Yafits - A distributed 2D/3D quick-look viewer

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

[1]*Observatoire de Paris, LERMA, CNRS, PSL University, Sorbonne University, UPMC, Paris;* philippe.salome@observatoiredeparis.psl.eu

Abstract. Yafits is a Distributed Quick Look Viewer (DQLV). Standing close to a set of FITS files stored on a distant server, it offers a rapid data inspection via a web browser client. With Yafits, no sotfware installation and no data download is needed for the user to access the data. Yafits includes a limited number of useful features to explore the data (positions for different projection systems, flux extraction and measurements, statistics of the data...). Yafits is interoperable with applications supporting the SAMP[1]protocol. This DQLV is used by Artemix (ALMA Remote Data Mining Experiment, http://artemix.obspm.fr) since 2018. It is well suited for archival data inspection, in particular for large files that require large enough RAM memory and computing power. It is build as a composition of Docker images. Yafits is referenced on Zenodo (https://doi.org/10.5281/zenodo.3696974) and accessible on Gitlab (https://gitlab.obspm.fr/artemix/yafits).

1. Introduction

Yafits (Yet Another FITS viewer), allows to browse remotely in a WEB navigator a collection of FITS files to visualize and to study their content. Inspired from tools like ds9 or goview (part of GILDAS software), it adds the distributed dimension. Yafits is included into Artemix that is described in Salomé et al. (2019) and Salomé et al. (2020).The project is a set of applications that have been packaged together into a Docker container in order to ease its distribution and installation. The only requirement is to have the Docker[2] and Docker-compose[3] applications available on the host where you plan to deploy the project. The code is documented with jsdoc [4] and sphinx[5]. The facility is architectured as a composition of five Docker images :

- yafitsv : an HTTP server (NodeJS[6]) that reacts to the user's requests such as navigating in the FITS collection or visually exploring the content of one selected FITS file

[1]https://www.ivoa.net/documents/SAMP/

[2]https://docs.docker.com/install/

[3]https://docs.docker.com/compose/install/

[4]https://jsdoc.app/

[5]https://www.sphinx-doc.org/en/master/

[6]https://nodejs.org/en/

- yafitss : an HTTP server (Bottle[7]) which actually performs all the hard work with the FITS files (browse, load in memory, extract parts to display, compute means...) and is callable via a series of REST APIs. It uses a number of Python modules from Astropy, (Astropy Collaboration 2013; Astropy Collaboration & Astropy Contributors 2018)
- spectro : an HTTP server (NodeJS) that searches spectroscopy data in a mongo database and sends results as JSON files
- seed : a container that simply copies spectroscopy data in the mongo container. It is only used when spectroscopy data are updated
- mongo[8] : a mongo database

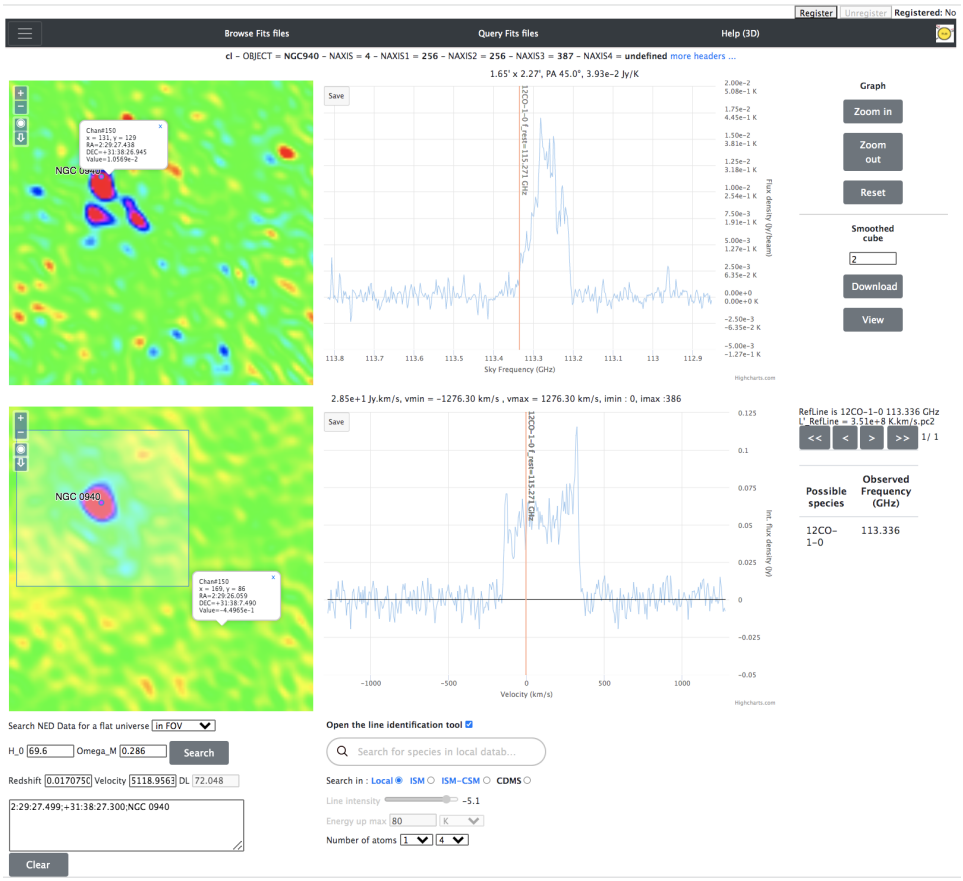

Figure 1. YAFITS interface showing the display of a 3D viewer. Line indentification has been performed

[7] `https://bottlepy.org/docs/dev/`

[8] `https://www.mongodb.com/`

2. Yafits features

The access to the FITS data set is possible inside the web-browser via a file browser and a query tool (SQLite[9]) selection built after the header keywords. The Yafits viewer proposes a number of analysis tools that are described in video and pdf tutorials. Yafits is specially designed for radio-astronomy data (ALMA, NOEMA, NenuFAR...) but could easily provide visualisation of other 2D and 3D FITS. Yafits uses the Openlayers[10] (for images) and Highcharts[11] (for spectra) javascript libraries. Main features are:

- Browse file collection, SQL-selection tools
- Pan and zoom in images and spectra
- Hanning smooth in frequency
- NED[12] query tool (add marker positions, retrieve source velocity/redshift)
- Line identification tools with many filter options. It uses CDMS[13] (Endres et al. 2016) and JPL[14] catalogues for multiple species rest frequency search
- Integrated line flux and luminosity computation
- Download : spectrum, channel map, moment maps (zeroth order)
- Export via samp : spectrum, channel map, moment maps (zeroth order)
- Open channel map and zeroth order moment maps (native or extracted from 3D)
- Several projection systems have been implemented in javascript (on the client-side) for a proper and rapid display of the coordinate grid

3. Conclusions

The Yafits DQLV is fully operational and its installation is very simple with Docker. A number of tools have been implemented to optimize the data inspection and leave further analysis for more dedicated softwares. Source position can be verified very quickly as well as image cross-matching with complementary data. Very fast line identification is made possible with filters on theoretical line frequencies searches. Fluxes, velocities, integrated measurements and statistics are easily accessible. Without any software installation or file download, astronomers can easily retrieve key information on a large number of big datasets inside their web-browser, even with limited local resources.

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[9] `https://www.sqlite.org/index.html`

[10] `https://openlayers.org/`

[11] `https://www.highcharts.com/`

[12] `https://ned.ipac.caltech.edu/`

[13] `https://cdms.astro.uni-koeln.de/classic/`

[14] `https://spec.jpl.nasa.gov/`

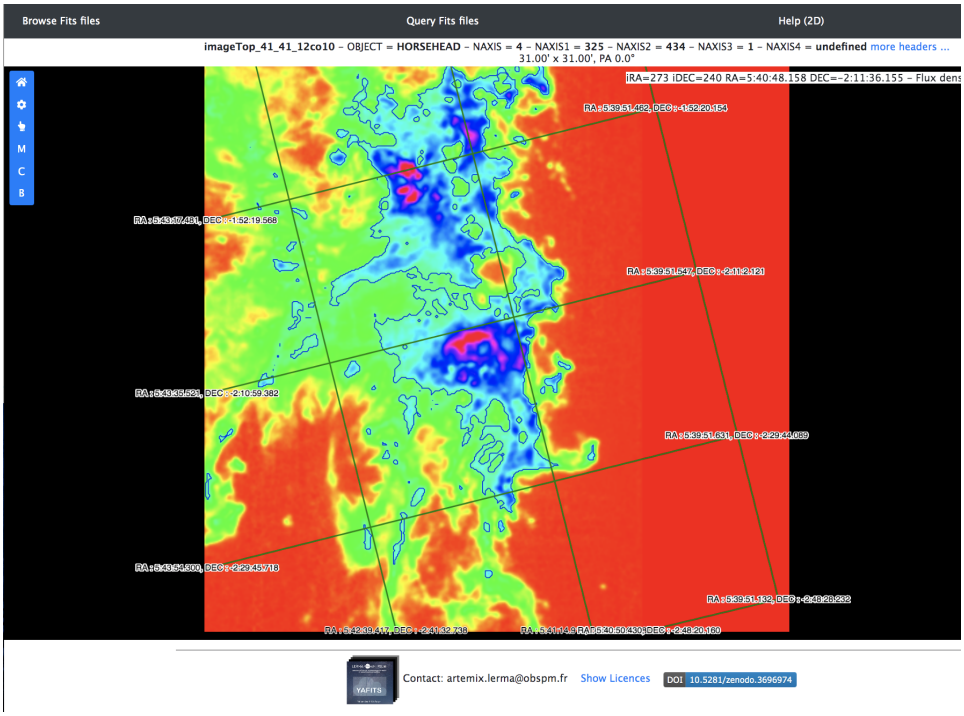

Figure 2. YAFITS interface showing the display of a 2D image. Line indentification has been performed

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References

Astropy Collaboration 2013, A&A, 558, A33. 1307.6212
Astropy Collaboration, & Astropy Contributors 2018, AJ, 156, 123. 1801.02634
Endres, C. P., Schlemmer, S., Schilke, P., Stutzki, J., & Müller, H. S. P. 2016, Journal of Molecular Spectroscopy, 327, 95. 1603.03264
Salomé, P., Caillat, M., Moreau, N., & Ba, Y. A. 2020, in Astronomical Data Analysis Software and Systems XXIX, edited by R. Pizzo, E. R. Deul, J. D. Mol, J. de Plaa, & H. Verkouter, vol. 527 of Astronomical Society of the Pacific Conference Series, 113

[15] https://dio.obspm.fr/

[16] https://padc.obspm.fr/

[17] https://padc.obspm.fr, https://vm-wordpress-lerma01.obspm.fr/af-anh/

[18] http://www.astropy.org

Salomé, P., Kasradze, N., & Caillat, M. 2019, in Astronomical Data Analysis Software and Systems XXVI, edited by M. Molinaro, K. Shortridge, & F. Pasian, vol. 521 of Astronomical Society of the Pacific Conference Series, 421