



"We interfere constructively"

JMMC Updates 2024

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LESIA



Observatoire de la CÔTE d'AZUR



THE UNIVERSITY OF SYDNEY



Australian National University



KYOTO SANGYO UNIVERSITY





JMMC Services



VLTI



CHARA

- + Expertise Center
- + User Support
- + Training
- + OLBIN publications

Real time astrophysical models

AMHRA

SearchCal

Found Calibrators

a2p2

Reduce data

- amdlib
- pndrs

Aspro2

SearchFTT

Prepare Observations

VO SAMP

View Data

OIFits Explorer

CDS Catalogs

Search Data

JSDC JMDC

OiDB

Fit Models

LITpro

Reconstruct Images

Olmaging

News

- Great VLTI School in June 23 (Budapest), ***next in Porquerolles Island (France), Sep 22-28 2024 !***
- Gaspard Duchêne joined in late 2023 to take the scientific leadership on OiDB & JMMC databases
- Human resources involved: (small team but wonderful)
 - Engineers: 1.3 FTE
 - JMMC Services & User support: 1.2 & 0.7 FTE
- New tutorials (Myriam Benisty):
 - <https://www.jmmc.fr/english/training/tools-tutorials/>
- Release page:
 - <https://releases.jmmc.fr/>

Outline

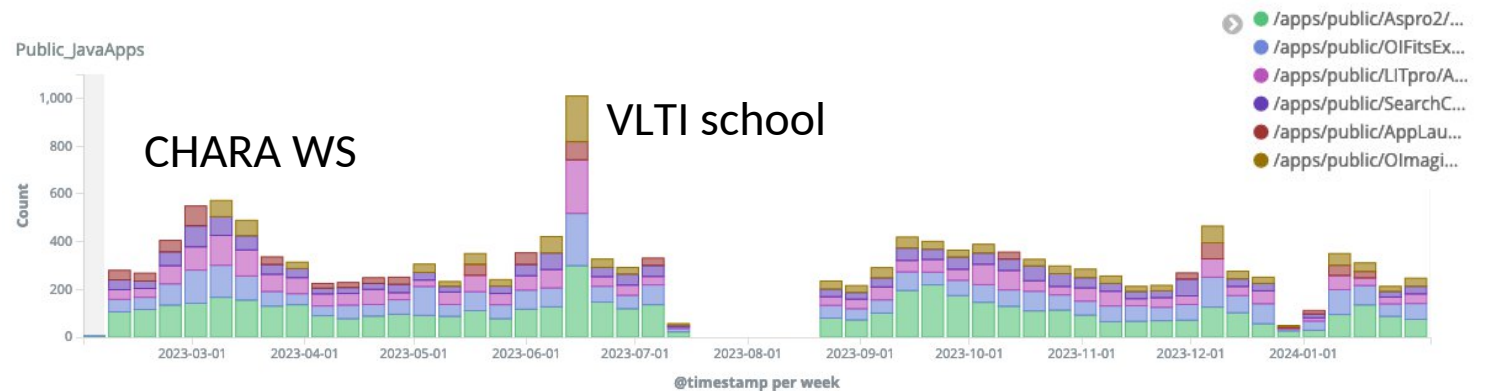
- Major service Updates
- JMMC Roadmap for 2024
- CHARA support actions & longer-term perspectives

Reminder: JMMC 'Open' strategy (license):

- Public money = public code (GPL)
 - <https://github.com/JMMC-OpenDev>
- Open Data (FAIR)

"We interfere constructively"

- Statistics still high:

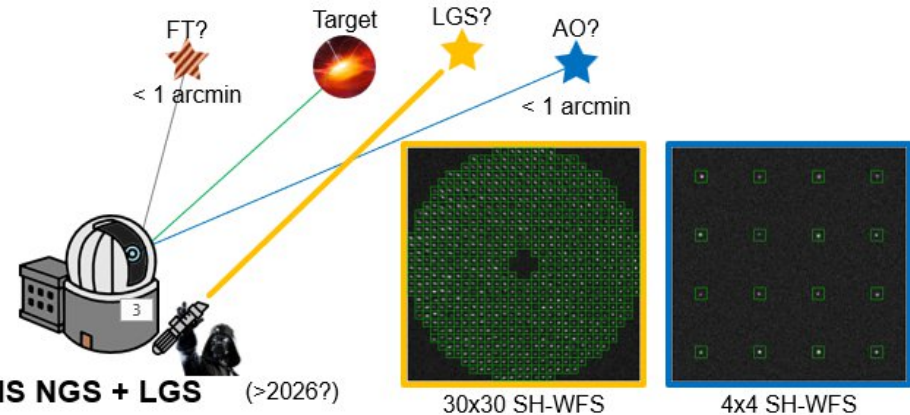




Preparing for GRAVITY+

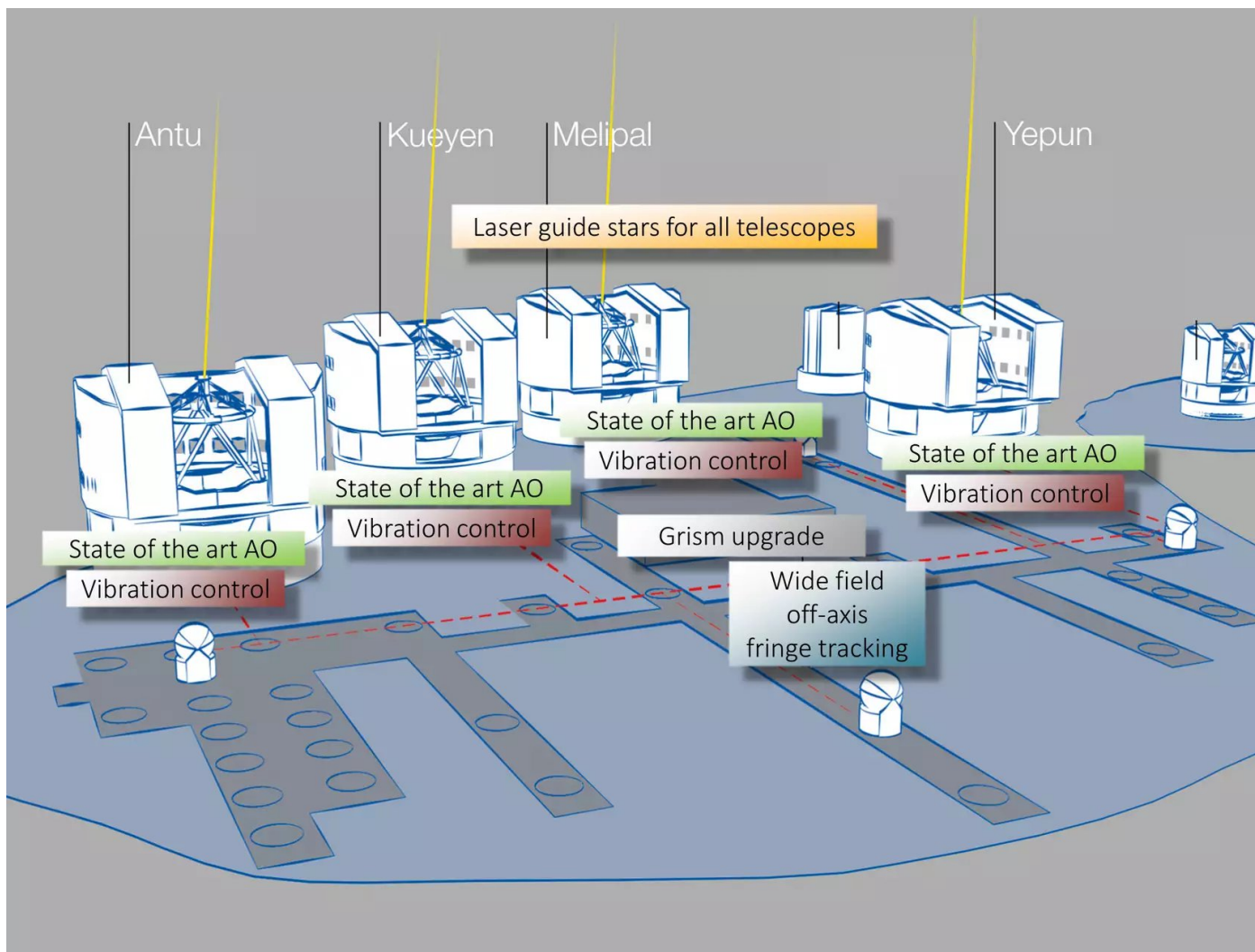
- Massive challenge

- Aspro2:** allow the user to handle science, adaptive optics and fringe tracking targets potentially different
- Aspro2:** integrate a proper noise model of GPAO the off-axis adaptive optics and fringe tracking mode (inputs from T. Shimizu, A. Berdeu, J-B. Le Bouquin)
- Aspro2:** integrate the fringe tracking jitter on the science instrument noise for GRAVITY & MATISSE (GRA4MAT)






Preparing for GRAVITY+



GPAO (UTs):

- NGS VIS in 24.08
 - R band, 1300 act.
- LGS in 2026:
 - 4 Laser guide stars
 - Fast AO + low Tip-tilt correction

Preparing for GRAVITY+

- Massive challenge
 - SearchFFT**: new tool to search for proper FT and AO stars
 - Compute and filter hundreds of targets
 - By score or ranking position:

HD 156411	259.964	-48.549	HD 156411	HD 156411	0.
CD-31 9113	173.862	-32.540	CD-31 9113	CD-31 9113	0.
HAT-P-17	324.536	30.489	HAT-P-17	HAT-P-17	0.

Showing 1 to 156 of 156 entries (filtered from 223 total entries)

Limit to:

Get my ASPRO2 file

The screenshot shows the 'AO setup' section with 'GPAO_NGS_VIS' selected. The 'Fringe Tracker mode' is set to 'GRAVITY'. Under 'FT target', 'Gaia DR3 2095108312831833600' is selected. The 'HA min' and 'HA max' values are also visible.

The screenshot shows the SearchFFT web interface with search results. The 'Constraints' section shows 'FT mag' set to 12, 'AO mag' to 12.5, and 'declinaison' to 40. The results table has columns for 'user_identifier', 'ra', 'dec', 'FT identifier', 'AO identifier', 'Score', 'Rank', 'ft_mag', 'sci_ft_dist', 'ao_mag', 'sci_ao_dist', 'ft_ao_dist', and 'Catalog'. The last row is highlighted in red, showing a score of 0.001 and rank of 2.

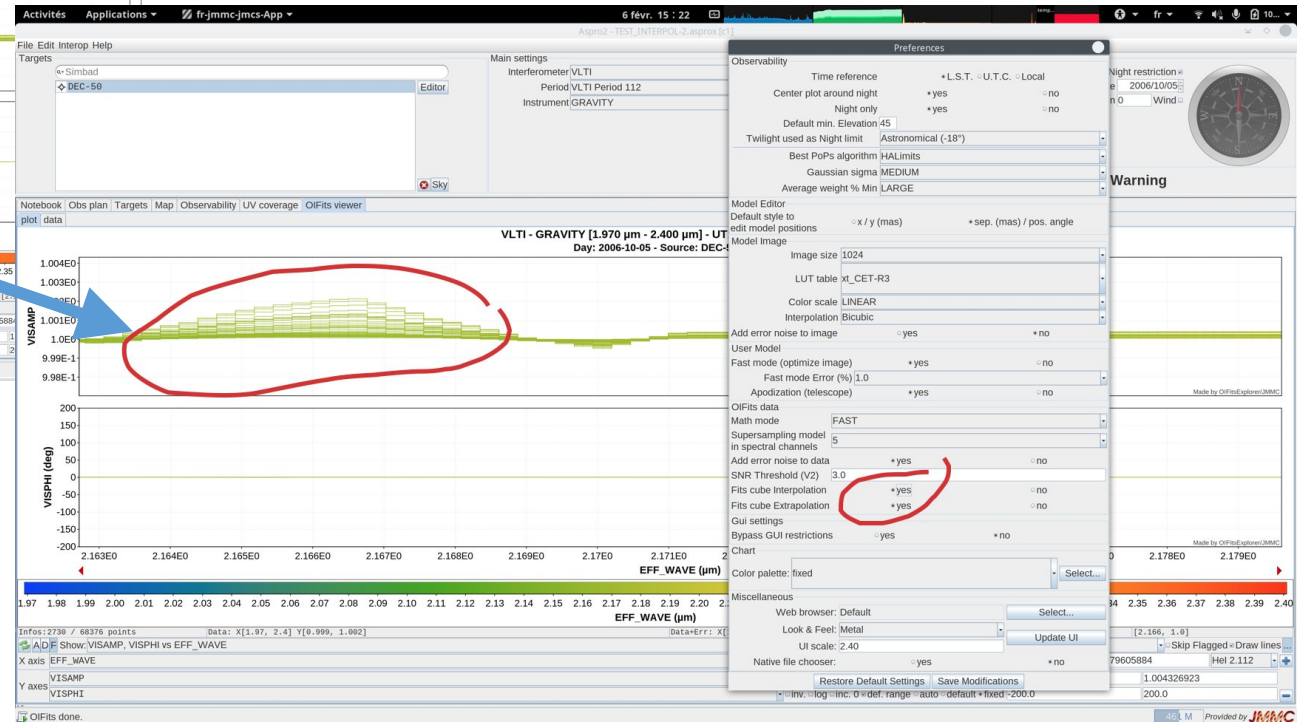
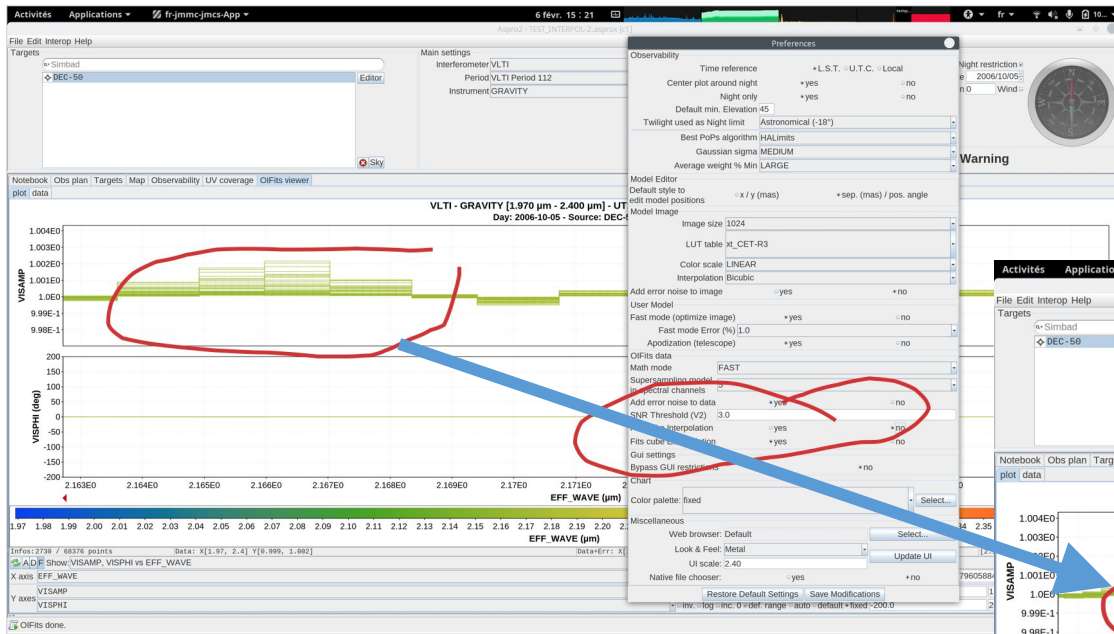
user_identifier	ra	dec	FT identifier	AO identifier	Score	Rank	ft_mag	sci_ft_dist	ao_mag	sci_ao_dist	ft_ao_dist	Catalog
HD 192310	303.822	-27.033	HD 192310	HD 192310	0.692	1	3.501	2.172	5.481	2.172	0	Gaia DR3
HD 156846	260.143	-19.334	HD 156846	HD 156846	0.724	1	5.149	0.124	6.376	0.124	0	Gaia DR3
HD 156846	260.143	-19.334	HD 156846B	HD 156846	0.658	2	6.377	5.235	6.376	0.124	5.351	Gaia DR3
HD 156846	260.143	-19.334	HD 156846	HD 156846B	0.441	3	5.149	0.124	12.212	5.235	5.351	Gaia DR3
HD 156846	260.143	-19.334	HD 156846B	HD 156846B	0.401	4	6.377	5.235	12.212	5.235	0	Gaia DR3
HD 86081	149.025	-3.808	HD 86081	HD 86081	0.703	1	7.299	0.002	8.599	0.002	0	Gaia DR3
HD 125595	215.347	-40.394	HD 125595	HD 125595	0.679	1	6.447	2.143	8.662	2.143	0	Gaia DR3
HD 125595	215.347	-40.394	HD 125595	Gaia DR3 6104435819513398272	0.001	2	6.447	2.143	12.565	29.927	29.923	Gaia DR3

<https://searchfft.jmmc.fr>



Aspro2: a better handling of spectral resolution

New Interpolation (by default) & extrapolation in FITS image cubes



OIFits Explorer



- No major change in 2023

Fixed U-V plot orientation !

Plotting window (with tabs)

Granule tree panel

OI data selector

Filter panel

Oitools
Command line arguments

Tab view

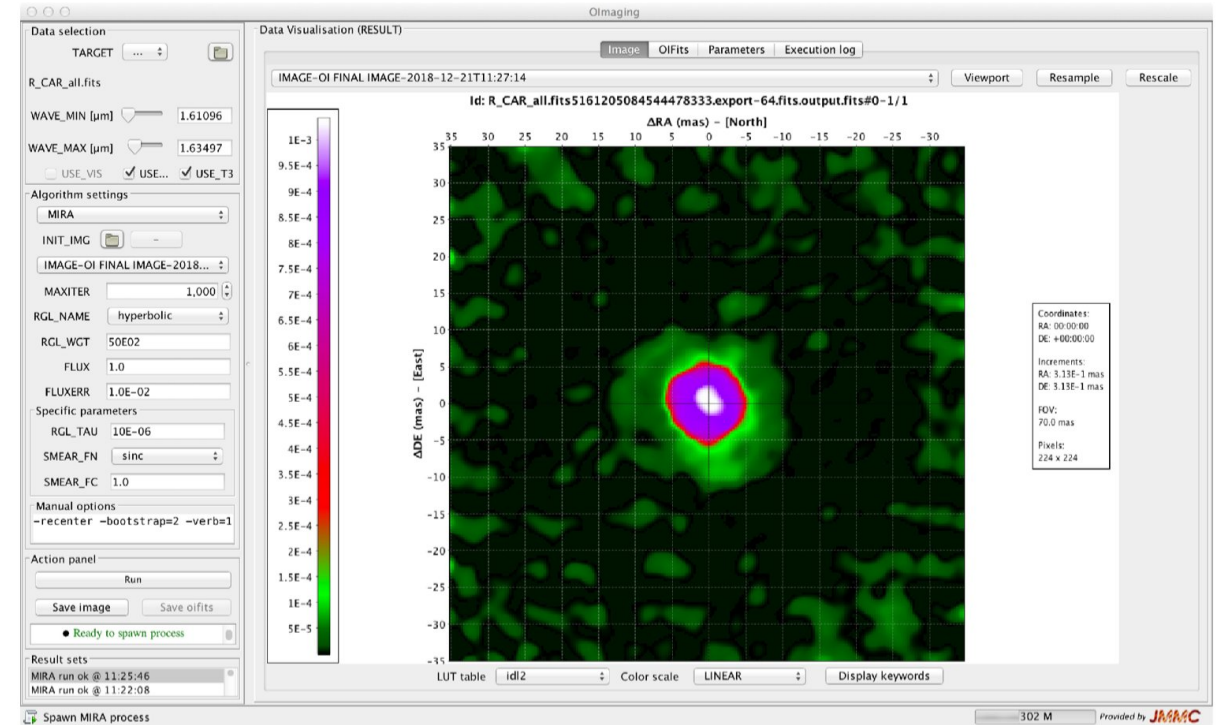
The screenshot displays the OIFits Explorer interface. On the left, there are three panels: a granule tree panel showing a hierarchy of data points for target ACHERNAR; an OI data selector panel listing various observation parameters; and a filter panel with checkboxes for 'EFF_WAVE' and 'MJD'. Below these is the 'Oitools' section with CLI arguments: `CLI args: -target_id ACHERNAR -mjd 55780.392185391365, 56706.0 -eff_wave 1.512822230487154E-6, 1.59263E-6`. The main area shows a 'Tab view' with a 'Plot/data switch' and two plotting windows. The top window is a 'VISZDATA' plot showing spatial frequency vs. visibility. The bottom window is a 'T3PHI (deg)' plot showing phase vs. spatial frequency. A color bar at the bottom indicates effective wavelength from 1.54 to 1.79 micrometers. The bottom right of the interface shows plotting parameters for X and Y axes, including axis labels, scales, and units.

Plotting parameters

OImaging

- No developments in 2023
- Little community feedback

=> need to understand use and limitations to prioritize next steps



AMHRA

Real time astrophysical models

- Kinematic Be disk**
Model of the geometry (size and shape) and kinematics (rotation and expansion) of circumstellar, flat, rotating disks, relevant to Be stars. It is suited to interpret spectro-interferometric data obtained on emission lines formed in the disk.
- Disk and stellar continuum – DISCO**
Model of the continuum emission from a star surrounded by a gaseous circumstellar disk (free-free and bound-free), with partially ionized and geometrically thin disk with a physical structure given by the viscous Keplerian accretion disk model. DISCO is well suited to model Be stars.
- Evolved stars (RSG, AGB)**
Stellar surface maps of evolved stars (RSG and AGB) computed from a 3d hydrodynamical simulation with COSMOS-OPTIM3D. The available model corresponds to a star similar to the famous RSG Betelgeuse.
- Binary spiral model**
Phenomenological model mimicking the shock caused by the collision between the winds from massive stars (e.g. WR and OB stars) and that results in dusty spirals.

- Generate (semi)-parametric astrophysical model images (grid) and send them to Aspro2 → OiFitsExplorer → Oimaging
- New YSO disk model with temperature profile:
 - Possibility to explore grid parameters and generate a cube of images
 - Batch mode offered
- Open to new models suggestions !

Circumstellar dust-disc parameters

Grid parameters

(Grid parameter under test)

Inner radius :

Min : Max :

Number of points : Sampling type : evenly spaced Flag for log :

Dust-disc outer radius: AU

Dust opacity model:

Temperature at disc basis (inner radius): K

Power-law coefficient for disc temperature :

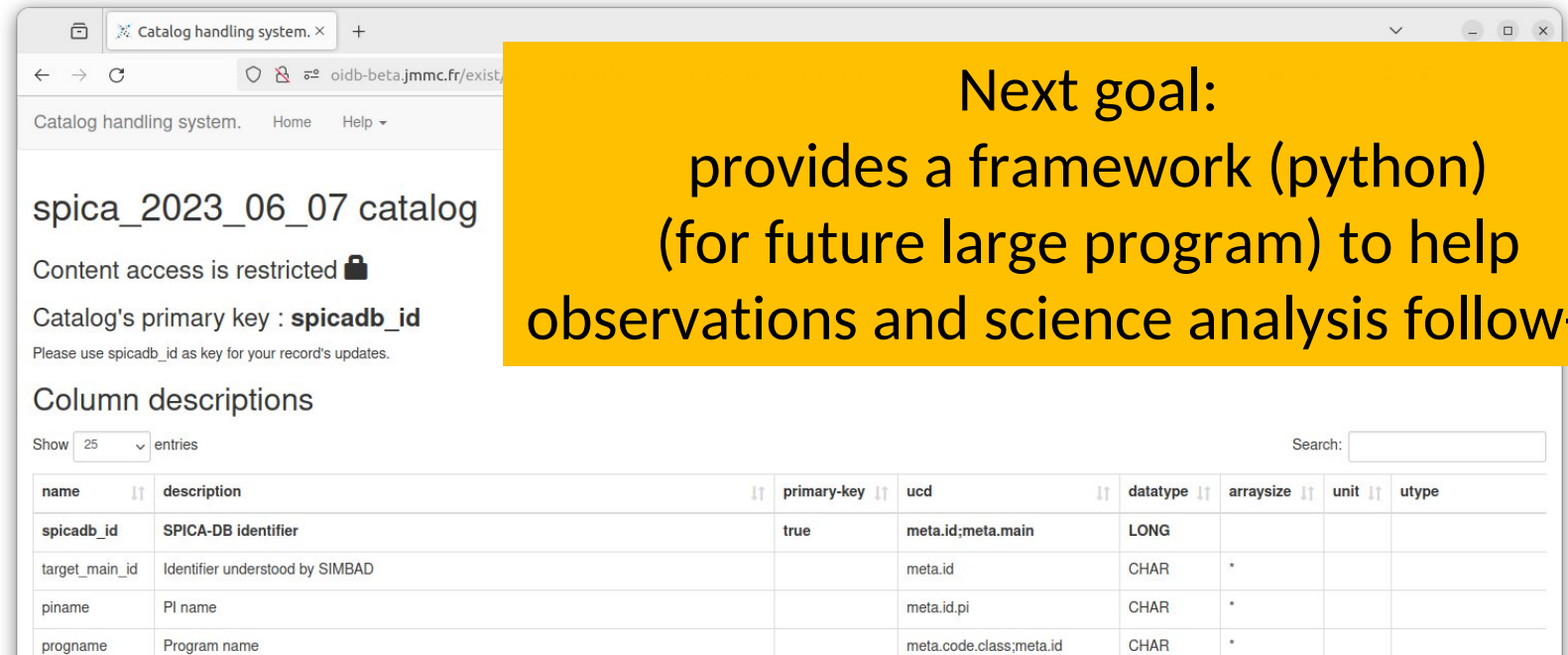
SPICA-DB in a nutshell

Adapt, develop missing building blocks for a synergistic solution

- Enhance data interchange between systems for a better interoperability (VO spirit)
- Offer collaborative catalogs and provide APIs for distributed content management:
CRU(D) : Create - Read - Update - (Delete)

Involved JMMC services:

- Catalog API (spica-db, calibrators) delegation support
- ObsPortal (obs log)
- OiDB (remote public/under embargo L1 L2, TF, quality plots...)
- BadCal
- JMDC, JSDC 2 / 3 (coming)
- a2p2 → SPICA server (python REST server)
- ASPRO2 interoperability (SAMP)



Next goal:
provides a framework (python)
(for future large program) to help
observations and science analysis follow-up

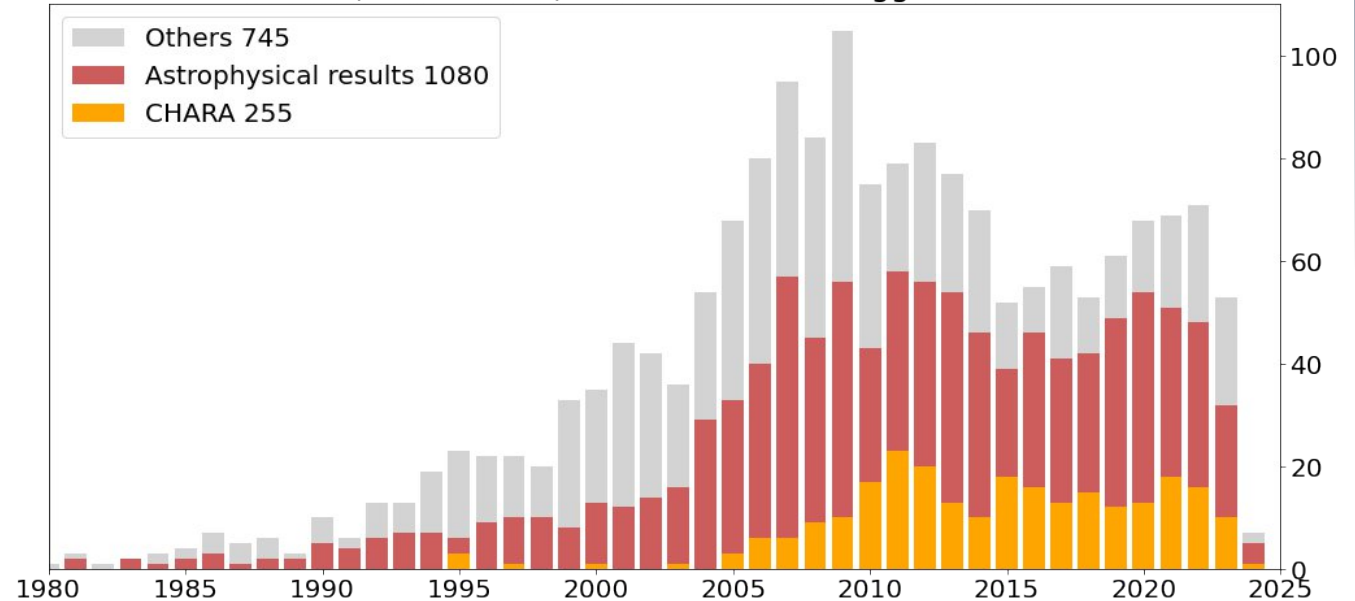
Column descriptions

name	description	primary-key	ucd	datatype	arraysize	unit	utype
spicadb_id	SPICA-DB identifier	true	meta.id;meta.main	LONG			
target_main_id	Identifier understood by SIMBAD		meta.id	CHAR	*		
piname	PI name		meta.id.pi	CHAR	*		
programe	Program name		meta.code.class;meta.id	CHAR	*		

Publications.OLBIN.org

- Curation/tagging on a monthly basis
- 1800+ refereed ADS articles
 - new interferometric results
 - Observational, theoretical, experimental or technically related to Interferometry
 - Direct, Heterodyne, Intensity, Nulling and Aperture Masking Interferometry (new)
- Useful for paper reviews ?
- Minor UI changes :
 - Search for publications related to a your targets
 - Export or explore form results in ADS

OLBIN (1920 - 2024) - Rank A articles tagged 'CHARA'



Tags used to search into the publication database : **CHARA** and **Binary and multiple stars**

Query of the publication database search : **Schaefer**

41 matching articles [\(view on ADS\)](#)

Astrophysical results (41)

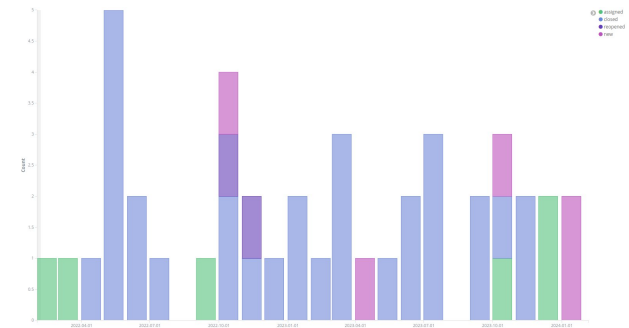
YEAR 2024

The interface also shows a 'Paper Network' visualization with nodes for 'precision', 'armada', 'companion', 'orbit', 'cephei', 'companion', 'giant', 'rs', 'aurigae', 'orbits', 'precise', 'age', 'visual', 'hd', 'cephei', 'companion', 'giant', 'rs', 'aurigae', 'orbits', 'precise', 'age', 'visual', 'hd'.



JMMC User Support

- Historically 1 mailing list: jmmc-user-support@jmmc.fr
- Feedback form: <https://apps.jmmc.fr/feedback/>
- VLTI (French) Expertise Center:
 - See <https://www.jmmc.fr/english/user-support/expertise-center/>
 - preparation of observing proposals and observations
 - GRAVITY and MATISSE data reduction => new OIBD datasets
 - data analysis using model fitting and image reconstruction software



Support requests (22-now)

Since early 2024 all support requests & bug reports are supervised by the JMMC SUV service to improve response time & deal with all incoming requests.



JMMC short term (1yr) Roadmap

- **Aspro 2:**
 - Finalize integration of Gravity+ and GRAVITY for MATISSE (including LGS with A. Berdeu, J.B.Le Bouquin)
 - Integrate LITpro analytical models with blackbody temperature
- **Aspro2/a2p2:**
 - Link between Aspro2 and Cosmic Debris (CHARA)
- **OIFitsExplorer:**
 - Better ergonomoy to deal with data units / files / granules
- **Oimaging:**
 - Propose a set of standard metrics to compare the quality of image reconstruction (E. Thiébaud)
 - Integrate a standard beam estimation (F. Soulez)
- **JSDC 3 / SearchCal**
 - Integration of mid-infrared photometry and infrared excess information (Pierre Cruzalèbes)
- **AMHRA:**
 - generalize to all models the possibility to generate model grids
 - New models ?
- **LITpro:** development frozen
- **BadCal:** enrichment + interrogation by other tools (e.g SearchCal, Aspro2)

JMMC & CHARA “Backlog”

- Aspro2 → a2p2 → Cosmic Debris integration
- Proper modeling of the instruments (including AO)
- Taking into account fringe tracking
- Automatic optimization of POPs
- Providing a POP-free sky coverage (overall coverage)
- Specific needs for 7T operation ?
- Checking the JMDC data base with CHARA diameters
- Continue to feed BadCal & OiDB

We need CHARA inputs & define priorities (best-effort) !





JMMC & community longer term roadmap

- **OIDB:** help feeding the archive (see Gaspard's talk), provide DOIs or permanent links for publications, collections & collaborative session
- **ASPRO2:**
 - Allow multiple instrument management
 - New ASGARD suite instruments (including NOTT nuller)
 - Model "blocs" in Aspro2
 - Enable large program management (inspired by SPICA)
- **Diameters / JSDC:**
 - JSDC4: precision stellar diameters (SPICA & GAIA) ?
- **AMHRA:** enrichment of models astrophysical ?
- Standard SCI-CAL calibration tool
- Diameter estimation from user-provided photometry
- Data reduction, model fitting, precision interferometry workshop: harmonization of approaches ?

**CHARA meetings: a rich source of new ideas !
Priorities are open to discussion !**

Contact US

- JMMC Issues on github
<https://github.com/JMMC-OpenDev/>
- Email: jmmc-user-support@jmmc.fr

Thanks for your attention!