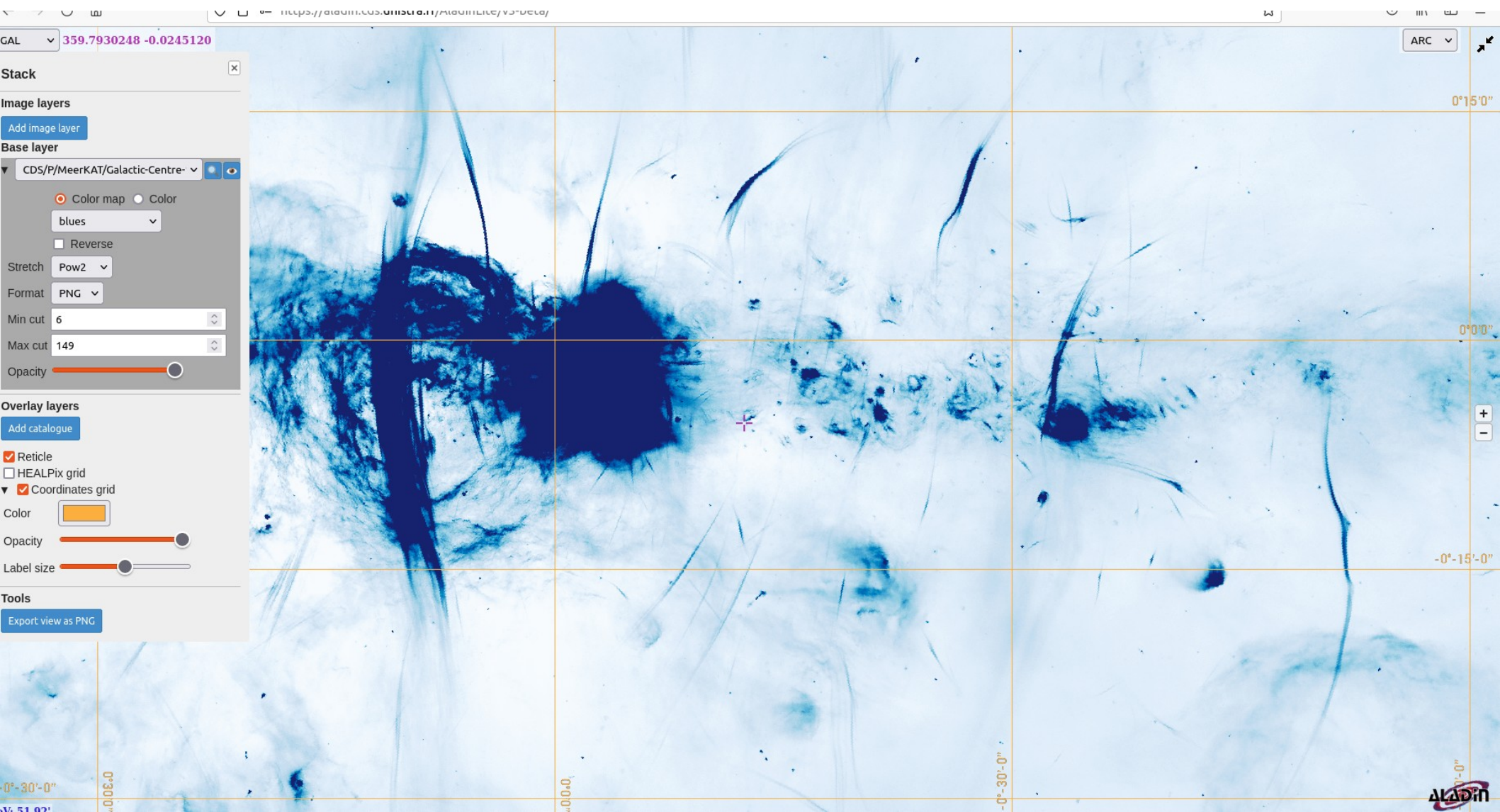
Tools

Export view as PNG





# Meerkat galactic center mosaic changing the projection



# Discovering comparison data, overlaying other images and catalogs,

- We discover other image or catalog HiPS with AladinLite in the same galactic center area
- We overlay these images from other spectral domains on top of Meerkat by transparency
- We overlay catalog sources on top of image and display full catalog content





# Meerkat galactic center mosaic

## Looking for GLIMPSE surveys

The screenshot shows the Aladin Lite web interface at <https://aladin.cds.unistra.fr/AladinLite/v3-beta/>. The interface is divided into a control panel on the left and a main viewing area on the right.

**Control Panel:**

- Stack:** GAL 265.7303302 -29.2378653
- Image layers:** Add image layer
- Overlay layers:** ov-gso/P/GLIMPSE/i
- Base layer:** CDS/P/MeerKAT/Gal
  - Color map:  Color map  Color
  - Stretch: Pow2
  - Format: FITS
  - Min cut: -0.0004
  - Max cut: 0.0004
  - Opacity: [Slider]
- Overlay layers:** Add catalogue
  - Reticle
  - HEALPix grid
- Tools:** Export view as PNG

The main viewing area displays a mosaic of astronomical images of the Galactic Center region, overlaid with a green grid. A central crosshair is visible in the middle of the grid.



# Meerkat galactic center mosaic overlaying GLIMPSE image in transparency

The screenshot displays the Aladin web interface for astronomical data visualization. The main window shows a dark blue galactic center mosaic with a red, semi-transparent GLIMPSE image overlaid. The interface includes a sidebar with the following sections:

- Stack**:
  - Image layers**: Add image layer
  - Overlay layers**:
    - ov-gso/P/GLIMPSE/i (selected)
    - Color map (selected) / Color
    - grayscale (selected)
    - Reverse (unchecked)
    - Stretch: Linear
    - Format: PNG
    - Min cut: 0
    - Max cut: 255
    - Blending mode: Default
    - Opacity: slider
  - Base layer**:
    - CDS/P/MeerKAT/Gal (selected)
    - Color map / Color (selected)
    - Stretch: Pow2
    - Format: FITS
    - Min cut: -0.0004
    - Max cut: 0.0004
    - Opacity: slider
  - Overlay layers**:
    - Add catalogue
    - Reticle (checked)
    - HEALPix grid (unchecked)
  - Tools**:
    - Export view as PNG

# Meerkat galactic center mosaic looking for GLIMPSE catalogs

The screenshot displays the Aladin Lite web interface. The main view shows a mosaic of the galactic center region, overlaid with a grid. A 'Stack' panel on the left shows the current configuration: GAL (266.4150089 -29.0061110), Image layers (Add image layer), Overlay layers (Color map selected), Stretch (Linear), Format (PNG), Min cut (0), Max cut (255), Blending mode (Default), and Opacity. The Base layer is set to CDS/P/MeerKAT/Gal, with Color selected, Stretch (Pow2), Format (FITS), Min cut (-0.0004), Max cut (0.0004), and Opacity. The Overlay layers panel shows 'Add catalogue' and 'Reticle' checked. The Tools panel has 'Export view as PNG'. A 'Select Catalogue' dialog box is open, listing various GLIMPSE-related catalogs. The search criteria are 'By ID, title, keyword' and the search term is 'GLIMPSE'. The first result is highlighted: 'GLIMPSE Source Catalog (I + II + 3D) (IPAC 2008) (glimpse) - CDS/J/A+A/563/A130/table1'. Other results include 'IR-excess sources in GLIMPSE and MSX (Uzpen+, 2007) (glimpse) - CDS/J/ApJ/658/1264/glimpse', 'GLIMPSE/BGPS 6.7GHz methanol maser survey (Sun+, 2014) (table1) - CDS/J/A+A/563/A130/table1', 'New star clusters discovered in the GLIMPSE survey (Mercer+ 2005) (table1) - CDS/J/ApJ/635/560/table1', 'GLIMPSE 6.7GHz methanol masers non-detections (Ellingsen+, 2007) (table3) - CDS/J/MNRAS/377/571/table3', 'JHKs & GLIMPSE photometry towards G305.2+0.2 (Longmore+, 2007) (table1) - CDS/J/MNRAS/380/1497/table1', and 'JHKs and GLIMPSE photometry of G305.2+0.2 (Longmore+, 2007) (table1) - CDS/J/MNRAS/380/1497/table1'.

Stack

Image layers

Add image layer

Overlay layers

Color map Color

Stretch Linear

Format PNG

Min cut 0

Max cut 255

Blending mode Default

Opacity

Base layer

CDS/P/MeerKAT/Gal

Color map Color

Stretch Pow2

Format FITS

Min cut -0.0004

Max cut 0.0004

Opacity

Overlay layers

Add catalogue

Reticle

HEALPix grid

Tools

Export view as PNG

Select Catalogue:

By ID, title, keyword

GLIMPSE

GLIMPSE Source Catalog (I + II + 3D) (IPAC 2008) (glimpse) - CDS/J/A+A/563/A130/table1

IR-excess sources in GLIMPSE and MSX (Uzpen+, 2007) (glimpse) - CDS/J/ApJ/658/1264/glimpse

GLIMPSE/BGPS 6.7GHz methanol maser survey (Sun+, 2014) (table1) - CDS/J/A+A/563/A130/table1

New star clusters discovered in the GLIMPSE survey (Mercer+ 2005) (table1) - CDS/J/ApJ/635/560/table1

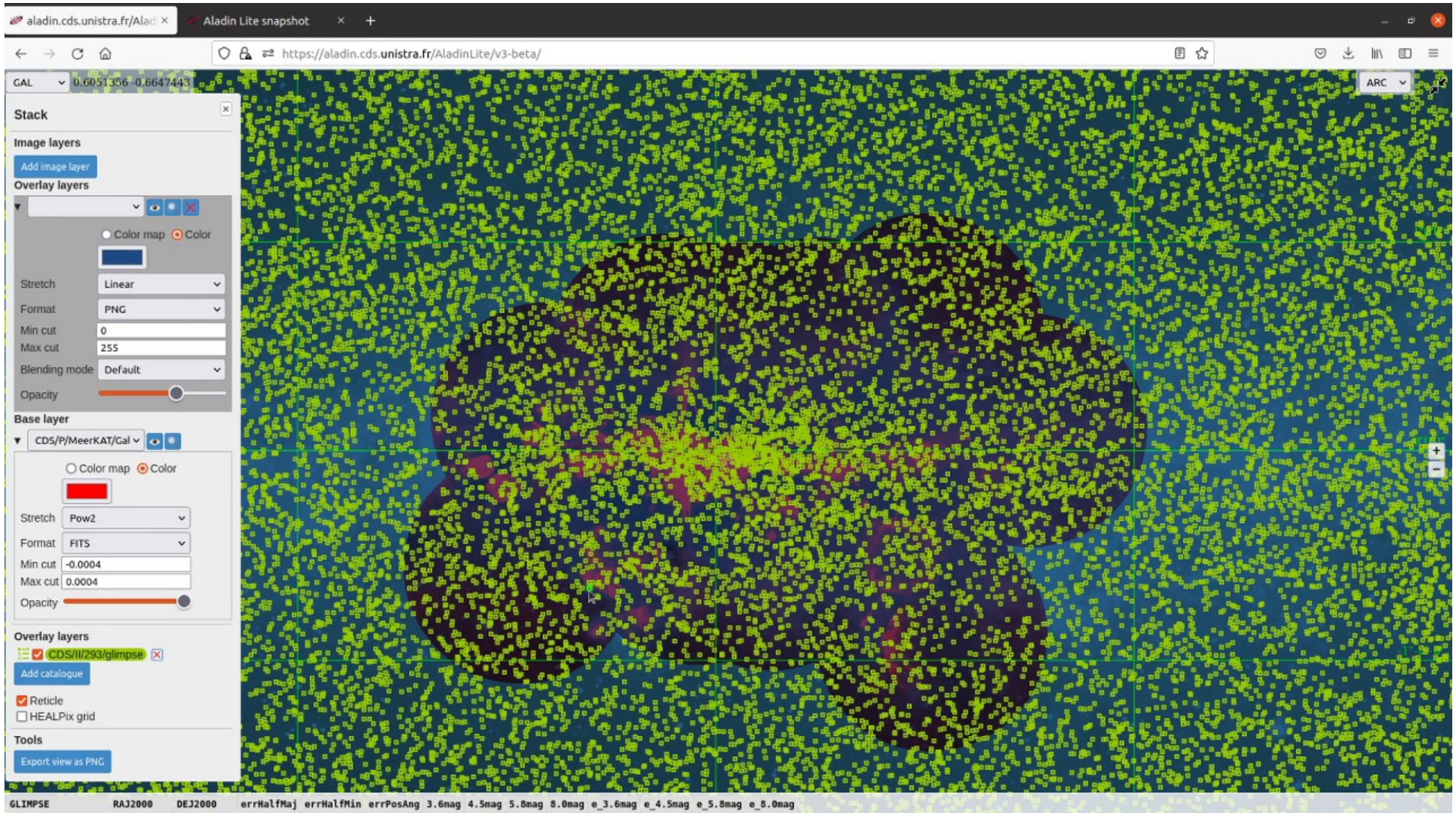
GLIMPSE 6.7GHz methanol masers non-detections (Ellingsen+, 2007) (table3) - CDS/J/MNRAS/377/571/table3

JHKs & GLIMPSE photometry towards G305.2+0.2 (Longmore+, 2007) (table1) - CDS/J/MNRAS/380/1497/table1

JHKs and GLIMPSE photometry of G305.2+0.2 (Longmore+, 2007) (table1) - CDS/J/MNRAS/380/1497/table1



# Meerkat galactic center mosaic overlaying GLIMPSE catalog sources





# Discovering data cubes, extracting spectra from them and analyzing the spectral lines

- We discover spectral datacubes for Apertif with AladinDesktop from Astron VO services
- We download and display one of them in movie mode
- We start the CASSIS spectral analysis plugin tool
- We extract a spectrum and send it to CASSIS
- CASSIS will provide the analysis functionalities
- See ADASS XXXI : « CASSIS and Aladin interfaced for a VO-compliant spectral data cube analysis tool » by

J.M Glorian, P. Fernique, T.Boch, M.Boiziot, F.Bonnarel, C.Bot, S.Bottinelli, E.Caux, A.Coutens, M.Louys, C.Vastel



# Discovering Apertif spectral cubes with Aladin around NGC 5585 from Astron services

Aladin v11.9 \*\*\* BETA VERSION (based on v11.917) \*\*\*

Fichier Edition Image Catalogue Graphique Couverture Outil Vue Interop Aide

Données disponibles → 9 / 29  
Commande 14:20:13.31 +56:47:00.3

Référentiel ICRS Projection Autoff

DSS2 color

Bienvenue sur Aladin, votre atlas professionnel du ciel.

- Accédez à toutes les données astronomiques disponibles sur le net !
- Comparez-les avec vos propres données.
- Préparez vos missions d'observations.

Pour débuter, saisissez un nom d'objet, par exemple M1, puis validez par ENTER...

Ou tout simplement, cliquez dans la fenêtre principale pour explorer le ciel.

41.13' x 21.84'

accrref	r	mime	accsize	centerAlpha...	centerDelta...	imageTitle	instid	dateObs	nAxes	pixelSize
https://vo.astron...	2128688640	image/fits	215.021065568...	56.8411926492...	200110007 AP B	Apertif	58858.2729421...	3	661 661 1218	
https://vo.astron...	2128688640	image/fits	215.021065568...	56.8411926492...	200110007 AP B	Apertif	58858.270416...	3	661 661 1218	
https://vo.astron...	2128688640	image/fits	215.021065568...	56.8411926492...	200110007 AP B	Apertif	58858.27041435...	3	661 661 1218	
https://vo.astron...	2128688640	image/fits	215.021065568...	56.8411926492...	200110007 AP B	Apertif	58858.2704166...	3	661 661 1218	

Chercher

select. apertif  
dans .. toutes les collec...

gnileexam-ligne maj nord bar malvoies unit

14:15:49.03 +56:43:5

2019-09-15 20:00



# Downloading the cube and displaying it in movie mode

Aladin v11.9 \*\*\* BETA VERSION (based on v11.917) \*\*\*

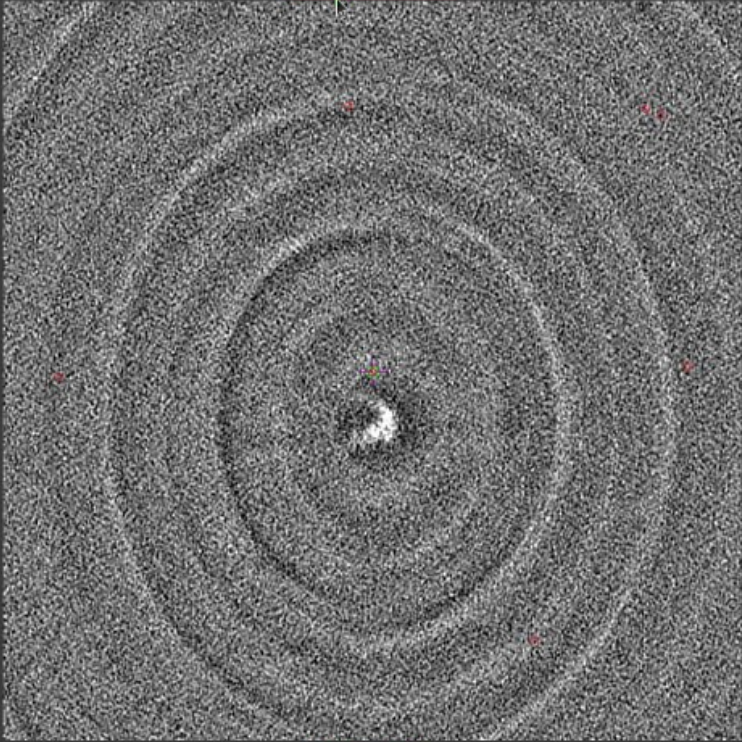
Fichier Edition Image Catalogue Graphique Couverture Outil Vue Interop Aide

Données disponibles → 9 / 29  
● in view ● out view

Commande: 14:20:57.03 +57:23:57.0

Référentiel: ICRS Projection: Atof

1.418E9



30" 2.285" x 1.206"

Blink control: Change the current frame

accrref	r	mime	accsize	centerAlpha...	centerDelta...	imageTitle	instid	dateObs	nAxes	pixelSize
<a href="https://vo.astron...">https://vo.astron...</a>		image/fits	2128688640	215.021085568...	56.8411926492...	200110007 AP B. Apertif		58858.2729421...	3	661 661 1218
<a href="https://vo.astron...">https://vo.astron...</a>		image/fits	2128688640	215.021085568...	56.8411926492...	200110007 AP B. Apertif		58858.2704016...	3	661 661 1218
<a href="https://vo.astron...">https://vo.astron...</a>		image/fits	2128688640	215.021085568...	56.8411926492...	200110007 AP B. Apertif		58858.27041435...	3	661 661 1218
<a href="https://vo.astron...">https://vo.astron...</a>		image/fits	2128688640	215.021085568...	56.8411926492...	200110007 AP B. Apertif		58858.2704166...	3	661 661 1218

sélect. apertif dans -- toutes les collec...

Chercher

Bienvenue sur Aladin, votre atlas professionnel du ciel.

- Accédez à toutes les données astronomiques disponibles sur le net !
- Comparez-les avec vos propres données.
- Préparez vos missions d'observations.

Pour débuter, saisissez un nom d'objet, par exemple M1, puis validez par ENTER...

Ou tout simplement, cliquez dans la fenêtre principale pour explorer le ciel.

select dépli dist phot dessin marq moc spectre filtre corr. zoom assoc coupe cont pixel prop X suppr

https://vo.astron.fr/spectif\_d https://vo.astron.fr GDS/IP/DSS2/col

épo... taille dens. spec. zoom



# Launching the cassis tool

The screenshot shows the Aladin v11.9 software interface. The main window displays a star field with a central bright star. The 'Outil' menu is open, showing various tools. The 'Gestionnaire de Plugins...' option is selected, and a sub-menu is displayed with 'Cassis Spectrum extraction from a cube' highlighted. The interface includes a menu bar (Fichier, Edition, Image, Catalogue, Graphique, Couverture, Outil, Vue, Interop, Aide), a toolbar on the right, and a data table at the bottom.

Aladin v11.9 \*\*\* BETA VERSION (based on v11.917) \*\*\*

Commande: 14:20:05.0557366 +56:50:28.293537

1.419E9

30° 2.285° x 1.206°

accref	r	mime	accsize	centerAlpha...	centerDelta...	imageTitle	instid	dateObs	nAxes	pixelSize
https://vo.astron.nl/aper.tif		image/fits	2128688640	215.021065568...	56.8411926492...	200110007 AP B. Aper.tif		58858.2729421...	3	661 661 1218
https://vo.astron.nl/aper.tif		image/fits	2128688640	215.021065568...	56.8411926492...	200110007 AP B. Aper.tif		58858.2704016...	3	661 661 1218
https://vo.astron.nl/aper.tif		image/fits	2128688640	215.021065568...	56.8411926492...	200110007 AP B. Aper.tif		58858.27041435...	3	661 661 1218
https://vo.astron.nl/aper.tif		image/fits	2128688640	215.021065568...	56.8411926492...	200110007 AP B. Aper.tif		58858.2704166...	3	661 661 1218

Chercher

# Extracting a spectrum and sending to CASSIS

The screenshot displays the Aladin v11.9 software interface, which is a BETA VERSION based on v11.917. The main window shows a spectrum plot with Frequency [GHz] on the x-axis (ranging from 1.415E9 to 1.430E9) and a red line representing the spectrum. A 'Plot Info' dialog box is open, showing 'Spectrum Analysis 1' with a checked box for 'Aladin-Phot 1' and 'In: SKY' and 'vlsr: 0'. The background shows a star field with two circular regions highlighted in red and blue. The interface includes a menu bar (Fichier, Edition, Image, Catalogue, Graphique, Couverture, Outil, Vue, Interop, Aide), a toolbar, and a right-hand panel with various tools and a 'Tips & tricks' section. At the bottom, a table lists data for several sources.

accref	r	mime	accsize	centerAlpha...	centerDelta...	imageTitle	instid	dateObs	nAxes	pixelSize
<a href="https://vo.astron.nl">https://vo.astron.nl</a>	2128688640	image/fits	2128688640	215.021065568...	56.8411926492...	200110007 AP B	Apertif	58858.2728421...	3	661.661.1218
<a href="https://vo.astron.nl">https://vo.astron.nl</a>	2128688640	image/fits	2128688640	215.021065568...	56.8411926492...	200110007 AP B	Apertif	58858.2704016...	3	661.661.1218
<a href="https://vo.astron.nl">https://vo.astron.nl</a>	2128688640	image/fits	2128688640	215.021065568...	56.8411926492...	200110007 AP B	Apertif	58858.27041435...	3	661.661.1218
<a href="https://vo.astron.nl">https://vo.astron.nl</a>	2128688640	image/fits	2128688640	215.021065568...	56.8411926492...	200110007 AP B	Apertif	58858.2704166...	3	661.661.1218

Additional information from the interface:

- Commande: 161617.65 +57:1143.5
- ALADIN CASSIS PLUGIN 6.2.0.0 - 2021-10-21 10:02
- Plot Info: Spectrum Analysis 1, Aladin-Phot 1, In: SKY, vlsr: 0
- Search Range: 2207E9 to 8047E7
- Table columns: accref, r, mime, accsize, centerAlpha..., centerDelta..., imageTitle, instid, dateObs, nAxes, pixelSize
- Table values: 2128688640, 215.021065568..., 56.8411926492..., 200110007 AP B, Apertif, 58858.2728421..., 3, 661.661.1218



# Work in progress/experimental : Prototyping new features of HiPS 3D using AladinLite as interface

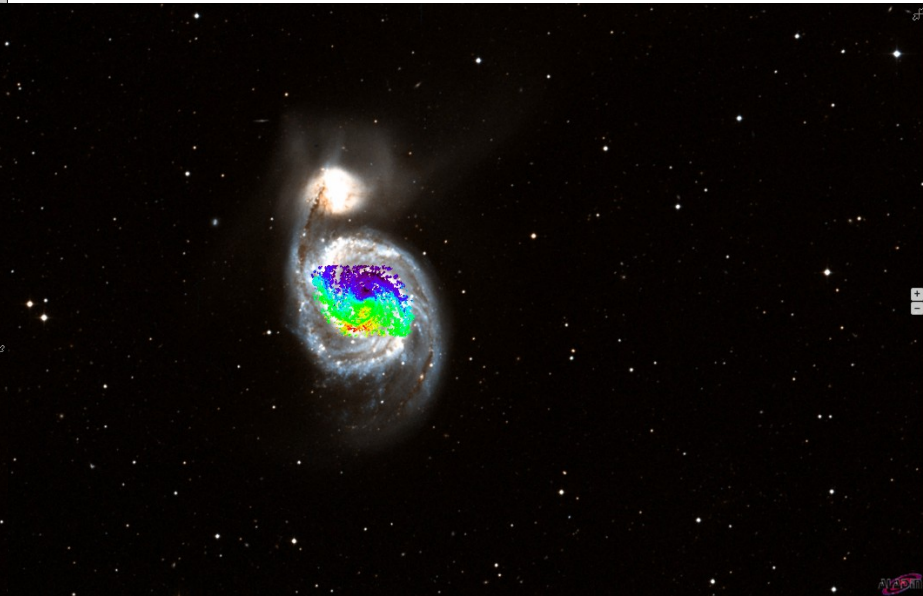
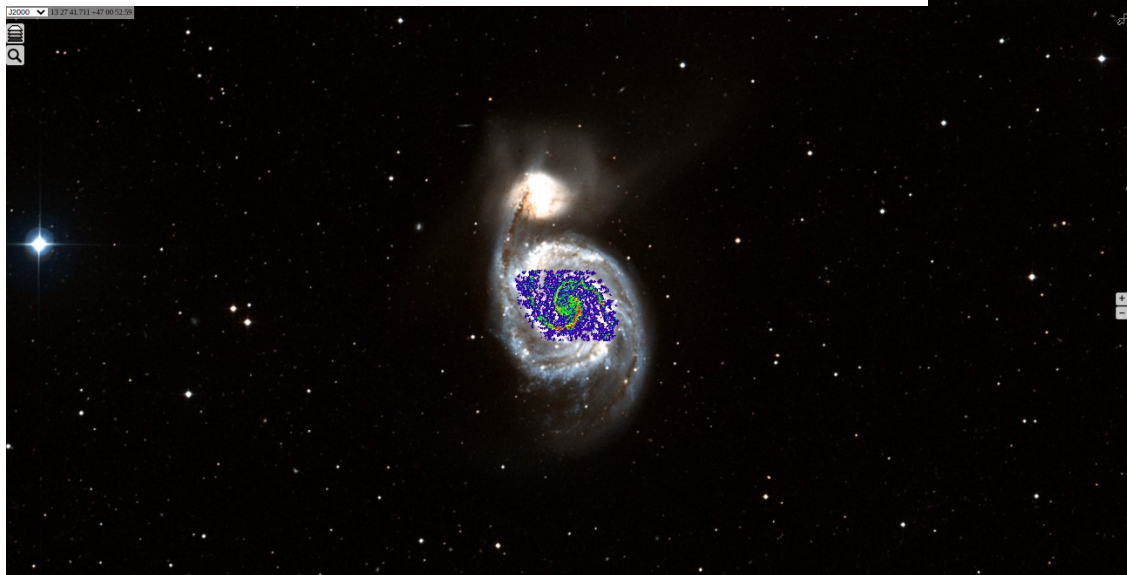
- AladinLite discovers Cube HiPS and displays moment maps provided by experimental HiPS server (on IRAM spectral cubes)
- AladinLite requests to « experimental HiPS server » spectra extracted from SDC2 HiPS cubes
- Extracted spectra displayed and sent to other tools by SAMP (here to CASSIS)



# Moment maps (0, 1, 2) for IRAM HiPS cubes displayed with Aladin Lite



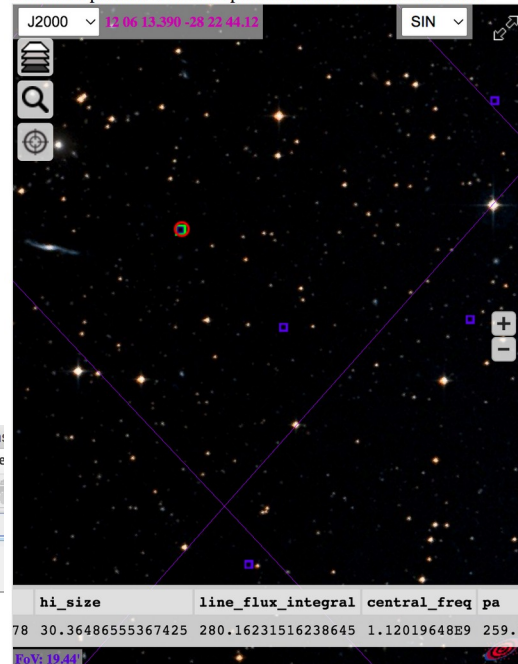
Ca





# Extracting spectra from Cube HiPS server (experimental) for SDC2 spectral cube and send to other tools using SAMP

Click on a position to extract spectrum from SKA DC2 HiPS cube



Spectrum at 181.60354360919192 -28.3257982414846  
[Download as CSV](#) [Download as VOTable](#) [Send to SAMP applications](#)

