ARTEMIX

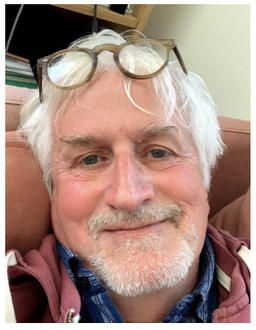
ALMA Archive Data Mining Experiment

YAFITS

Distributed Quick Look Viewer

e-Tools for Radio-astronomy






N. Moreau, Y-A Ba, M. Caillat, P. Salomé

LERMA, Observatoire de Paris

ASOV - April 2021

Outline

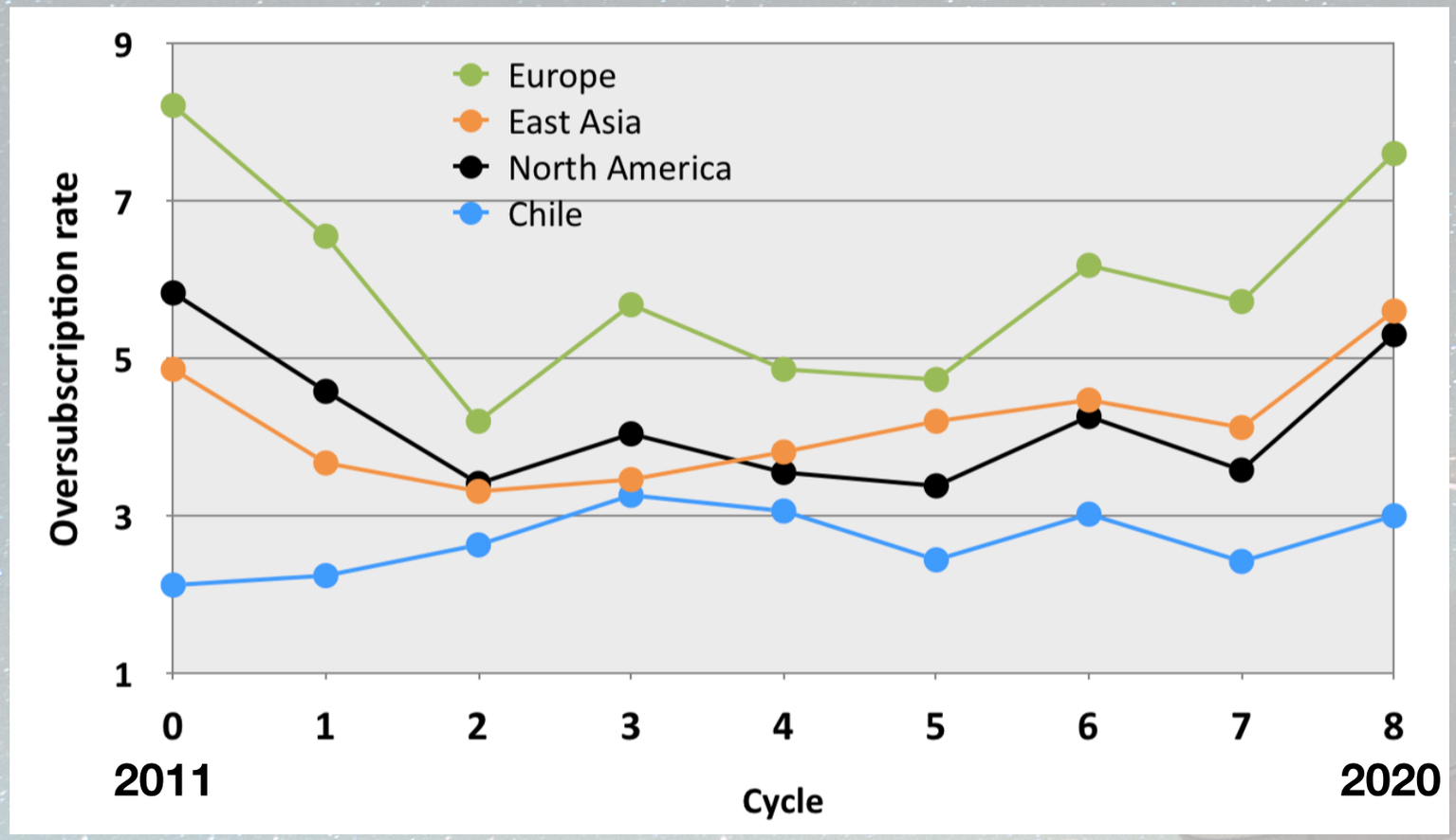
- An experiment for **data mining** the ALMA science Archive

  ➡ **ARTEMIX** : a **service to search and display** ALMA data (on-line since 2018)

- A standalone **Viewer inside web-browser**

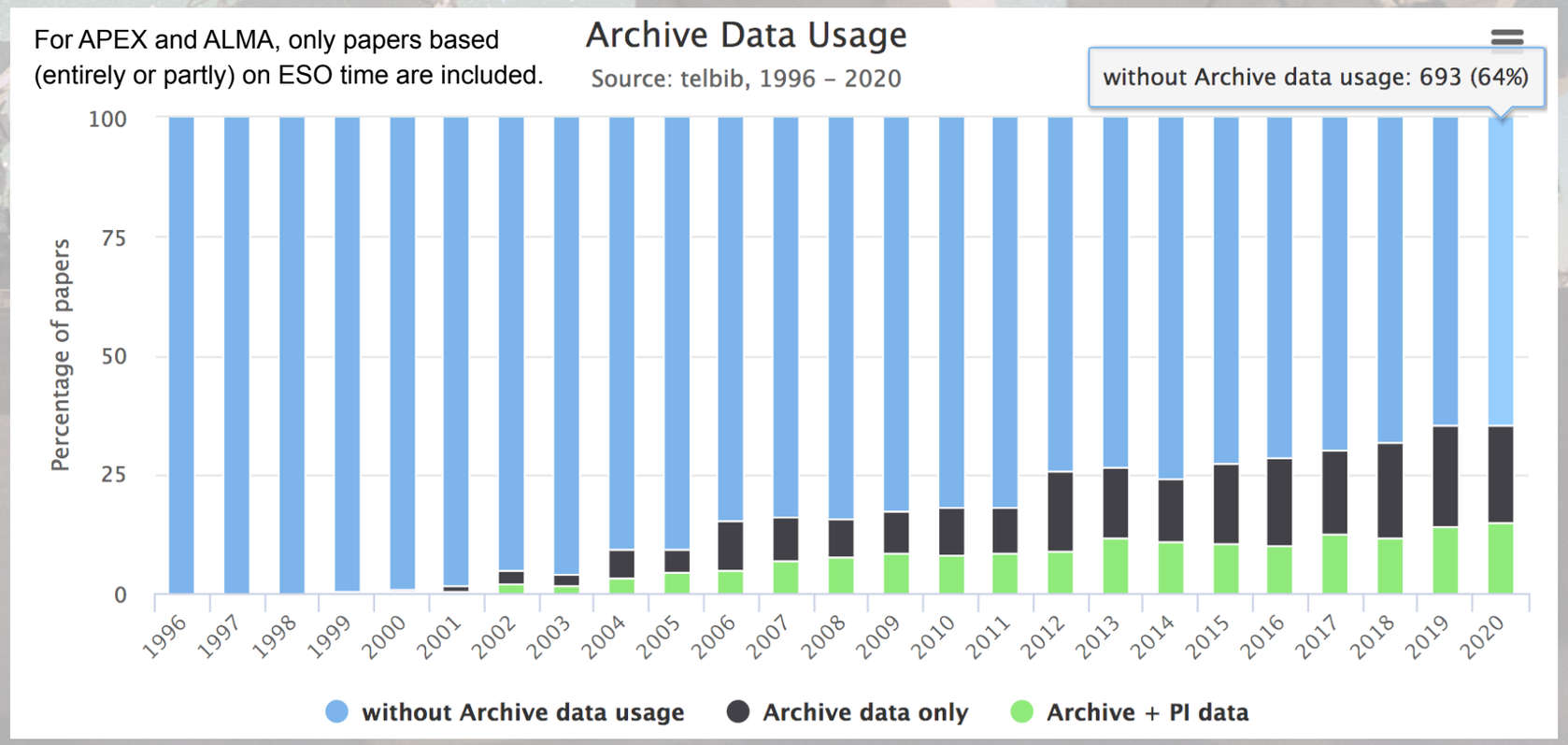
  ➡ **YAFITS** : a **distributed Quick-Look** FITS Viewer (sitting on the data / no-install for the user)

https://almascience.eso.org/news/cycle-8-2021-proposal-submission-statistics



https://www.eso.org/sci/php/libraries/telbibstats/archive.php

For APEX and ALMA, only papers based (entirely or partly) on ESO time are included.



ARTEMIX

Service

Remote visualisation of ALMA science Archive

ADASS 2017 (Trieste)

Astronomical Data Analysis Software and Systems XXVI
ASP Conference Series, Vol. 521
Marco Molinaro, Keith Shortridge, and Fabio Pasian, eds.

ARTEMIX - Alma RemoTE MIning eXperiment

Philippe Salome,[1] Nodar Kasradze,[1] and Michel Caillat[1]

[1]*LERMA, Observatoire de Paris, France,* philippe.salome@obspm.fr

Abstract. Even if not yet in full operation mode, the ALMA observatory has already delivered huge amounts of data. Those data are accessible to download via the ALMA science archive portal from their parent project id. We present here ARTEMIX (Alma RemoTE MIning eXperiment), a development from the Paris Observatory that aims at exploring new tools for metadata and datacube remote visualisation. ARTEMIX does not reprocess the calibrated data. It is thought as a collection of display facilities which aim is to ease the definition of trans-project subsamples. Future developments, like automated subsample selection via higher-level data analysis are possible, but require the access to fully imaged data-cubes that are not provided yet.

YAFITS

Tool

Standalone Quick Look Viewer

ADASS 2019 (Leiden)

Astronomical Data Analysis Software and Systems XXVIII
ASP Conference Series, Vol. 523
P.J. Teuben, M.W. Pound, B.A. Thomas, and E.M. Warner, eds.

ARTEMIX and YAFITS : Remote Viewer Experiments

P. Salomé,[1] M. Caillat,[1] N. Moreau,[1] and Y.–A. Ba[1]

[1]*LERMA, Observatoire de Paris, F-75014 Paris, France;*
philppe.salome@obspm.fr

Abstract. ARTEMIX[1] — The access to astronomical data has never been so simple for our community. From a technical side, it is however more and more difficult. The size and the number of the current and future data-sets raise the question of the best way for astronomers to visualise and to analyse archived observations. The increasing speed of network communications and the much powerful computing capacities of dedicated servers as compared to personal machines naturally question the choice of centralised data-center with remote (client-server) tools versus individual and local softwares. The advent of cloud-based services has already taken over for editing (i.e. overleaf, sharelatex[2]...) or scripting (jupyter-notebooks[3]). We present here ARTEMIX: an experiment of a service based on the World Wide Web to explore the ALMA scientific data products (cubes in FITS-format): select a data-set, visualize its content and perform some fundamental measurements. We also introduce YAFITS : its standalone and generalised version, running inside Docker[4]. The strength of these tools is to let the user directly manipulate and display on-line the FITS content without any local resource, other than a simple browser (no download, no local software).

ARTEMIX

YAFITS

Service

Tool

Rem
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Viewer

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Astronomical Data An
ASP Conference Series,
Marco Molinaro, Keith
© 2019 Astronomical So

ARTEMI

Philippe Sal

[1]*LERMA, Ob*

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xperiments

1

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Astronomy. Software. Systems.

ADASS XXXI

24 – 28 October 2021

Cape Town, South Africa and Online

PDF video 5 Yafits - A remote 2D/3D radio-data explorer - new features

ARTEMIX

ALMA RemoTE MIning eXperiment

Goals

(i) Search by products not by instrumental configuration

(ii) Provide trans-project queries (ie famous sources)

(iii) Have a rapid idea of the data content (fits files)

Means

(i) ALMA observing configuration previews (meta-data)

(ii) ALMA cube previews (science products QA2)

1- Artemix

Sesame-resolver

Search by M83 Search or by right ascensio declination Searc with a radius of 1 arcsec × or by alma-name Search or by project code Search

Redshift 513

Spectroscopic data source : Local JPL CDMS

Line intensity -1

Energy up max (cm-1) Disabled for Local data

Search

From number ... to number ... atoms in molecule

Species

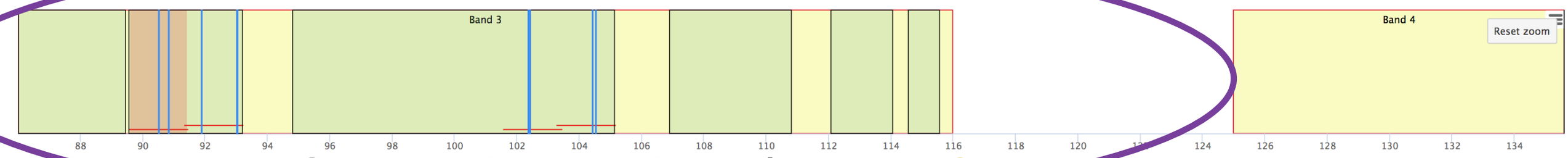
(0.05) ND
(0.126) HCO+ 7 - 6
(0.7511) C3
(3.0818) C3
12CO-1-0
13C17O 2-1
13C17O 3-2
13C18O 2-1
13C18O 3-2

Filters

Species	Shifted Frequency (GHz)	Rest Frequency (GHz)	Eup(cm-1)	Elow(cm-1)	Aij(s-1)
HC3N 10-9	9.0824e+1	9.0979e+1			

Upper level Lower level

JPL / CDMS databases



Observed (metadata) vs Imaged (FITS)

Highcharts.com

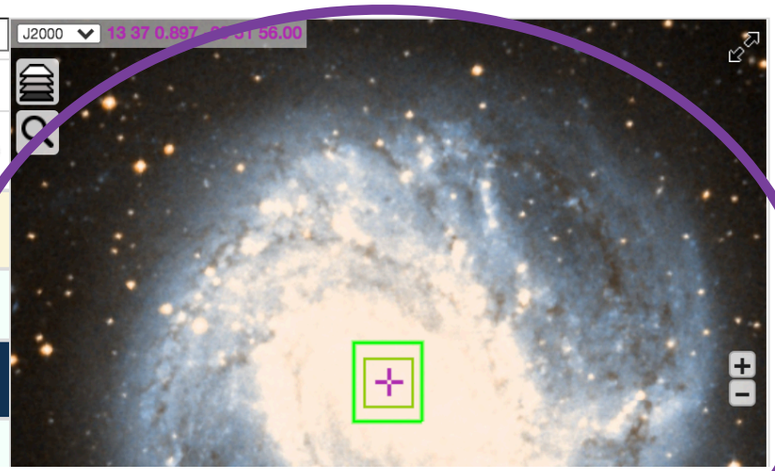
Warning : the collection of FITS files used by ARTEMIX and copied from the Alma Science Archive is already quite large. However, it is incomplete; we strive to improve the situation until we have a full copy of the ensemble of FITS files present in the ASA. Please also notice that only a relatively small fraction of all ALMA raw data are actually turned into images. Please go to the ALMA archive and download raw data for a complete overview of the data.

Show all data. *.pbcor.fits and *.pbcorr.fits *.image.fits *.clean.fits *.cont.fits and *.line.fits

All Info Metadata Available fits file(s) for selected metadata : 5

Show 10 entries Search:

Metadata										
#	Target	Band	RA	DEC	Res (")	Freq. Range (GHz)	Proj. code	Release Date	PI name	Search Alma Fits
1	m83	3	13:37:0.92	-29:51:56.74	2.0458	99.94 --- 101.93; 101.7 --- 103.69; 112.08 --- 114.07; 114.57 --- 115.57	2012.1.00762.S	2017-01-19	Hirota, Akihiko	search
2	M83	3	13:37:0.92	-29:51:56.74	62.2649	85.59 --- 87.58; 87.47 --- 89.46; 97.58 --- 99.57; 99.46 --- 101.45	2013.1.01312.S	2016-12-28	Hirota, Akihiko	search
3	M83	3	13:37:0.90	-29:51:56.00	1.5194	89.57 --- 91.44; 91.34 --- 93.21; 101.57 --- 103.44; 103.28 --- 105.15	2015.1.00175.S	2018-03-20	Harada, Nanase	search
4	M83	3	13:37:0.90	-29:51:56.00	1.4378	95.06 --- 96.94; 96.84 --- 98.71; 107.06 --- 108.94; 108.84 ---	2015.1.00175.S	2018-02-17	Harada, Nanase	search



AladinLite viewer

Context

(i) To stand **just beyond what is provided by the Observatory** Science Archive (not delivering data, not providing material for data reduction). —> Redirection to the Observatory Science Archive

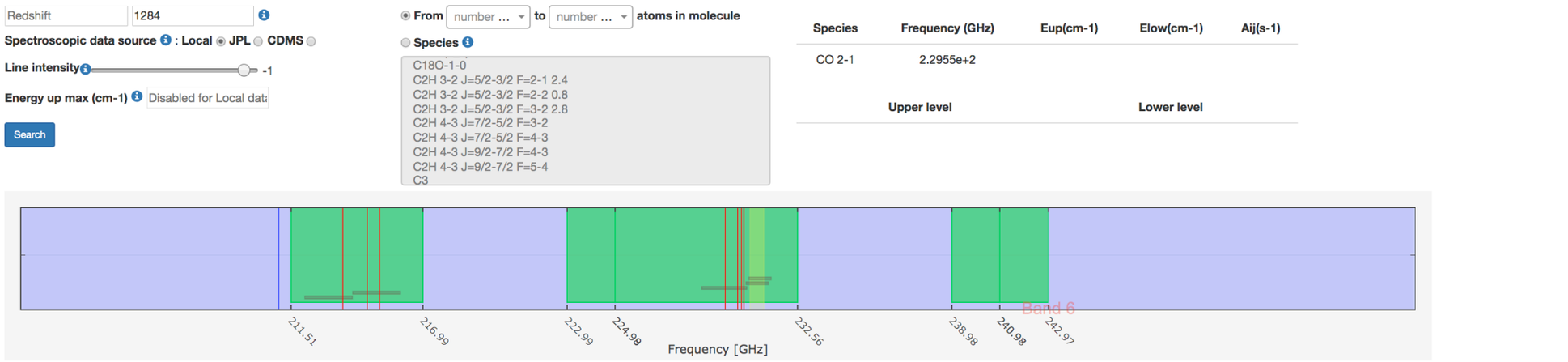
(ii) To **use public meta-data** and **public fits data cubes**

(iii) **Not to redo what already exist** in the Observatory Archive Query tools (ie rapid metadata query by multi-filters)

—> To Provide **a pilot study** of **remotely** operated tools for **quick look** visualisations (regular discussions with F. Stoer, **ie new ASA interface**)

—> Developed with **new/flexible techno** i.e. Serveur HTTP:NodeJS, Database:MongoDB; FITS server:python, dask multi-threads, openLayers..

ARTEMIX interface 2018

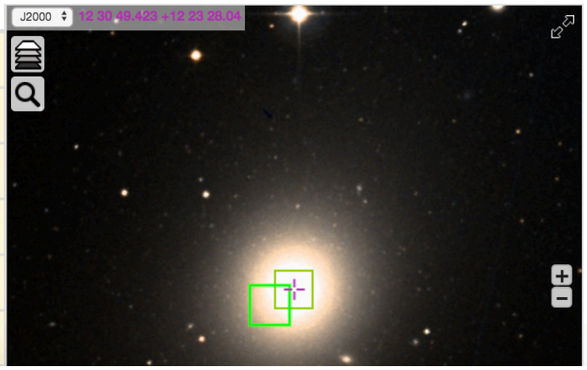


Warning : the collection of FITS files used by ARTEMIX and copied from the Alma Science Archive is already quite large. However, it is incomplete; we strive to improve the situation until we have a full copy of the ensemble of FITS files present in the ASA. Please also notice that only a relatively small fraction of all ALMA raw data are actually turned into images. Please go to the ALMA archive and download raw data for a complete overview of the data.

All Info | FitsData

Show all data: *.pbcor.fits and *.pbcorr.fits *.image.fits *.clean.fits *.cont.fits and *.line.fits

	Fits file	Target	RA	DEC	Cube size	Freq. range	Proj. code	uid
1	Info	M8	12:30:49.42	12:23:28.04	4500x4500x1	136.991 --- 152.995	2015.1.01352.S	uid://A001/X2d6/X2be
2	Info	M87	12:30:49.42	12:23:28.04	4500x4500x1	136.991 --- 152.995	2015.1.01352.S	uid://A001/X2d6/X2be
3	Info	M87	12:30:49.42	12:23:28.04	4500x4500x1	136.991 --- 152.995	2015.1.01352.S	uid://A001/X2d6/X2be
4	Info	M87	12:30:49.42	12:23:28.04	3200x3200x1	222.993 --- 243	2015.1.01352.S	uid://A001/X2d6/X2c2
5	Info	M87	12:30:49.42	12:23:28.04	3200x3200x1	222.993 --- 243	2015.1.01352.S	uid://A001/X2d6/X2c2
6	Info	M87	12:30:49.42	12:23:28.04	3200x3200x1	222.993 --- 243	2015.1.01352.S	uid://A001/X2d6/X2c2



Quick Look the FITS files 2D, 3D On-line 2018

New ALMA query interface

2021

Possible With CARTA 2022

Local Archive

1. Completed up to 2016 (Full science data base in local)

2. From 2017 and later : local copy of files < 2 Gb (more than 96% of the # of file but about 15% of the total size (scaled on 2016).

Download on-demand (for large files)

List of fits coming from ALMA (experimental phase)

Science Pbcor

Id	Url	Size (MB)	Local download script	Download / Preview on Artemix
1	local://uid___A002_Xe1a561_Xc37_J1851p0035_sci.spw27.cube.I.manual.image.pbcor.fits	459.009	Local download Script	Visit the fits
2	local://member.uid___A001_X1465_X1635.J1851p0035_sci.spw29.mfs.I.pbcor.fits	1.123	Local download Script	Visit the fits
3	local://member.uid___A001_X146c_X16.JVAS_J1935p2031_sci.spw25_27_29_31.mfs.I.manual.pbcor.fits	4.796	Local download Script	Visit the fits
4	local://member.uid___A001_X1465_X1635.J1851p0035_sci.spw25_27_29_31.cont.I.pbcor.fits	1.123	Local download Script	Visit the fits
5	local://member.uid___A001_X1465_X1635.J1851p0035_sci.spw27.cube.I.pbcor.fits	2131.304	Local download Script	Visit the fits

Local Archive

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2. From 2017 and later : local copy of files < 2 Gb (more than 96% of the # of file but about 15% of the total size (scaled on 2016).

Download on-demand (for large files)

Download in progress

List of fits coming from ALMA (experimental phase)

Science Pbcor

Id	Url	Size (MB)	Local download script	Download / Preview on Artemix
1	https://almascience.eso.org//dataPortal/member.uid___A001_X2f6_X44d.m83_spw0-line.image.pbcor.fits	1210.435	Local download Script	Waiting to be downloaded
2	https://almascience.eso.org//dataPortal/member.uid___A001_X2f6_X44d.m83_spw0123-cont.image.pbcor.fits	2.661	Local download Script	Download/Preview on Artemix
3	https://almascience.eso.org//dataPortal/member.uid___A001_X2f6_X44d.m83_spw1-line.image.pbcor.fits	1236.187	Local download Script	Download/Preview on Artemix
4	https://almascience.eso.org//dataPortal/member.uid___A001_X2f6_X44d.m83_spw2-line.image.pbcor.fits	1086.465	Local download Script	Download/Preview on Artemix
5	local://m83.image.line_SPW2_6_uvtaper.image.pbcor.fits	500.197	Local download Script	Visit the fits
6	local://m83.image.continuum_uvtaper.image.pbcor.fits	6.446	Local download Script	Visit the fits
7	local://member.uid___A001_X2f6_X44b.m83.image.continuum_uvtaper.image.pbcor.fits	6.446	Local download Script	Visit the fits
8	local://m83.image.line_SPW1_5_uvtaper.image.pbcor.fits	500.194	Local download Script	Visit the fits
9	local://m83.image.H59gamma_uvtaper.image.pbcor.fits	500.191	Local download Script	Visit the fits
10	local://m83.image.HCN_uvtaper.image.pbcor.fits	500.191	Local download Script	Visit the fits

Python script for local download
Link to ESO repository

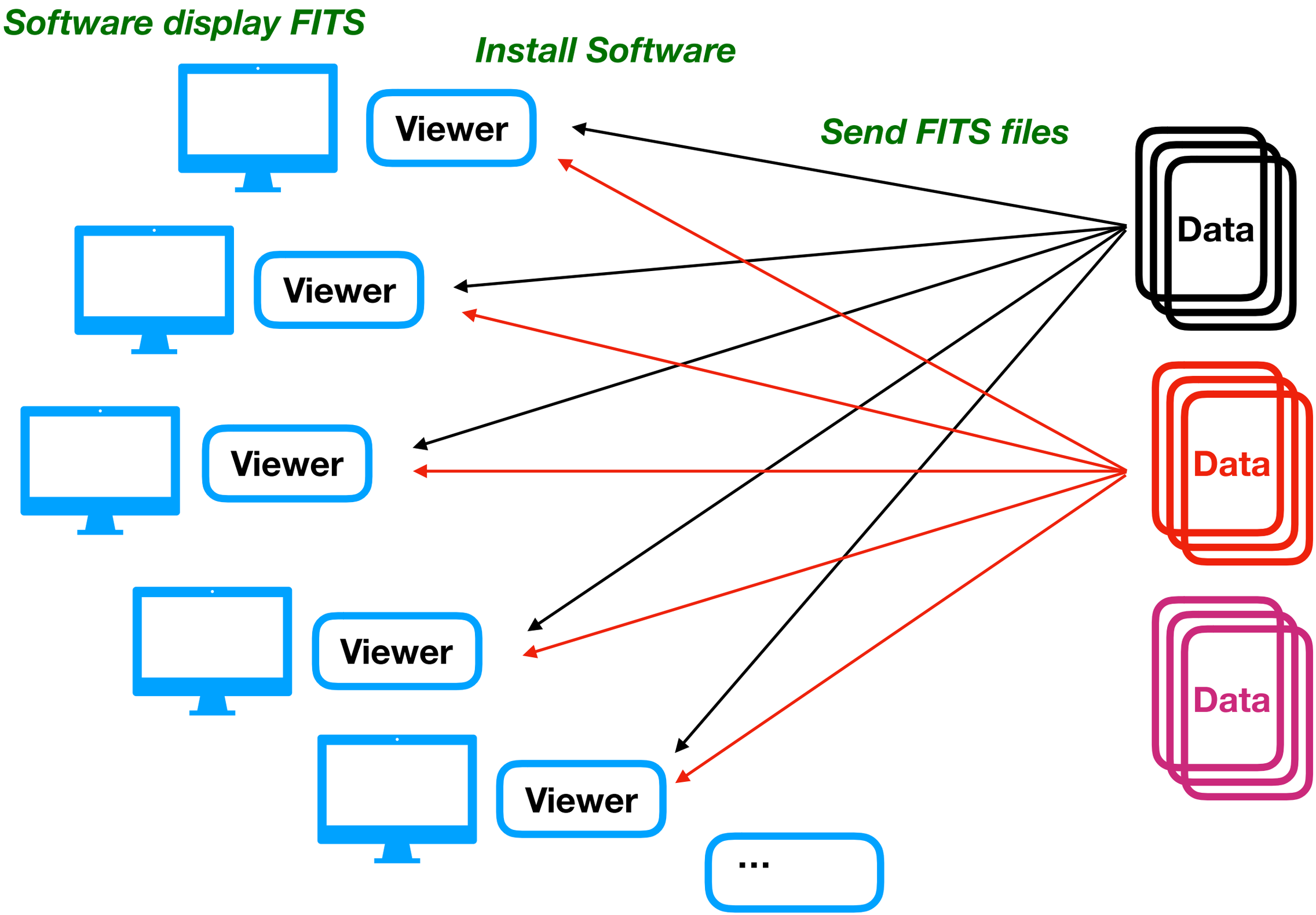
Already on-disk

YAFITS

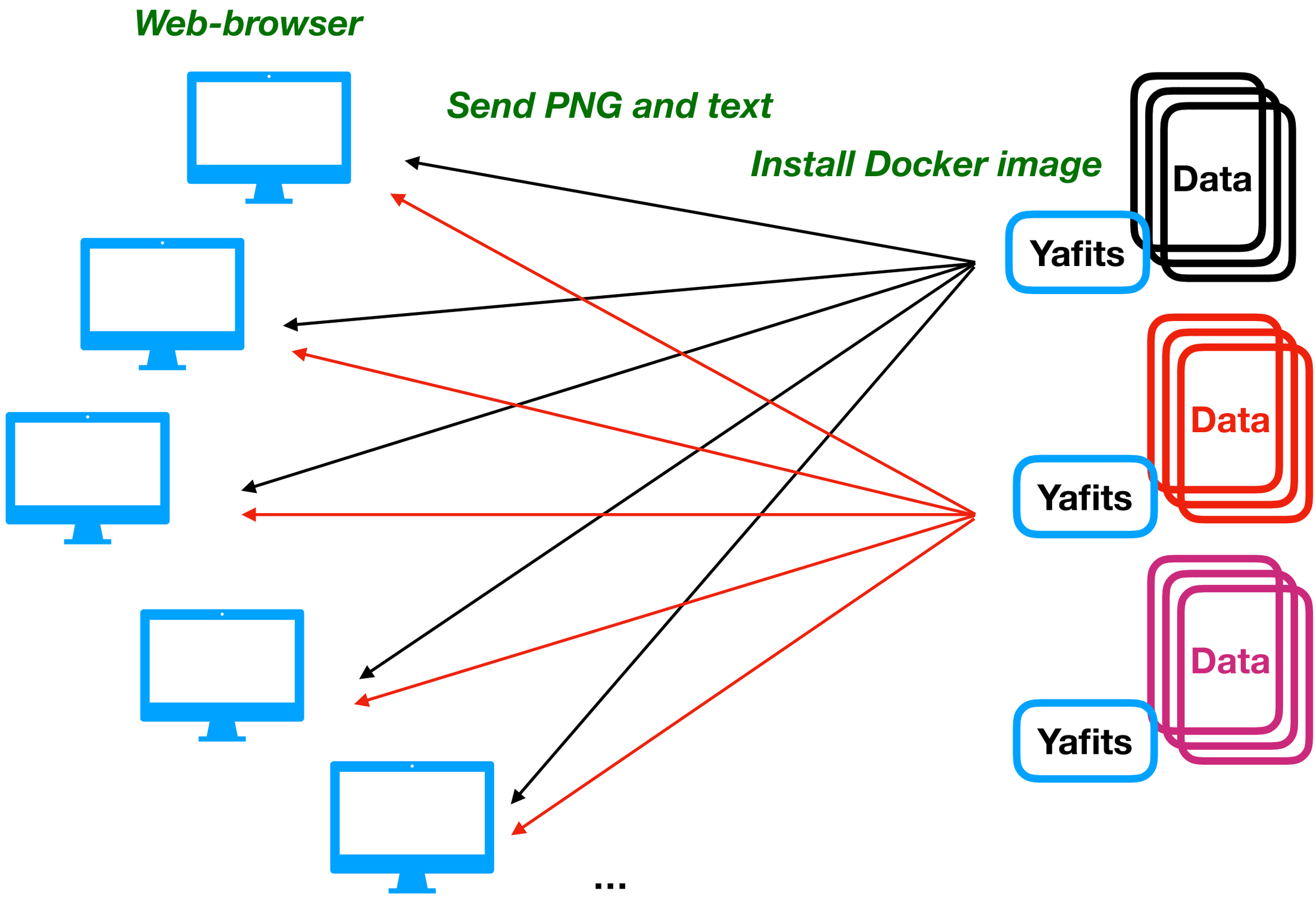
Yet Another FITS viewer

Distributed Quick Look Viewer
D-QLV

Local Viewer



Remote Viewer



Data

Yafits
Browser+Query

FITS file browser

Web browser client

YaFITS server

Browser client

Browser client

Local / Remote

Local

- Large range of analysis tools

But

- Need to download all the fits files to be checked (even if no detection)
- Speed limited by local computer performances and/or software optimization (for display) —> often need a local server

Remote

- Optimization on dedicated machines (load fits, calculations)
- No need to download fits files on local disk (if many and from different projects)

But

- Delay for loading (11 MB/s at most) large file (> 10 GB)
- Limited analysis

YAFITS

Goal : **provide a quick look preview of the data cube content**

Display the data cube (2 images, 2 spectra) : 1 channel map, 1 moment map, 1 spectra extracted from a pixel, 1 spectra extracted from a spatial region (square). Interactive and self-consistent

—> Based on **GILDAS Mapping « go view »**. Same functionalities implemented (frequency selection, region selection, integrated flux computation)

—> **Viewer implementation** based on **OpenLayers** / **Highcharts**

—> **Interoperabilty**

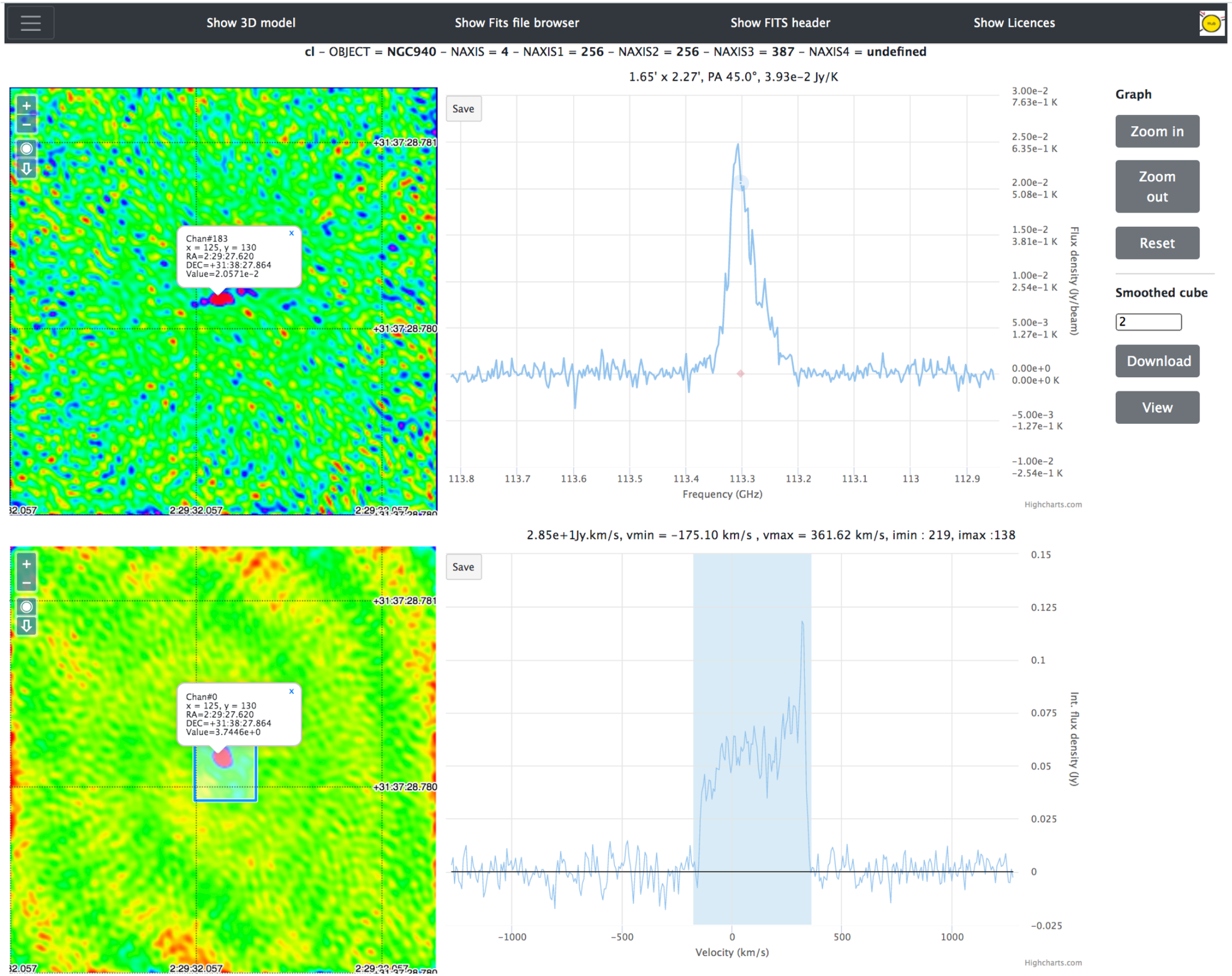
Context

Other similar software tools

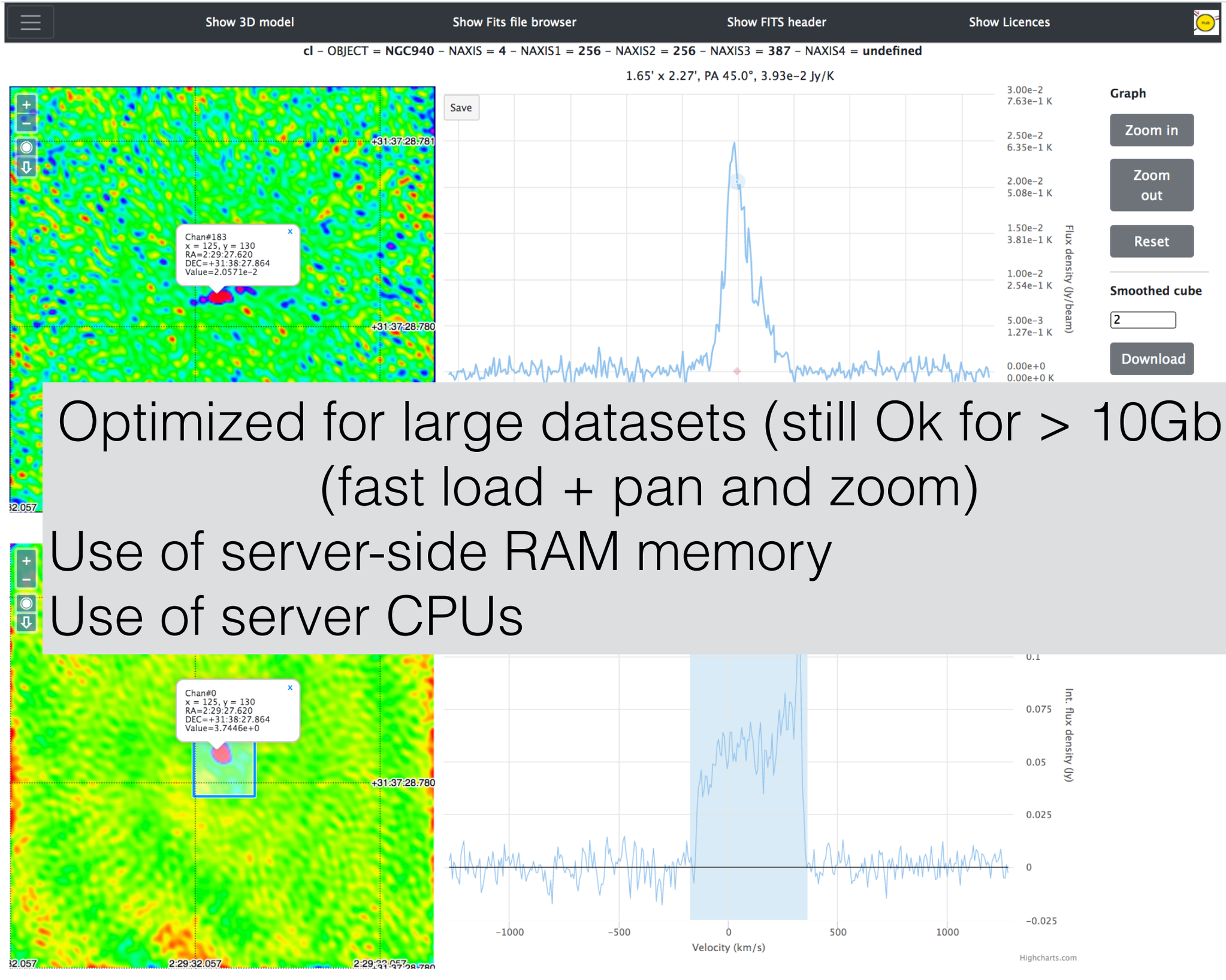
- A server-side visualization tool, which allows users to browse and manipulate the very large ALMA data cubes without having to download them to disk first : **CARTA** (Cube Analysis and Rendering Tool for Astronomy)
- Japanese Virtual Observatory (**JVO**) science-ready ALMA images (JVO portal (http://jvo.nao.ac.jp/index-e.html)

—> Use different implementations, different heuristics. New field but large potential of distributed (cloud-based) data inspection. Testbed for new methods. Room for several experiments

YAFITS


Show 3D model
Show Fits file browser
Show FITS header
Show Licences
cl – OBJECT = NGC940 – NAXIS = 4 – NAXIS1 = 256 – NAXIS2 = 256 – NAXIS3 = 387 – NAXIS4 = undefined
1.65' x 2.27', PA 45.0°, 3.93e-2 Jy/K
Chan#183
x = 125, y = 130
RA=2:29:27.620
DEC=+31:38:27.864
Value=2.0571e-2
+31:37:28.781
+31:37:28.780
2:29:32.057
Save
Flux density (Jy/beam)
Frequency (GHz)
Highcharts.com
Graph
Zoom in
Zoom out
Reset
Smoothed cube
2
Download
View
2.85e+1Jy.km/s, vmin = -175.10 km/s , vmax = 361.62 km/s, imin : 219, imax :138
Chan#0
x = 125, y = 130
RA=2:29:27.620
DEC=+31:38:27.864
Value=3.7446e+0
Int. flux density (Jy)
Velocity (km/s)

YAFITS


Show 3D model
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cl – OBJECT = NGC940 – NAXIS = 4 – NAXIS1 = 256 – NAXIS2 = 256 – NAXIS3 = 387 – NAXIS4 = undefined
1.65' x 2.27', PA 45.0°, 3.93e-2 Jy/K
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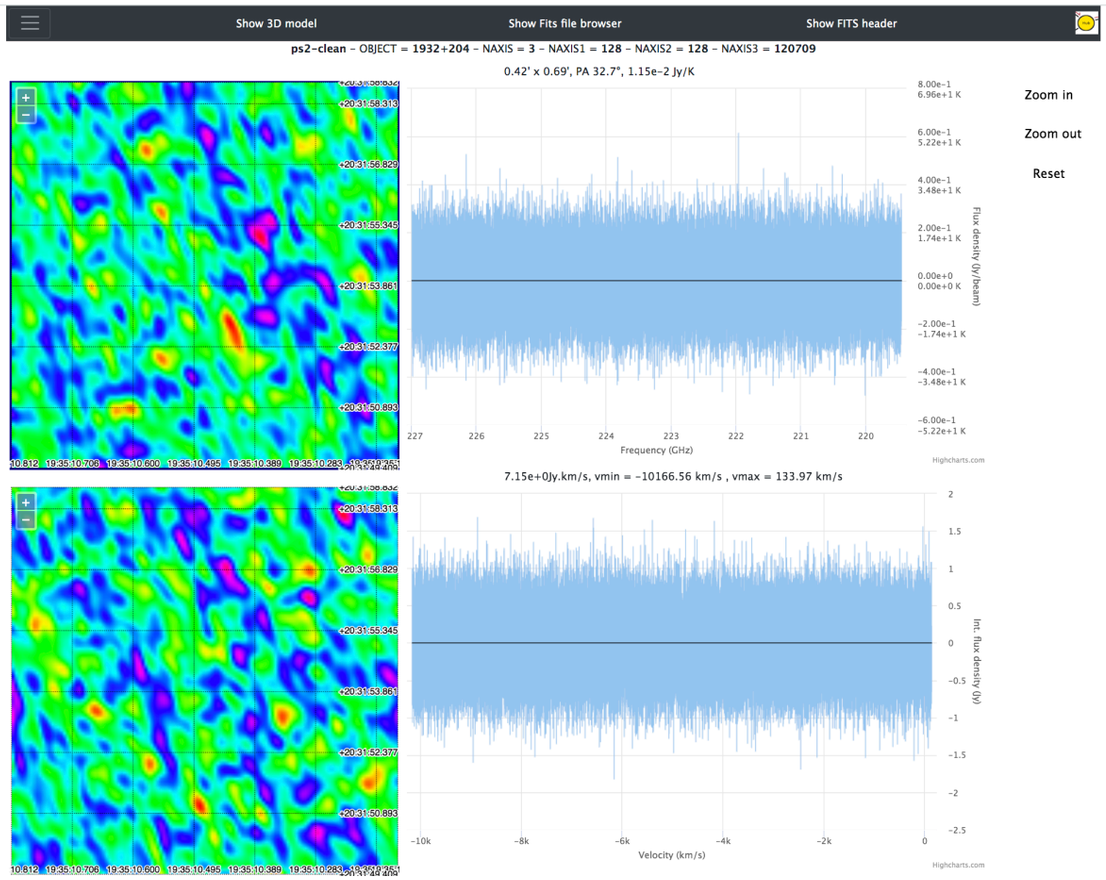
3.00e-2
7.63e-1 K
2.50e-2
6.35e-1 K
2.00e-2
5.08e-1 K
1.50e-2
3.81e-1 K
1.00e-2
2.54e-1 K
5.00e-3
1.27e-1 K
0.00e+0
0.00e+0 K
Flux density (Jy/beam)
Graph
Zoom in
Zoom out
Reset
Smoothed cube
2
Download
Optimized for large datasets (still Ok for > 10Gb)
(fast load + pan and zoom)
Use of server-side RAM memory
Use of server CPUs
Chan#0
x = 125, y = 130
RA=2:29:27.620
DEC=+31:38:27.864
Value=3.7446e+0
+31:37:28.780
2:29:32.057
0.1
0.075
0.05
0.025
0
-0.025
Int. flux density (Jy)
-1000
-500
0
500
1000
Velocity (km/s)
Highcharts.com

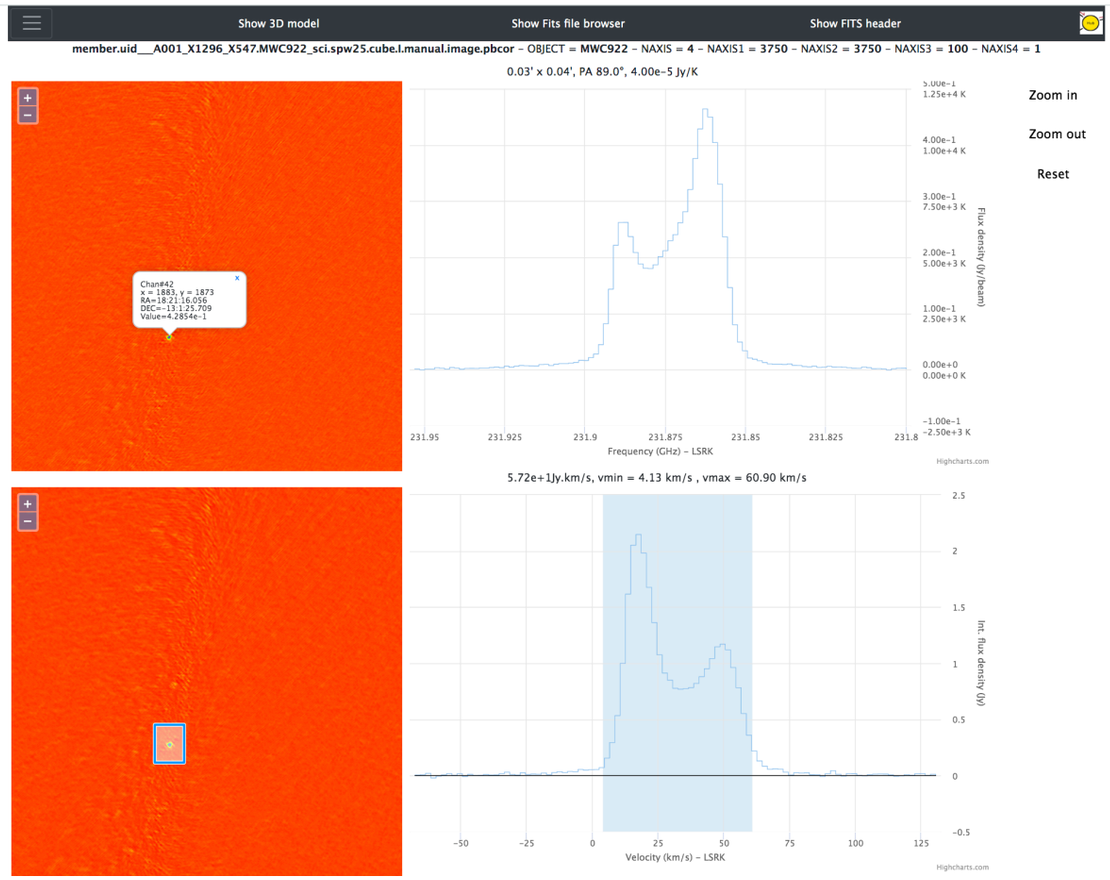
YAFITS

Effort to have a fluid interactivity for large images (2048 x 2048) and large spectra (120 000 channels) once loaded in memory (like locally)

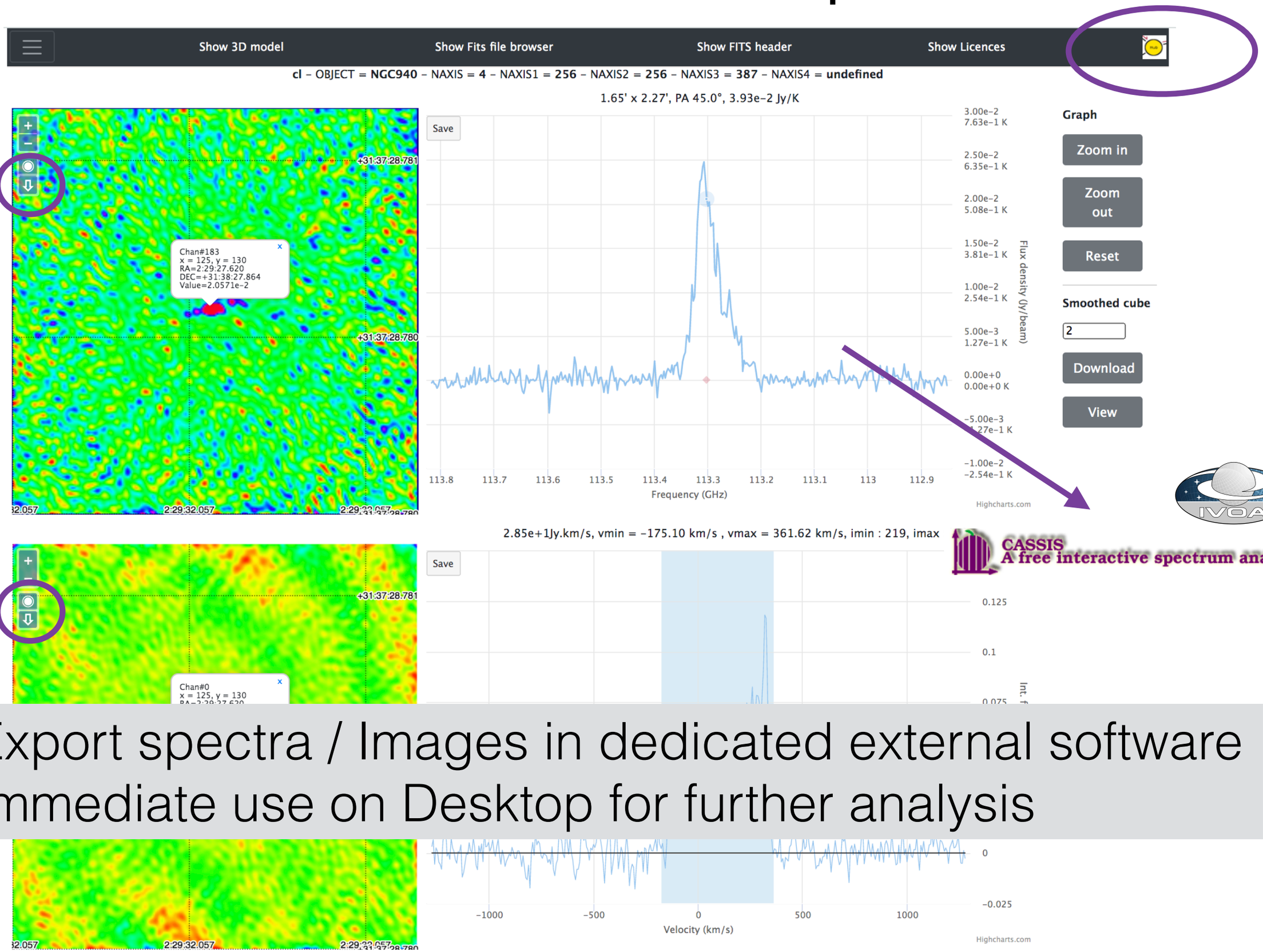
128 x 128 x 120 709



3750 x 3750 x 100

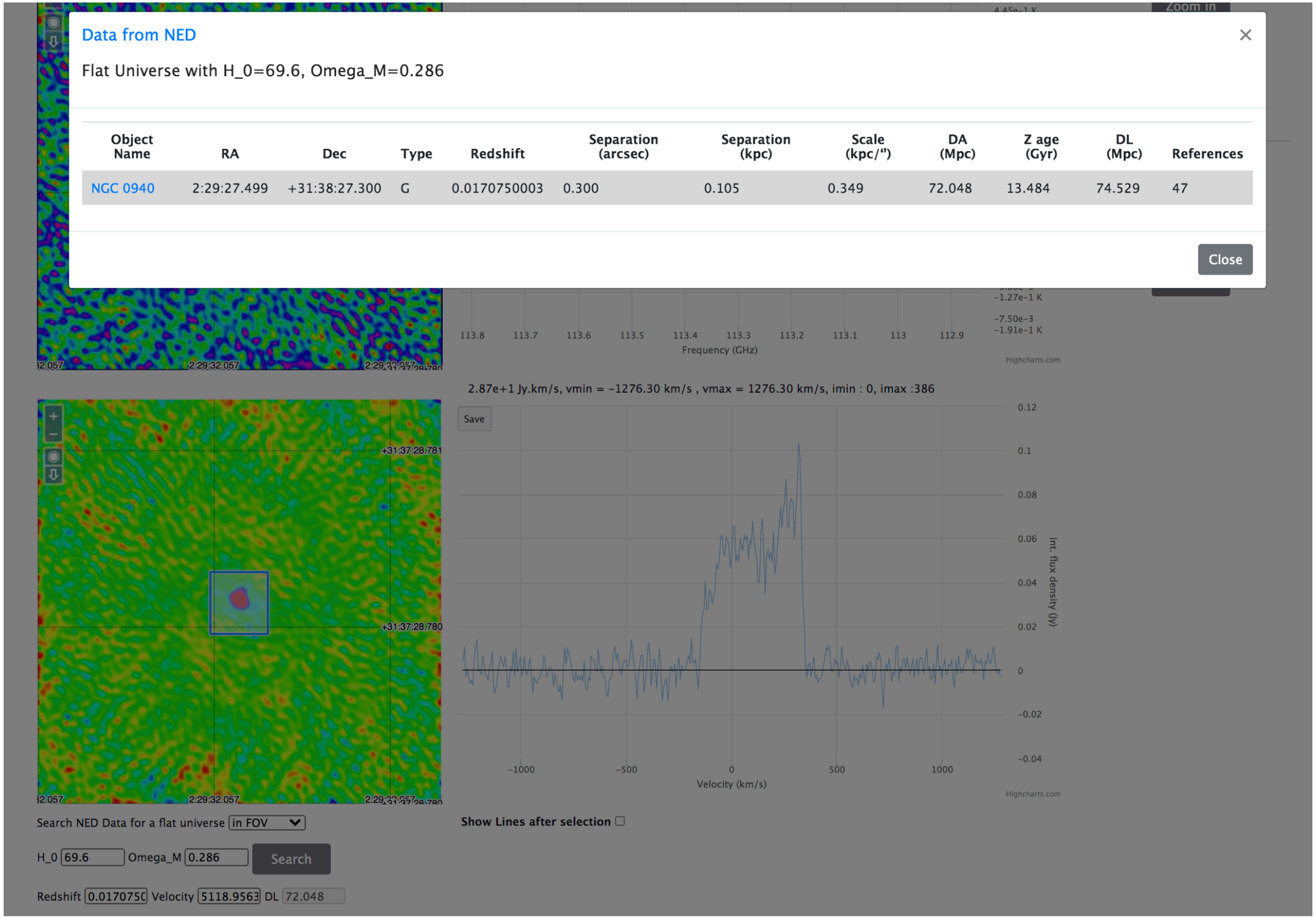


YAFITS Interop

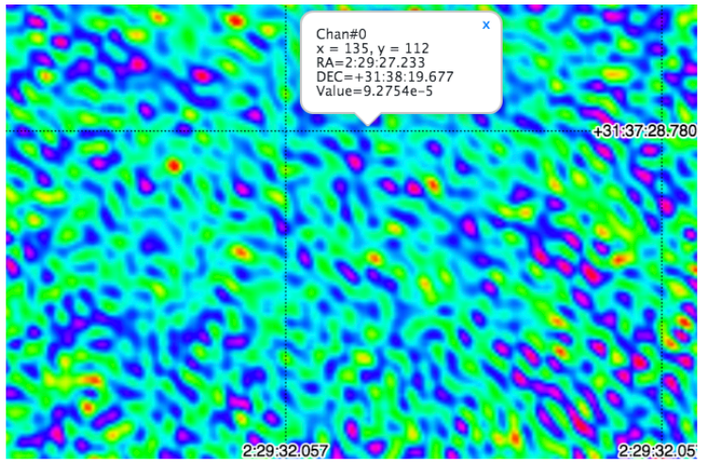


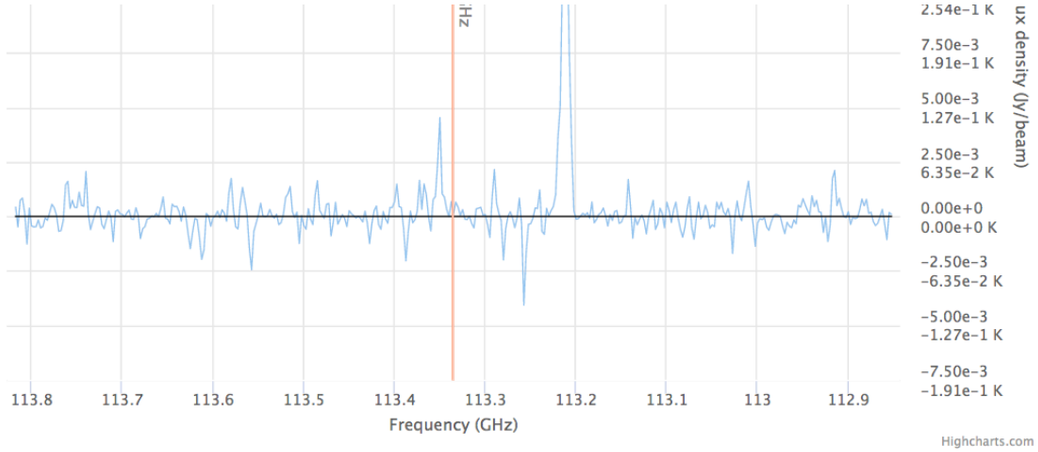
- Export spectra / Images in dedicated external software
- Immediate use on Desktop for further analysis

YAFITS Spectro



YAFITS Spectro





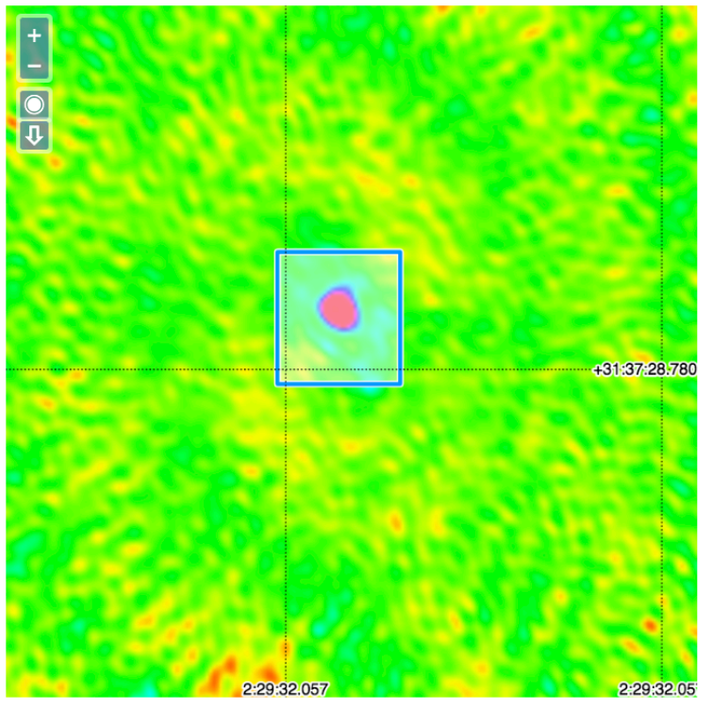
Reset

Smoothed cube

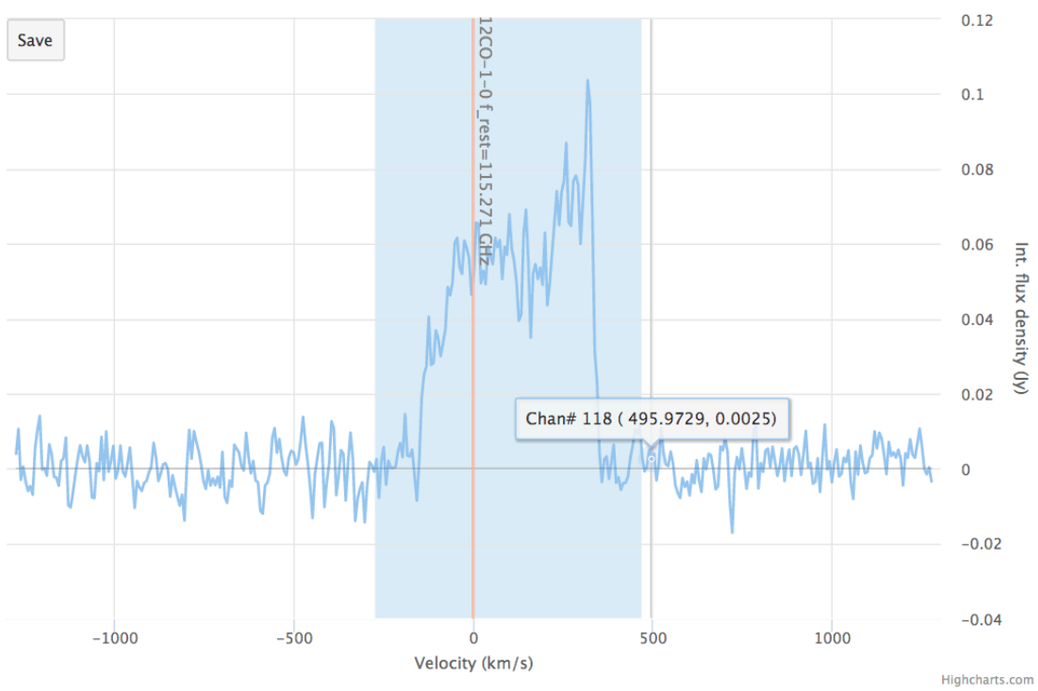
2

Download

View



2.78e+1 Jy.km/s, vmin = -273.21 km/s , vmax = 469.17 km/s, imin : 234, imax :122



<< < > >> 1/ 1

Possible species	Observed Frequency (GHz)
12CO-1-0	113.336

Search NED Data for a flat universe in FOV

H_0 69.6 Omega_M 0.286 Search

Redshift 0.017075(Velocity 5118.9563 DL 72.048

Show Lines after selection

028503- v 1:CO; $v=0$

- 028503- v 1:CO; $v=0$ Remove Dataset

Search in : Local ISM ISM-CSM CDMS

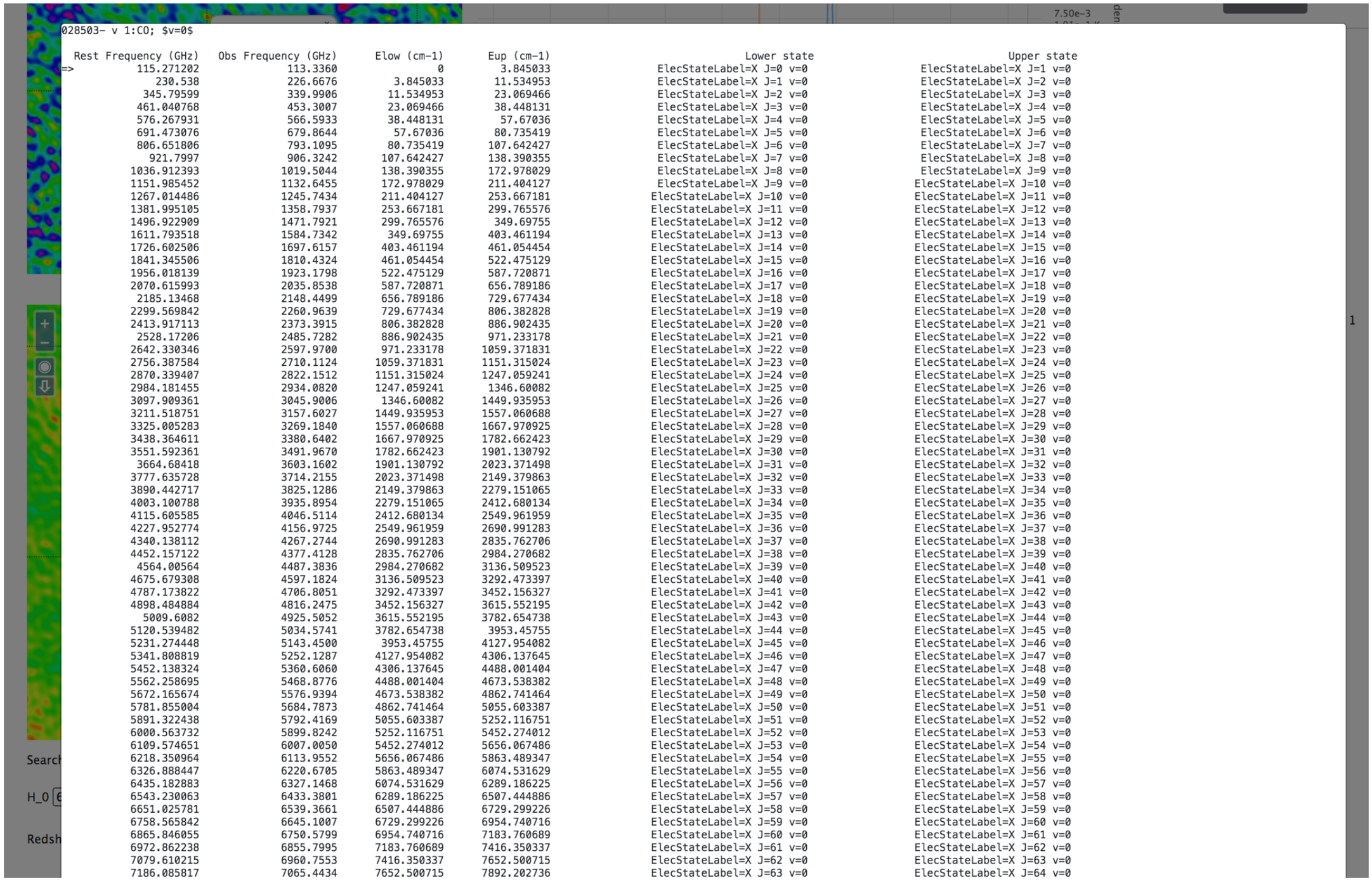
Line intensity -40

Energy up max 80 K

Number of atoms 1 4

Reference line : 12CO-1-0 113.336 GHz
L'_RefLine = 3.47e+8 K.km/s.pc2

YAFITS Spectro

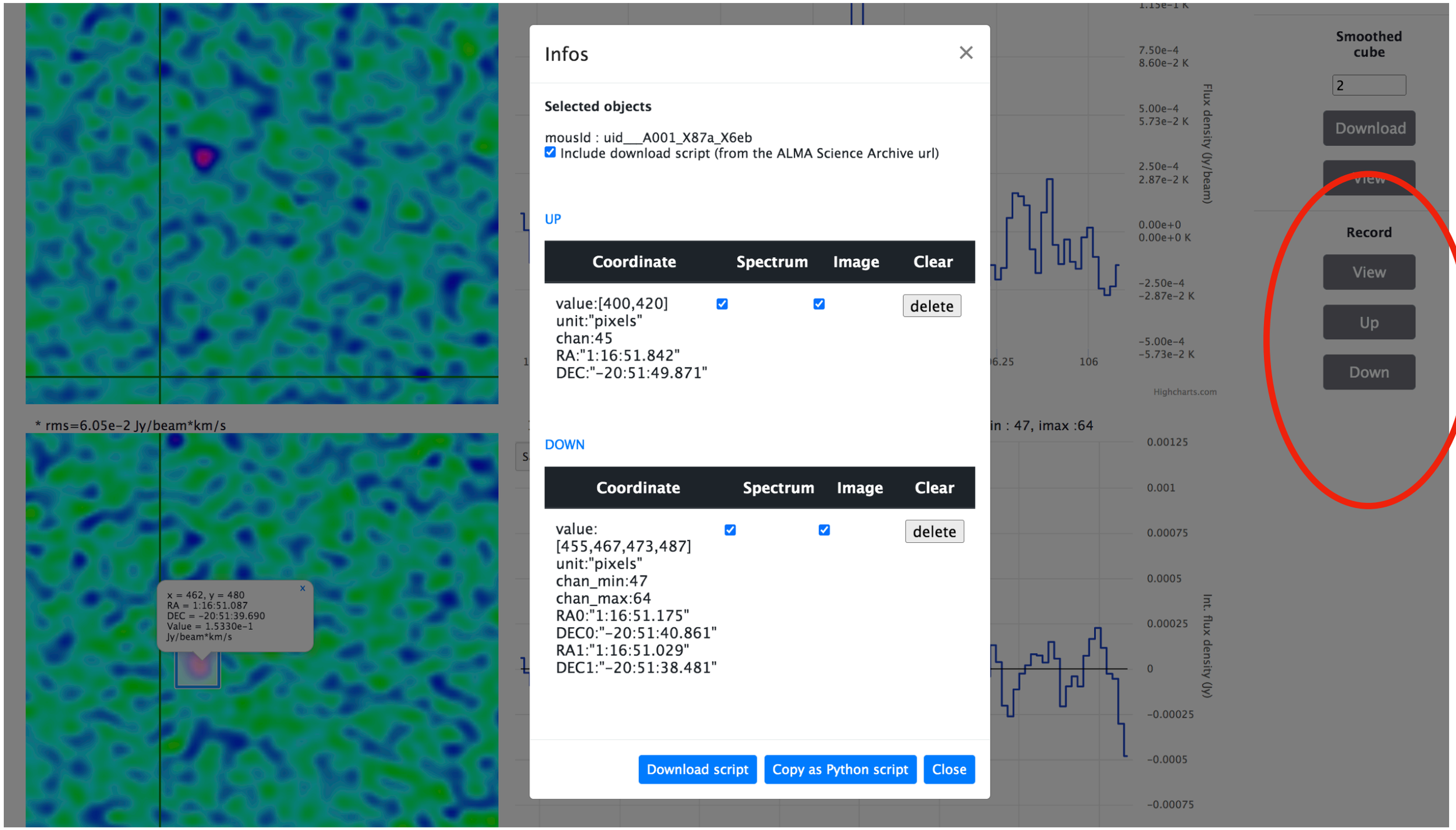


028503- v 1:CO; $v=0$

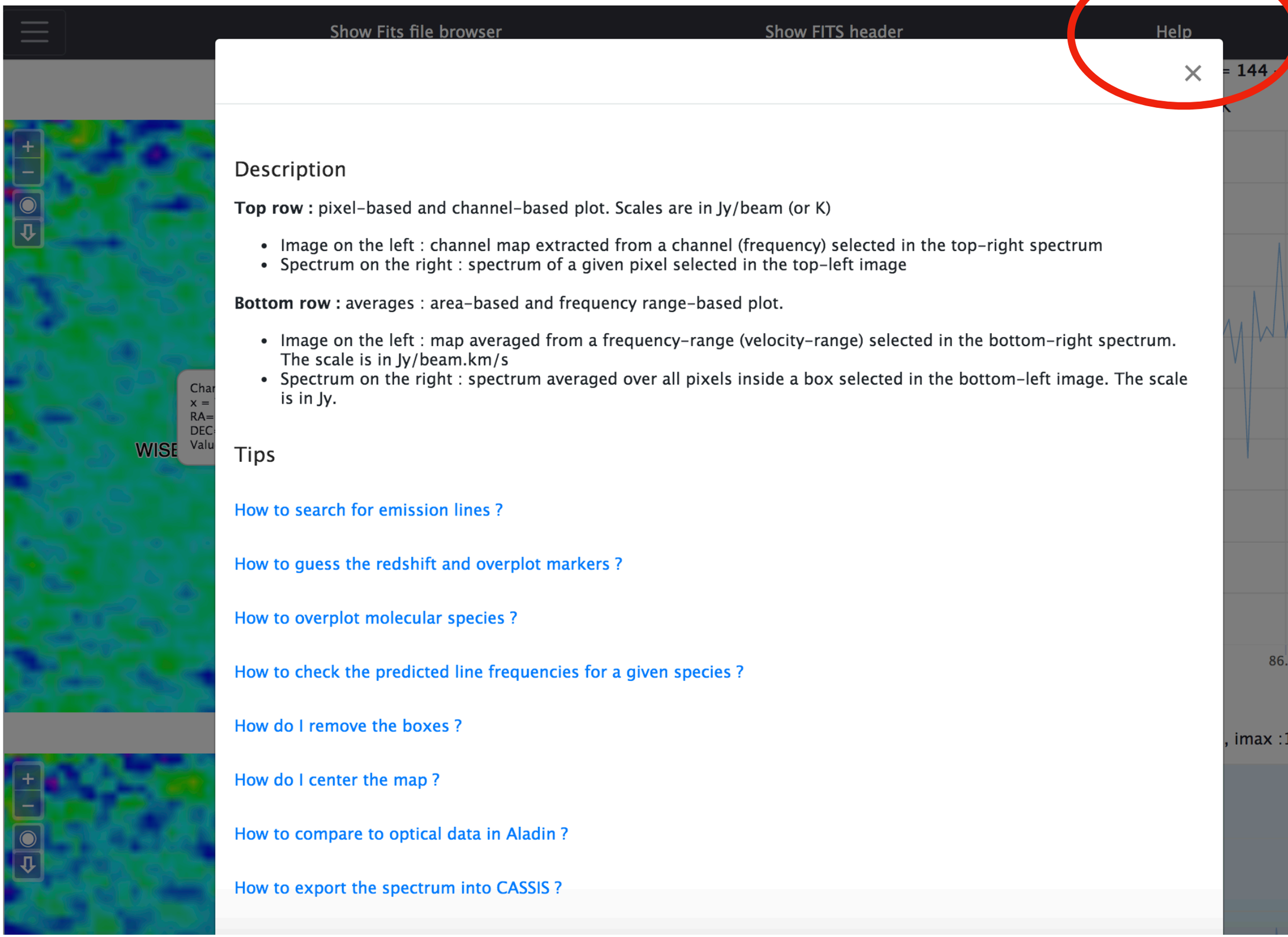
	Rest Frequency (GHz)	Obs Frequency (GHz)	Elow (cm-1)	Eup (cm-1)	Lower state	Upper state
=>	115.271202	113.3360	0	3.845033	ElecStateLabel=X J=0 v=0	ElecStateLabel=X J=1 v=0
	230.538	226.6676	3.845033	11.534953	ElecStateLabel=X J=1 v=0	ElecStateLabel=X J=2 v=0
	345.79599	339.9906	11.534953	23.069466	ElecStateLabel=X J=2 v=0	ElecStateLabel=X J=3 v=0
	461.040768	453.3007	23.069466	38.448131	ElecStateLabel=X J=3 v=0	ElecStateLabel=X J=4 v=0
	576.267931	566.5933	38.448131	57.67036	ElecStateLabel=X J=4 v=0	ElecStateLabel=X J=5 v=0
	691.473076	679.8644	57.67036	80.735419	ElecStateLabel=X J=5 v=0	ElecStateLabel=X J=6 v=0
	806.651806	793.1095	80.735419	107.642427	ElecStateLabel=X J=6 v=0	ElecStateLabel=X J=7 v=0
	921.7997	906.3242	107.642427	138.390355	ElecStateLabel=X J=7 v=0	ElecStateLabel=X J=8 v=0
	1036.912393	1019.5044	138.390355	172.978029	ElecStateLabel=X J=8 v=0	ElecStateLabel=X J=9 v=0
	1151.985452	1132.6455	172.978029	211.404127	ElecStateLabel=X J=9 v=0	ElecStateLabel=X J=10 v=0
	1267.014486	1245.7434	211.404127	253.667181	ElecStateLabel=X J=10 v=0	ElecStateLabel=X J=11 v=0
	1381.995105	1358.7937	253.667181	299.765576	ElecStateLabel=X J=11 v=0	ElecStateLabel=X J=12 v=0
	1496.922909	1471.7921	299.765576	349.69755	ElecStateLabel=X J=12 v=0	ElecStateLabel=X J=13 v=0
	1611.793518	1584.7342	349.69755	403.461194	ElecStateLabel=X J=13 v=0	ElecStateLabel=X J=14 v=0
	1726.602506	1697.6157	403.461194	461.054454	ElecStateLabel=X J=14 v=0	ElecStateLabel=X J=15 v=0
	1841.345506	1810.4324	461.054454	522.475129	ElecStateLabel=X J=15 v=0	ElecStateLabel=X J=16 v=0
	1956.018139	1923.1798	522.475129	587.720871	ElecStateLabel=X J=16 v=0	ElecStateLabel=X J=17 v=0
	2070.615993	2035.8538	587.720871	656.789186	ElecStateLabel=X J=17 v=0	ElecStateLabel=X J=18 v=0
	2185.13468	2148.4499	656.789186	729.677434	ElecStateLabel=X J=18 v=0	ElecStateLabel=X J=19 v=0
	2299.569842	2260.9639	729.677434	806.382828	ElecStateLabel=X J=19 v=0	ElecStateLabel=X J=20 v=0
	2413.917113	2373.3915	806.382828	886.902435	ElecStateLabel=X J=20 v=0	ElecStateLabel=X J=21 v=0
	2528.17206	2485.7282	886.902435	971.233178	ElecStateLabel=X J=21 v=0	ElecStateLabel=X J=22 v=0
	2642.330346	2597.9700	971.233178	1059.371831	ElecStateLabel=X J=22 v=0	ElecStateLabel=X J=23 v=0
	2756.387584	2710.1124	1059.371831	1151.315024	ElecStateLabel=X J=23 v=0	ElecStateLabel=X J=24 v=0
	2870.339407	2822.1512	1151.315024	1247.059241	ElecStateLabel=X J=24 v=0	ElecStateLabel=X J=25 v=0
	2984.181455	2934.0820	1247.059241	1346.60082	ElecStateLabel=X J=25 v=0	ElecStateLabel=X J=26 v=0
	3097.909361	3045.9006	1346.60082	1449.935953	ElecStateLabel=X J=26 v=0	ElecStateLabel=X J=27 v=0
	3211.518751	3157.6027	1449.935953	1557.060688	ElecStateLabel=X J=27 v=0	ElecStateLabel=X J=28 v=0
	3325.005283	3269.1840	1557.060688	1667.970925	ElecStateLabel=X J=28 v=0	ElecStateLabel=X J=29 v=0
	3438.364611	3380.6402	1667.970925	1782.662423	ElecStateLabel=X J=29 v=0	ElecStateLabel=X J=30 v=0
	3551.592361	3491.9670	1782.662423	1901.130792	ElecStateLabel=X J=30 v=0	ElecStateLabel=X J=31 v=0
	3664.68418	3603.1602	1901.130792	2023.371498	ElecStateLabel=X J=31 v=0	ElecStateLabel=X J=32 v=0
	3777.635728	3714.2155	2023.371498	2149.379863	ElecStateLabel=X J=32 v=0	ElecStateLabel=X J=33 v=0
	3890.442717	3825.1286	2149.379863	2279.151065	ElecStateLabel=X J=33 v=0	ElecStateLabel=X J=34 v=0
	4003.100788	3935.8954	2279.151065	2412.680134	ElecStateLabel=X J=34 v=0	ElecStateLabel=X J=35 v=0
	4115.605585	4046.5114	2412.680134	2549.961959	ElecStateLabel=X J=35 v=0	ElecStateLabel=X J=36 v=0
	4227.952774	4156.9725	2549.961959	2690.991283	ElecStateLabel=X J=36 v=0	ElecStateLabel=X J=37 v=0
	4340.138112	4267.2744	2690.991283	2835.762706	ElecStateLabel=X J=37 v=0	ElecStateLabel=X J=38 v=0
	4452.157122	4377.4128	2835.762706	2984.270682	ElecStateLabel=X J=38 v=0	ElecStateLabel=X J=39 v=0
	4564.00564	4487.3836	2984.270682	3136.509523	ElecStateLabel=X J=39 v=0	ElecStateLabel=X J=40 v=0
	4675.679308	4597.1824	3136.509523	3292.473397	ElecStateLabel=X J=40 v=0	ElecStateLabel=X J=41 v=0
	4787.173822	4706.8051	3292.473397	3452.156327	ElecStateLabel=X J=41 v=0	ElecStateLabel=X J=42 v=0
	4898.484884	4816.2475	3452.156327	3615.552195	ElecStateLabel=X J=42 v=0	ElecStateLabel=X J=43 v=0
	5009.6082	4925.5052	3615.552195	3782.654738	ElecStateLabel=X J=43 v=0	ElecStateLabel=X J=44 v=0
	5120.539482	5034.5741	3782.654738	3953.45755	ElecStateLabel=X J=44 v=0	ElecStateLabel=X J=45 v=0
	5231.274448	5143.4500	3953.45755	4127.954082	ElecStateLabel=X J=45 v=0	ElecStateLabel=X J=46 v=0
	5341.808819	5252.1287	4127.954082	4306.137645	ElecStateLabel=X J=46 v=0	ElecStateLabel=X J=47 v=0
	5452.138324	5360.6060	4306.137645	4488.001404	ElecStateLabel=X J=47 v=0	ElecStateLabel=X J=48 v=0
	5562.258695	5468.8776	4488.001404	4673.538382	ElecStateLabel=X J=48 v=0	ElecStateLabel=X J=49 v=0
	5672.165674	5576.9394	4673.538382	4862.741464	ElecStateLabel=X J=49 v=0	ElecStateLabel=X J=50 v=0
	5781.855004	5684.7873	4862.741464	5055.603387	ElecStateLabel=X J=50 v=0	ElecStateLabel=X J=51 v=0
	5891.322438	5792.4169	5055.603387	5252.116751	ElecStateLabel=X J=51 v=0	ElecStateLabel=X J=52 v=0
	6000.563732	5899.8242	5252.116751	5452.274012	ElecStateLabel=X J=52 v=0	ElecStateLabel=X J=53 v=0
	6109.574651	6007.0050	5452.274012	5656.067486	ElecStateLabel=X J=53 v=0	ElecStateLabel=X J=54 v=0
	6218.350964	6113.9552	5656.067486	5863.489347	ElecStateLabel=X J=54 v=0	ElecStateLabel=X J=55 v=0
	6326.888447	6220.6705	5863.489347	6074.531629	ElecStateLabel=X J=55 v=0	ElecStateLabel=X J=56 v=0
	6435.182883	6327.1468	6074.531629	6289.186225	ElecStateLabel=X J=56 v=0	ElecStateLabel=X J=57 v=0
	6543.230063	6433.3801	6289.186225	6507.444886	ElecStateLabel=X J=57 v=0	ElecStateLabel=X J=58 v=0
	6651.025781	6539.3661	6507.444886	6729.299226	ElecStateLabel=X J=58 v=0	ElecStateLabel=X J=59 v=0
	6758.565842	6645.1007	6729.299226	6954.740716	ElecStateLabel=X J=59 v=0	ElecStateLabel=X J=60 v=0
	6865.846055	6750.5799	6954.740716	7183.760689	ElecStateLabel=X J=60 v=0	ElecStateLabel=X J=61 v=0
	6972.862238	6855.7995	7183.760689	7416.350337	ElecStateLabel=X J=61 v=0	ElecStateLabel=X J=62 v=0
	7079.610215	6960.7553	7416.350337	7652.500715	ElecStateLabel=X J=62 v=0	ElecStateLabel=X J=63 v=0
	7186.085817	7065.4434	7652.500715	7892.202736	ElecStateLabel=X J=63 v=0	ElecStateLabel=X J=64 v=0

Export interactive parameters

(and python-scripts, in dev)



YAFITS Help



Description

Top row : pixel-based and channel-based plot. Scales are in Jy/beam (or K)

- Image on the left : channel map extracted from a channel (frequency) selected in the top-right spectrum
- Spectrum on the right : spectrum of a given pixel selected in the top-left image

Bottom row : averages : area-based and frequency range-based plot.

- Image on the left : map averaged from a frequency-range (velocity-range) selected in the bottom-right spectrum. The scale is in Jy/beam.km/s
- Spectrum on the right : spectrum averaged over all pixels inside a box selected in the bottom-left image. The scale is in Jy.

Tips

How to search for emission lines ?

How to guess the redshift and overplot markers ?

How to overplot molecular species ?

How to check the predicted line frequencies for a given species ?

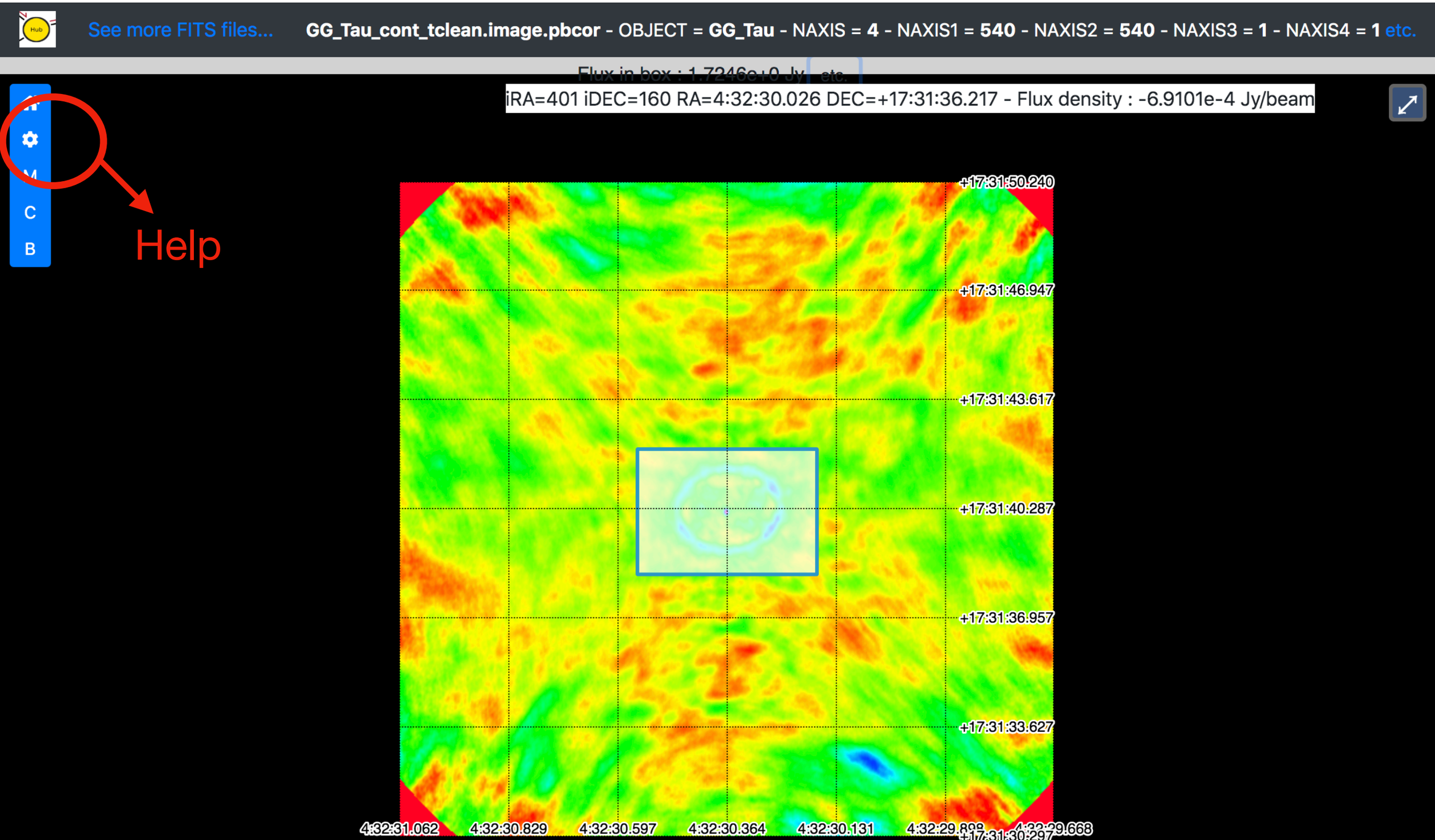
How do I remove the boxes ?

How do I center the map ?

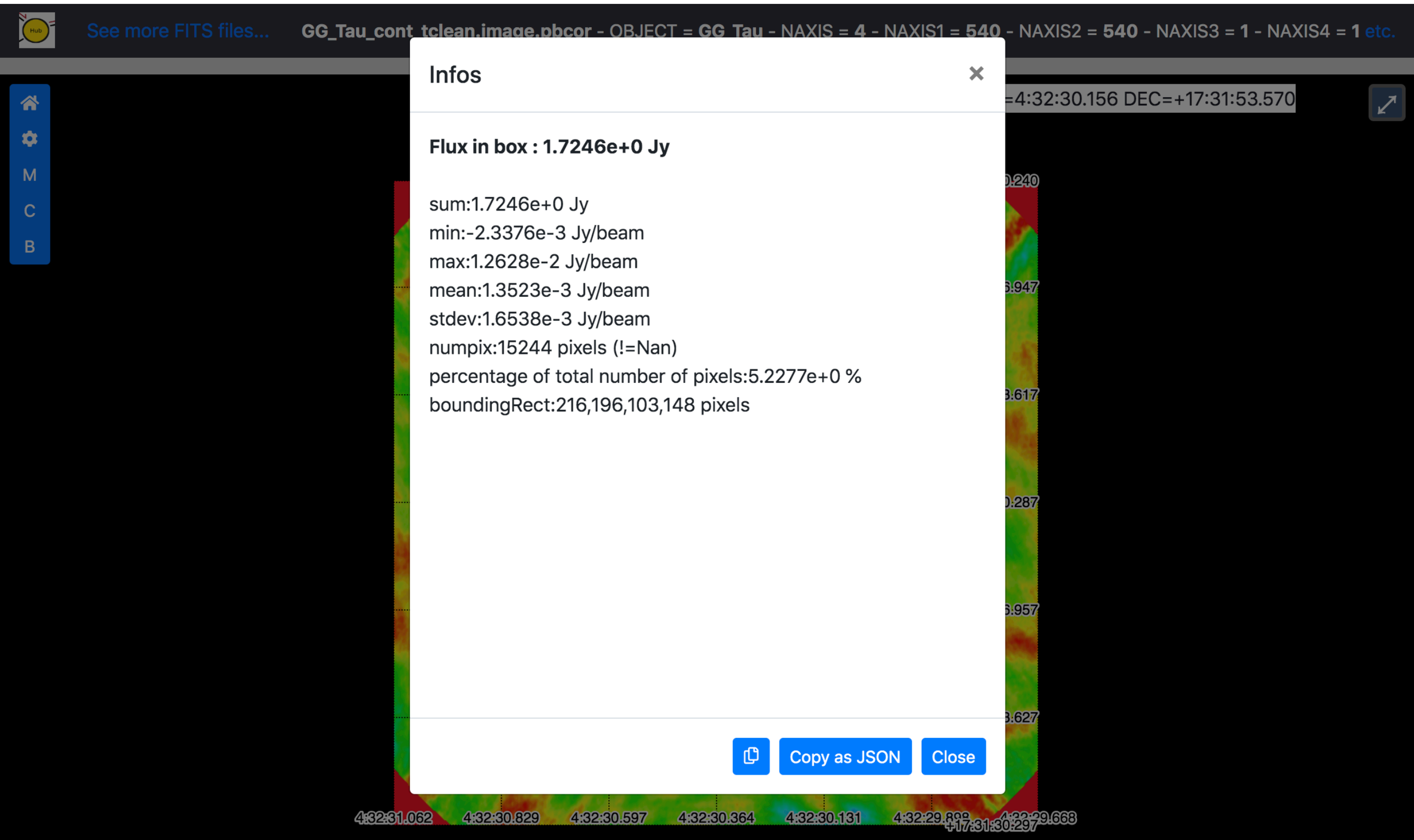
How to compare to optical data in Aladin ?

How to export the spectrum into CASSIS ?

YAFITS 2D

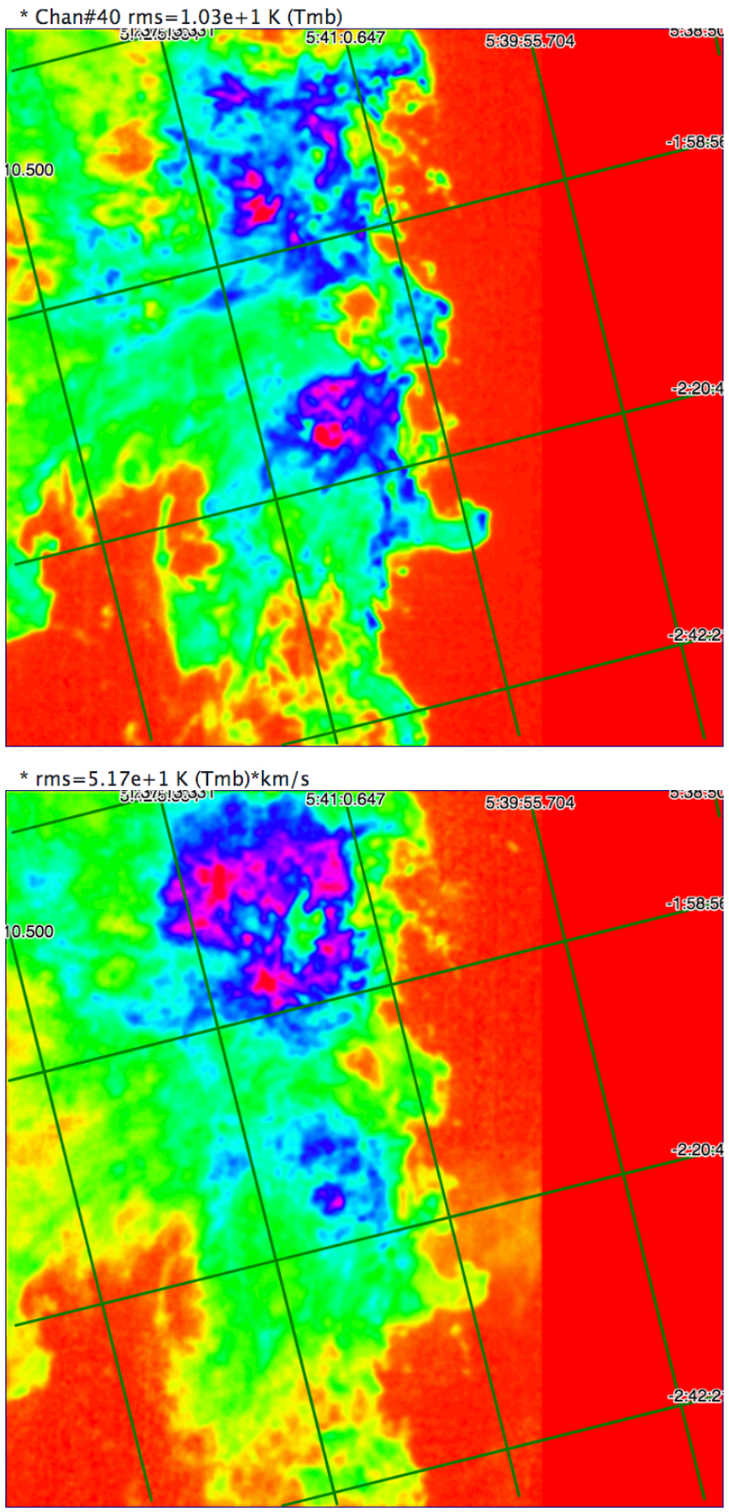

See more FITS files...
GG_Tau_cont_tclean.image.pbcor - OBJECT = GG_Tau - NAXIS = 4 - NAXIS1 = 540 - NAXIS2 = 540 - NAXIS3 = 1 - NAXIS4 = 1 etc.
Flux in box : 1.7246e+0 Jy etc.
iRA=401 iDEC=160 RA=4:32:30.026 DEC=+17:31:36.217 - Flux density : -6.9101e-4 Jy/beam
C
B
Help
+17:31:50.240
+17:31:46.947
+17:31:43.617
+17:31:40.287
+17:31:36.957
+17:31:33.627
+17:31:30.297
4:32:31.062
4:32:30.829
4:32:30.597
4:32:30.364
4:32:30.131

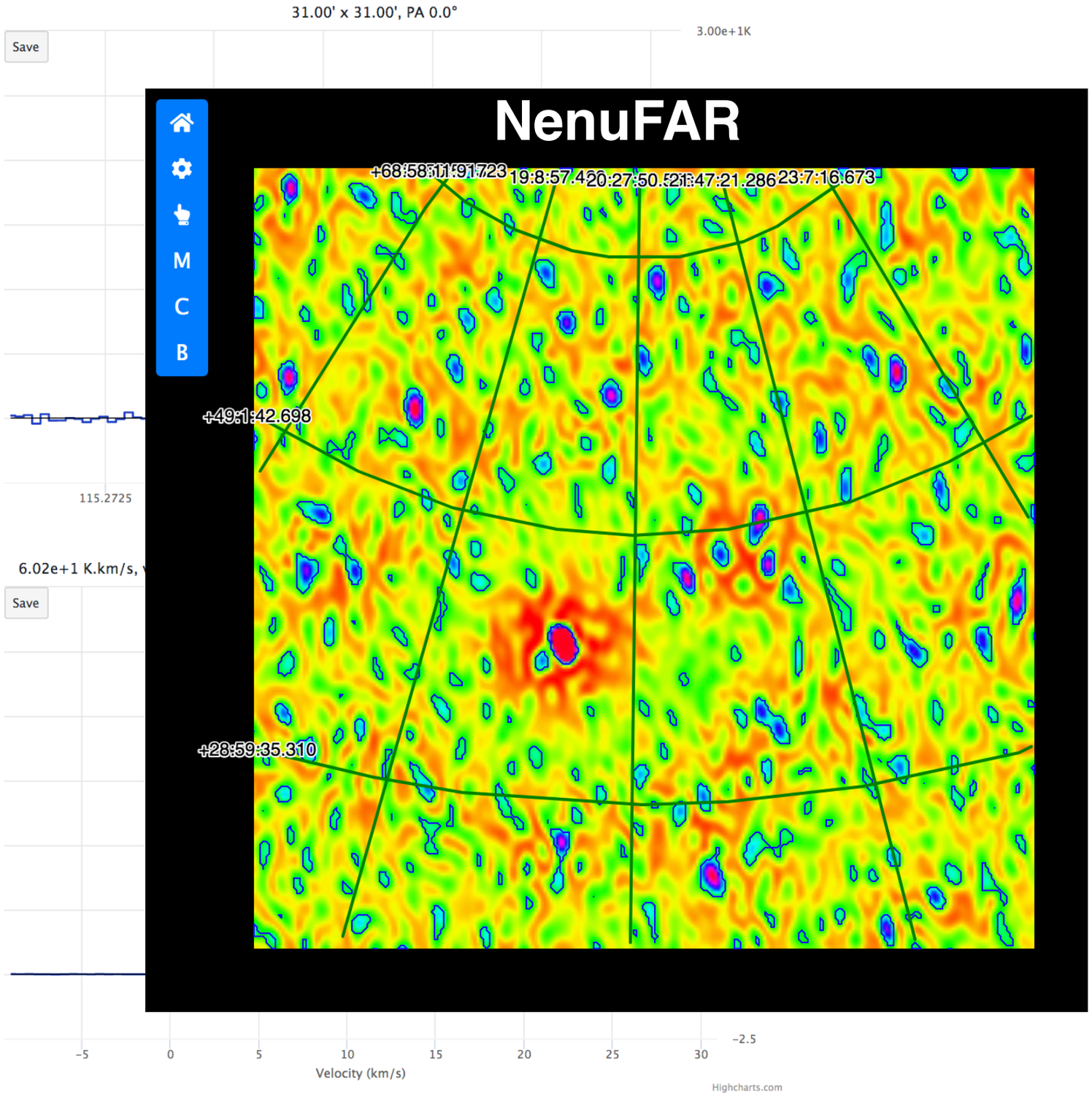
YAFITS 2D


See more FITS files...
GG_Tau_cont_tclean.image.pbcor - OBJECT = GG_Tau - NAXIS = 4 - NAXIS1 = 540 - NAXIS2 = 540 - NAXIS3 = 1 - NAXIS4 = 1 etc.
=4:32:30.156 DEC=+17:31:53.570
M
C
B
Infos
Flux in box : 1.7246e+0 Jy
sum:1.7246e+0 Jy
min:-2.3376e-3 Jy/beam
max:1.2628e-2 Jy/beam
mean:1.3523e-3 Jy/beam
stdev:1.6538e-3 Jy/beam
numpix:15244 pixels (!=Nan)
percentage of total number of pixels:5.2277e+0 %
boundingRect:216,196,103,148 pixels
Copy as JSON
Close
4:32:31.062
4:32:30.829
4:32:30.597
4:32:30.364
4:32:30.131
4:32:29.898
4:32:29.668
+17:31:30.297

YAFITS 2D and 3D

Gnomonic





YAFITS

Architecture, Technical aspects, Development environment, Install

https://yafits.obspm.fr/

radio astronomy | data visualisation | image cube | visual analytics

DOI 10.5281/zenodo.3696974

- Deployed inside Docker - No dependences - Easy configuration (PATH)
- Uses external libraries : Highcharts (spectra) and Openlayers (Images)
- Same as included in ARTEMIX but just need a file-system with FITS file
- Designed for radio-astronomy datacubes
- Tested with ALMA, NOEMA data, but also MUSE and SITELLE,

YAFITS

On GitLab

artemix › yafits

yafits
Project ID: 1302

Star 0 | Fork 0

903 Commits | **10** Branches | **1** Tag | **232.2 MB** Files | **274.6 MB** Storage | **1** Release

Yet Another FITS viewer. This project allows to browse remotely in a WEB browser a collection of FITS files and visualize their content. Inspired from tools like ds9 or goview (part of GILDAS software), it adds the "remote" dimension.

master | yafits / | + | History | Find file | Web IDE | Clone

Merge branch 'develop' into 'master'
Moreau Nicolas authored 25 minutes ago — 84f9f593

README | Add LICENSE | Add CHANGELOG | Add CONTRIBUTING | Add Kubernetes cluster | Set up CI/CD | Configure Integrations

Name	Last commit	Last update
docker-composers	Added the material in order to add the acc...	1 month ago
notebooks	Added the magic to obtain the plot widget...	1 year ago
spectro	Improve importation script when reloading...	2 months ago
yafitss	Changes Dockerfile after dataManager ha...	2 weeks ago
yafitsv	Uses properly formatted symbols for Hub...	26 minutes ago
.dockerignore	add the project yafitsv and create docker-...	2 years ago
LICENSE-3RD-PARTY.txt	add link to highcharts shop page	1 year ago
README.md	Update readme	2 weeks ago
docker-compose.yml	Removed the unneeded environment varia...	1 week ago
fs2sqlite.py	Removed import constants module and fix...	2 weeks ago
yafits	Removes orphans containers before startup	1 month ago
yafits.bashrc.dist	Added the env var YAFITS_SQLITE_MAXR...	2 weeks ago

ME.md

AFITS
- Docker's choice
- Architecture
- Requirements
- Getting the source code
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  - Adapt the configuration file
  - Customize the Welcome message file
- Building the images composition
- Running the images compositions in containers
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- Browsing available files
- Searching in available files
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  - Account considerations
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  - yafitss documentation
  - link between romeo and juliette

s root or sudo on juliette

FITS

nother **FITS** viewer This project allows to browse remotely in a WEB navigator a collection of FITS files to visualize and to study their nt. Inspired from tools like ds9 or goview (part of GILDAS software), it adds the "remote" dimension.

Docker's choice

After an initial phase where the project was built as a set of applications running on a (possibly virtual) machine in a classical way, it's been decided to package those applications in a Docker container mostly to ease the distribution and the installation of the product.

Architecture

f Docker images :

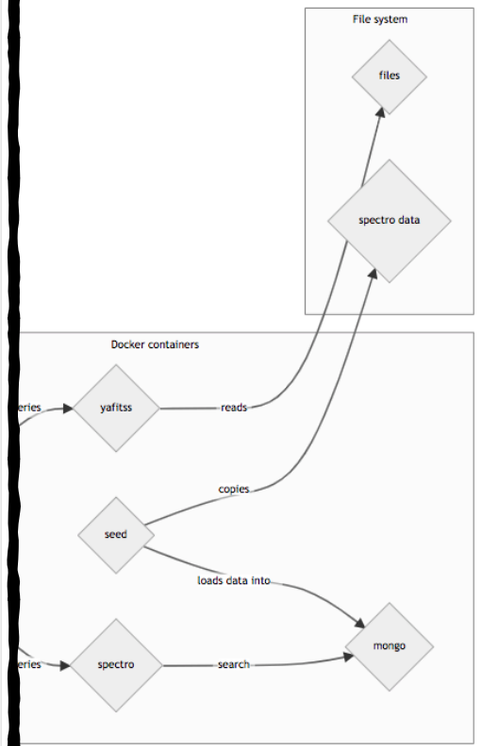
ts to the user's requests such that navigating in the FITS collection or visually exploring

ich actually performs all the hard work with FITS files (browsing, loading in memory, a a serie of REST APIs

ches spectroscopy data in a mongo database and sends results as JSON files

scopic data in the mongo container. It is only used in case spectroscopic data are

can be depicted as follows :



Requirements

Have the applications `docker` (https://docs.docker.com/install/) and `docker-compose` (https://docs.docker.com/compose/install/) available on the host where you plan to deploy the project.

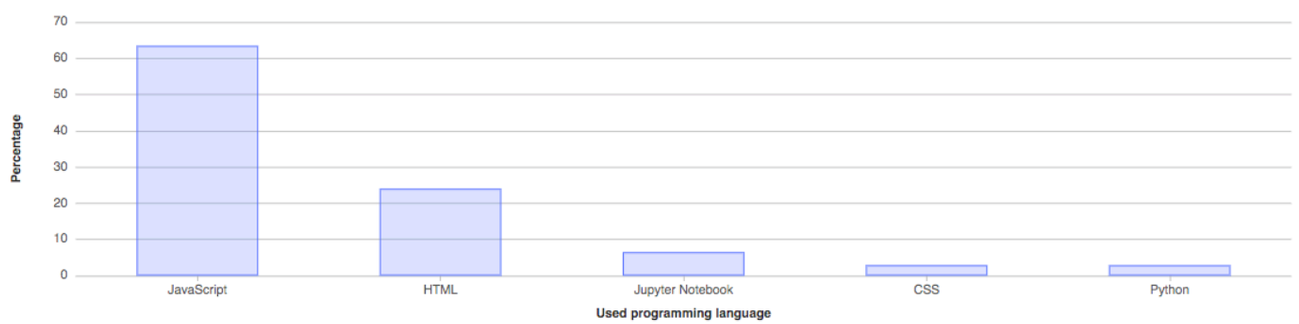
If your operating system is Linux please check that your docker's installation has been done completely and in particular that the post-installation steps have not been neglected. It's mandatory if you want to **manage Docker as a non-root user**, see https://docs.docker.com/install/linux/linux-postinstall/

Even if it's a not a requirement, having the Docker management and monitoring tool `portainer` (https://www.portainer.io/) installed is indiscutably a bonus.

Repository Analytics

Programming languages used in this repository

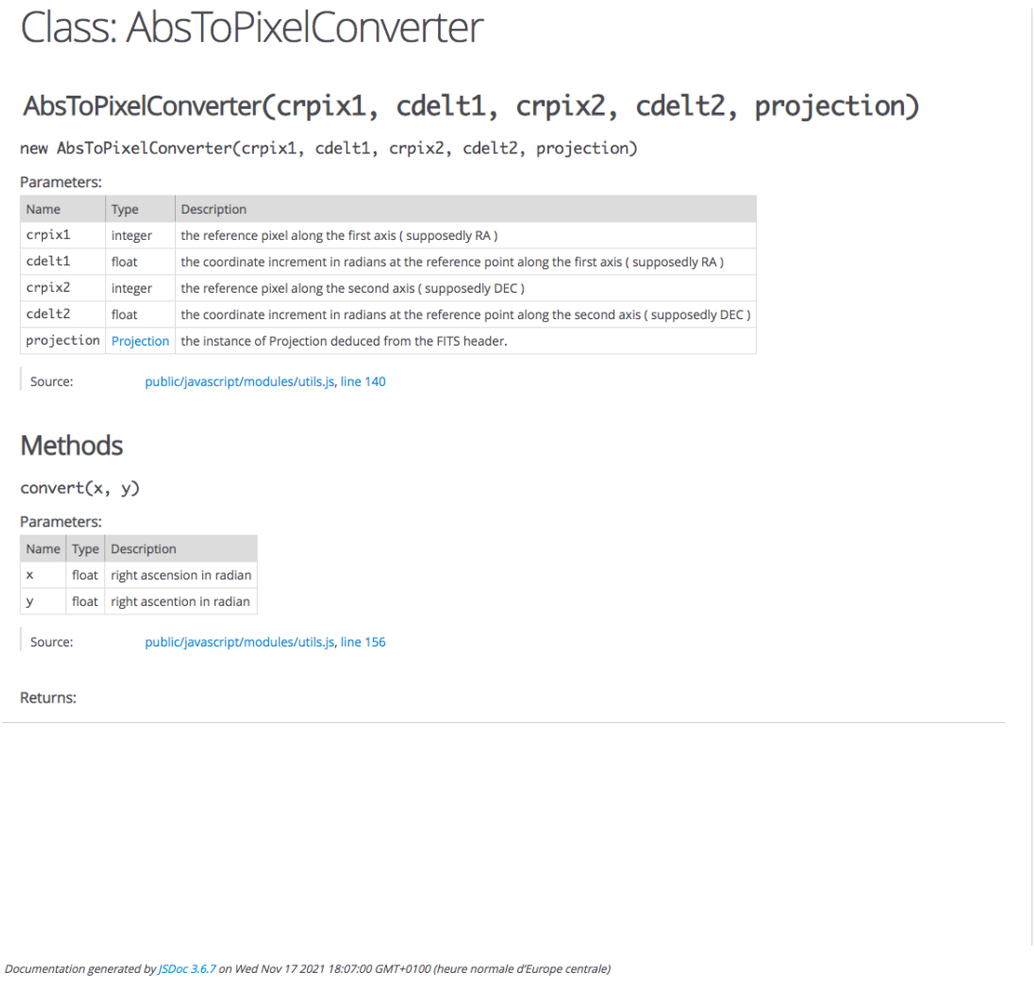
Measured in bytes of code. Excludes generated and vendored code.



YAFITS

Documentation for developers (in progress…)

- Javadoc for javascript



Class: AbsToPixelConverter

AbsToPixelConverter(crpix1, cdelt1, crpix2, cdelt2, projection)

new AbsToPixelConverter(crpix1, cdelt1, crpix2, cdelt2, projection)

Parameters:

Name	Type	Description
crpix1	integer	the reference pixel along the first axis (supposedly RA)
cdelt1	float	the coordinate increment in radians at the reference point along the first axis (supposedly RA)
crpix2	integer	the reference pixel along the second axis (supposedly DEC)
cdelt2	float	the coordinate increment in radians at the reference point along the second axis (supposedly DEC)
projection	Projection	the instance of Projection deduced from the FITS header.

Source: public/javascript/modules/utils.js, line 140

Methods

convert(x, y)

Parameters:

Name	Type	Description
x	float	right ascension in radian
y	float	right ascention in radian

Source: public/javascript/modules/utils.js, line 156

Returns:

Home

Classes

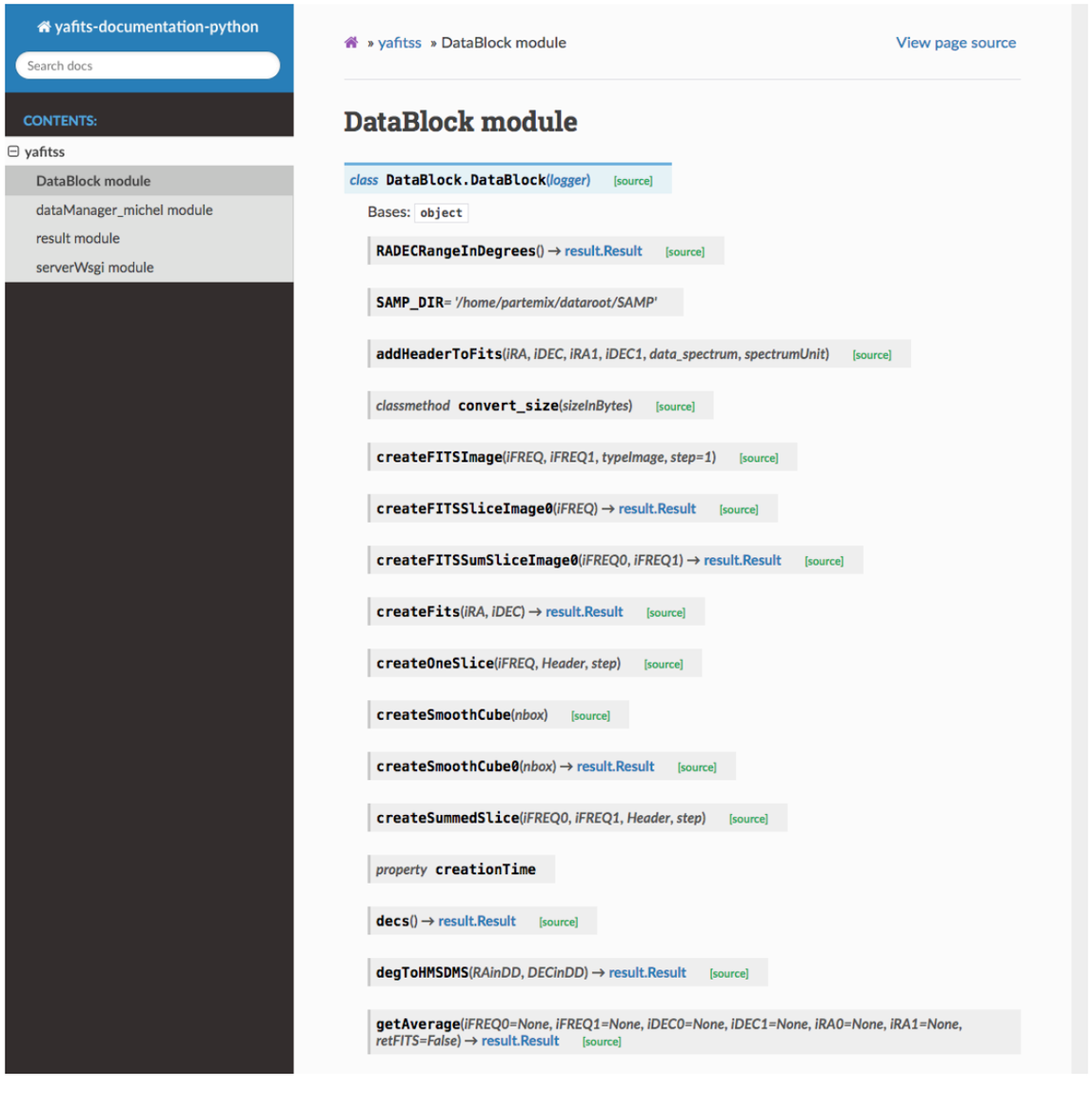
AbsToPixelConverter
FitsHeader
LinePlotter
MarkerManager
MarkersFactory
Overlay
PixelToAbsConverter
PixelToDECConverter
PixelToRAConverter
Projection
Slice
SourceTable
SpectroscopyFormatter
SpectroscopyQuery
SpectroscopyUI
ViewLinker

Global

changeDatabase
changeLinesGroup
cmToK
compute
dataPaths
dcmt
deleteFeature
disableSpectroMenu
DMS2DecDeg
enableSpectroMenu
getLpLine
getRadiusInDegrees
hashCode
HMS2DecDeg
KToCm
SAMPPublisher
separation
setOnHubAvailability
setOnHubAvailability2D
shift
toggleSpectroMenu
unshift

Documentation generated by JSDoc 3.6.7 on Wed Nov 17 2021 18:07:00 GMT+0100 (heure normale d'Europe centrale)

- Sphinx for python



yafits-documentation-python

Search docs

CONTENTS:

yafitss

DataBlock module
dataManager_michel module
result module
serverWsgi module

» yafitss » DataBlock module View page source

DataBlock module

class DataBlock.DataBlock(logger) [source]

Bases: object

RADECRangeInDegrees() → result.Result [source]

SAMP_DIR= '/home/partemix/dataroot/SAMP'

addHeaderToFits(iRA, iDEC, iRA1, iDEC1, data_spectrum, spectrumUnit) [source]

classmethod convert_size(sizeInBytes) [source]

createFITSImage(iFREQ, iFREQ1, typeImage, step=1) [source]

createFITSSliceImage0(iFREQ) → result.Result [source]

createFITSSumSliceImage0(iFREQ0, iFREQ1) → result.Result [source]

createFits(iRA, iDEC) → result.Result [source]

createOneSlice(iFREQ, Header, step) [source]

createSmoothCube(nbox) [source]

createSmoothCube0(nbox) → result.Result [source]

createSummedSlice(iFREQ0, iFREQ1, Header, step) [source]

property creationTime

decs() → result.Result [source]

degToHMSDMS(RAinDD, DECinDD) → result.Result [source]

getAverage(iFREQ0=None, iFREQ1=None, iDEC0=None, iDEC1=None, iRA0=None, iRA1=None, retFITS=False) → result.Result [source]

Summary

1. **Service on-line. Latest stable version 2018** http://artemix.obspm.fr —> Remote Quick-Look access to ALMA science data products.

2. Yafits : a **Standalone version of the viewer : Yafits.** Running inside **Docker** : simplified the installation procedure. No dependencies. **Fast viewer** based on Open Layers, **interoperability** via SAMP for spectra and images. Access to **molecular databases** via VAMDC. Overlay expected line frequencies

3. Project : visualisation of **IRAM Large Program database** (2022)

4. Project : Activités de prototypage "Visualization of SKA data with high volume of users and high amount of data »

More e-Tools **Automated signal identification**

Machine Learning for Radio-Astronomy **MINERVA (SKA data Challenge 2)** **`https://vm-weblerma.obspm.fr/minerva/`**

D. Cornu

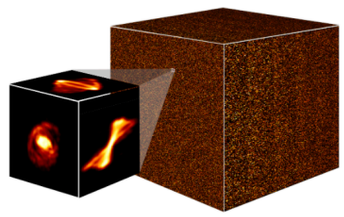
Position	User	Group	Score	Date
1	minerva	MINERVA	23254.16	2021-07-31T22:08:25.716098
2	forska	FORSKA-Sweden	22489.43	2021-07-14T05:29:44.394263
3	sofia	SoFiA	16822.24	2021-07-27T02:35:21.234327
4	naoc-tianlai	NAOC-Tianlai	14416.02	2021-07-28T12:59:39.209828
5	hi-friends	HI-FRIENDS	13902.62	2021-07-31T20:39:01.416127
6	epfl	EPFL	8515.16	2021-07-31T20:30:40.569408
7	spardha	Spardha	5614.59	2021-07-30T13:54:14.229580
8	starmech	Starmech	2095.65	2021-07-31T15:42:40.105279
9	jlrat	JLRAT	1079.73	2021-07-31T18:13:38.347097
10	coin	Coin	-1.76	2021-07-31T22:48:57.226716
11	hiraxers	HIRAXers	-2.00	2021-07-15T10:55:52.222569
12	shao	SHAO	-471.00	2021-07-31T16:14:46.451245

Machine Learning - SKA

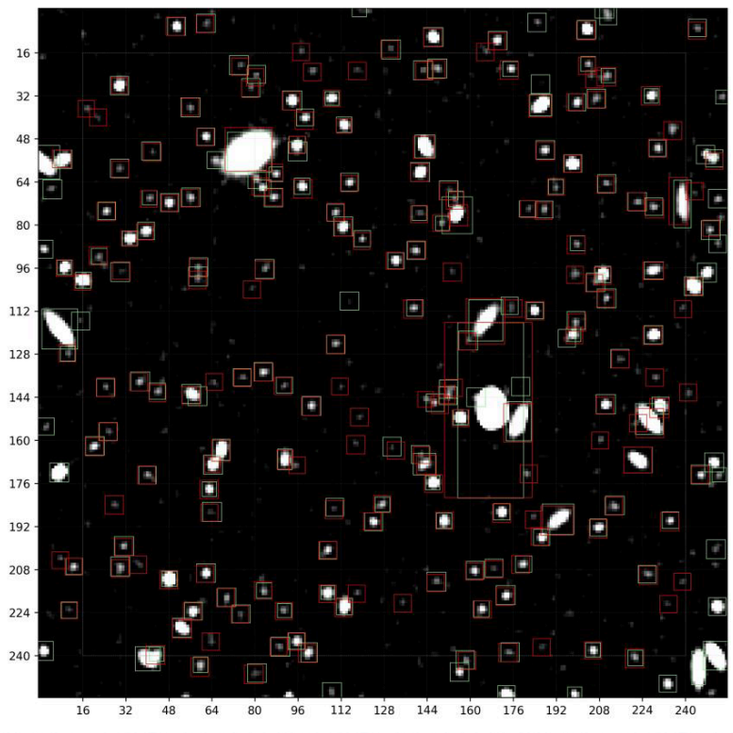
Identify and visualize the information in the data

2020-2024 : **MINERVA** (MachINe lEarning for Radioastronomy at the obserVatoire de pAris) https://vm-lerma.obspm.fr/minerva/

MINERVA

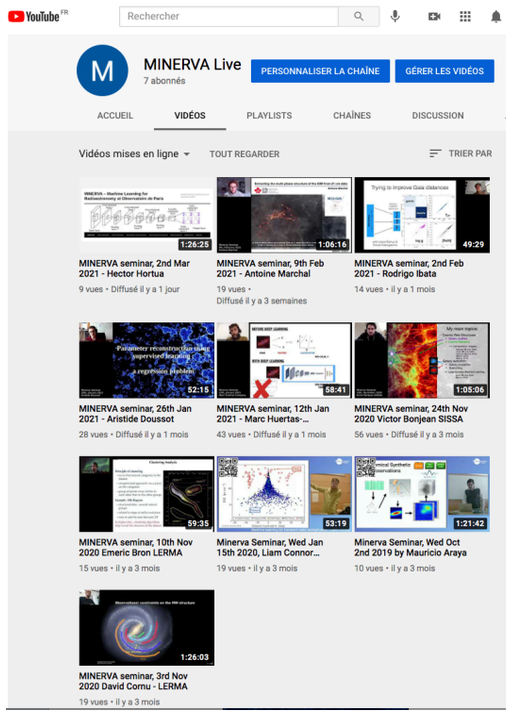


MINERVA : Winner of the SDC2 ! (Cornu et al.)



YOLO on SDC1

LoTSS DR2



Youtube Channel **(Subscribe)**

https://astrotube.obspm.fr/w/3j9P8HP3rvc1WPEto76GGt

Demo