

"We interfere constructively"

# JMMC Updates 2024

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2024.03.13 @ Tucson, arizona



# JMMC Services

The CHARA Science Meeting 2024



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

AMHRA

SearchCal

a2p2

Reduce data

- amdlib
- pndrs

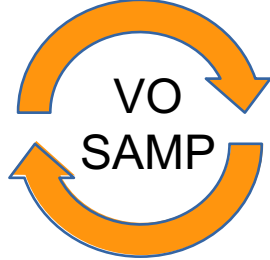
Aspro2

SearchFTT

View Data

OIFits Explorer

Prepare Observations



Fit Models

CDS Catalogs

JSDC JMDC

Reconstruct Images

Search Data

OiDB

Olmaging

LITpro

# 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

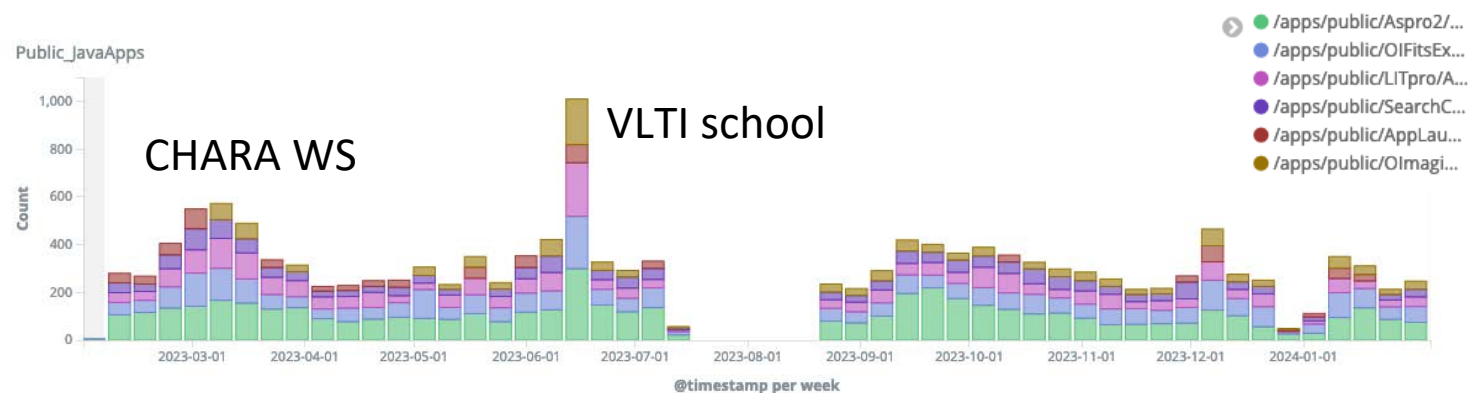
- Major service Updates
- JMMC Roadmap for 2024
- CHARA support actions & longer-term perspectives

Reminder: JMMC 'Open' strategy (license):

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

"We interfere constructively"

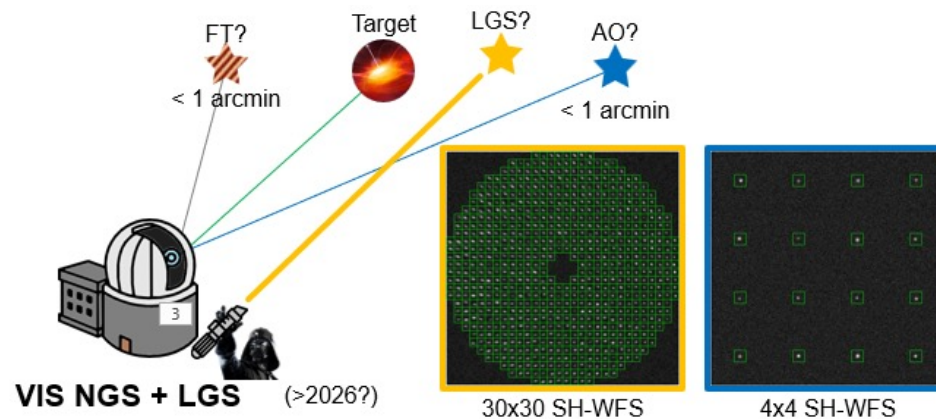
- Statistics still high:



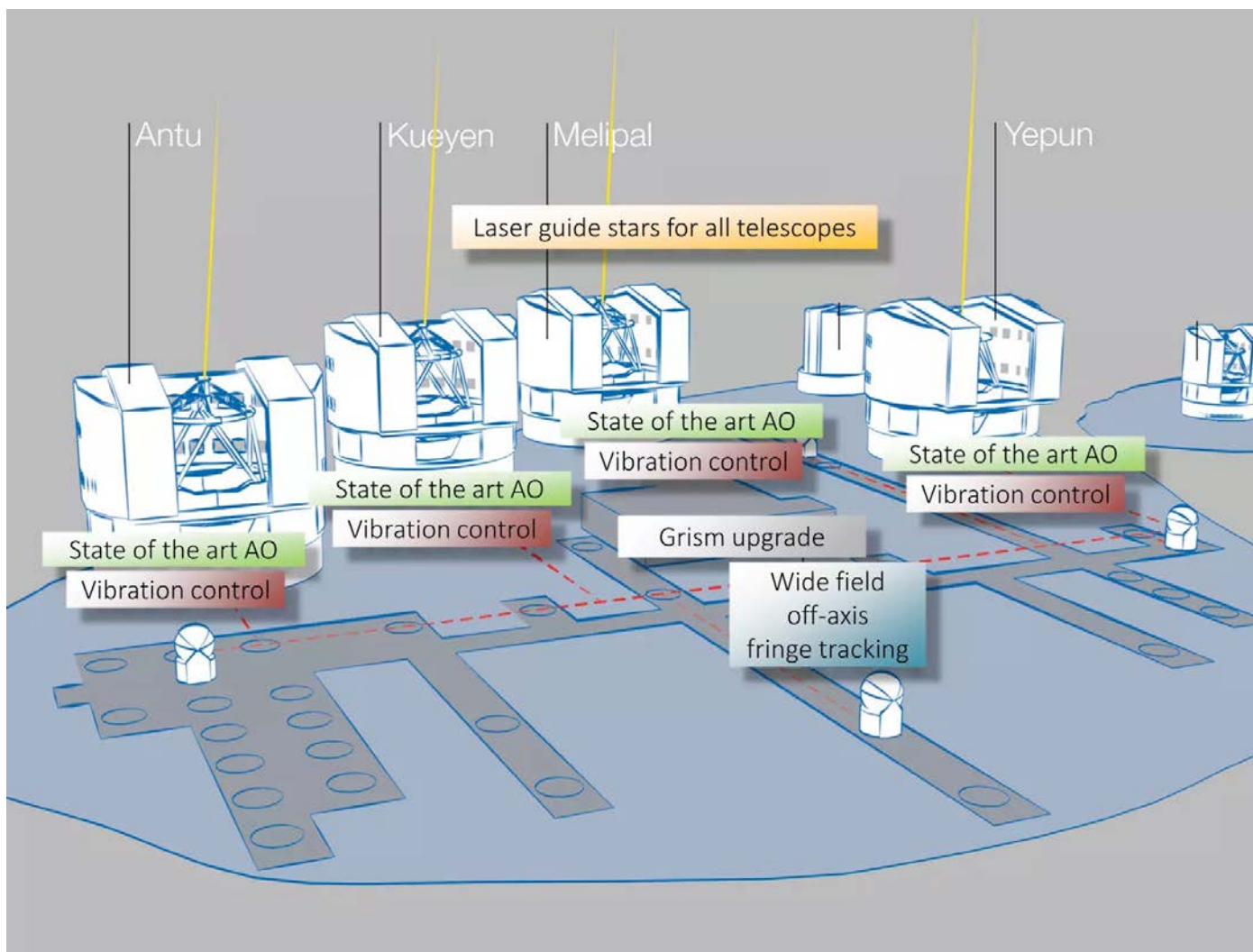
# Preparing for GRAVITY+

- 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:

<a href="#">HD 156411</a>	259.964	-48.549	<a href="#">HD 156411</a>	<a href="#">HD 156411</a>	0.
<a href="#">CD-31 9113</a>	173.862	-32.540	<a href="#">CD-31 9113</a>	<a href="#">CD-31 9113</a>	0.
<a href="#">HAT-P-17</a>	324.536	30.489	<a href="#">HAT-P-17</a>	<a href="#">HAT-P-17</a>	0.

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

Limit to:

[Get my ASPRO2 file](#) [Get as SearchFFT input file](#)

The screenshot shows the configuration panel for the SearchFFT tool. Key settings include:
 

- Instrument mode:** LOW-COMBINED
- Atmosphere quality:** Average
- AO setup:** GPAO\_NGS\_VIS
- Fringe Tracker mode:** FringeTrack GRAVITY
- FT target:** UCAC4 629-058739
- Star selection:** Gaia DR3 2095108312831833600
- HA min:** 12.00
- HA max:** 12.00

The screenshot shows the SearchFFT web interface. The search criteria are:
 

- Catalogs to query:** Gaia DR3
- Constraints:** FT mag 12, AO mag 12.5, declinaison 40

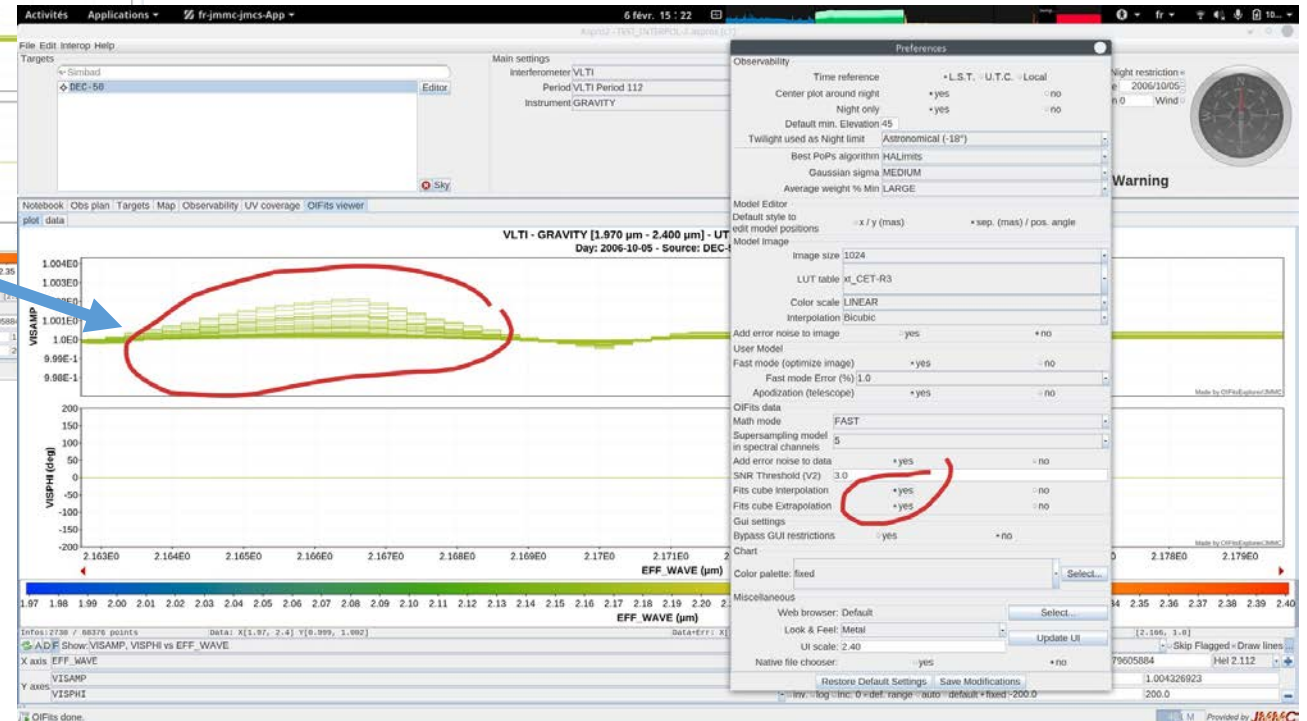
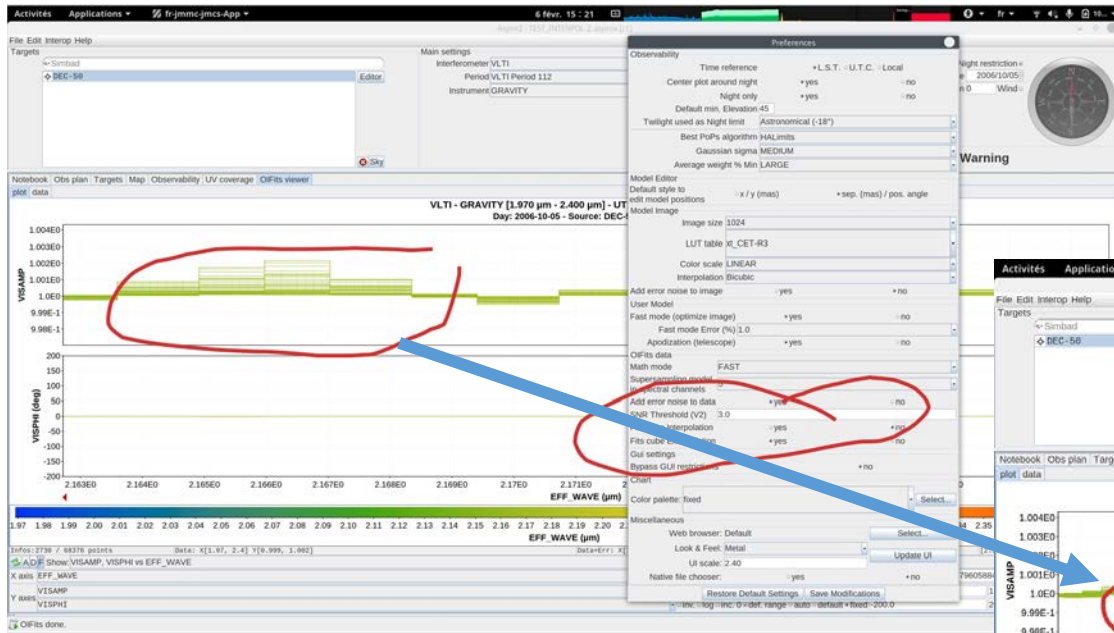
 The results table shows 150 targets with columns for user\_id, ra, dec, FT identifier, AO identifier, Score, Rank, ft\_mag, sci\_ft\_dist, ao\_mag, sci\_ao\_dist, ft\_ao\_dist, and Catalog. A red box highlights the 'Score' and 'Rank' columns for the first few entries.

user_id	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	5.501	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

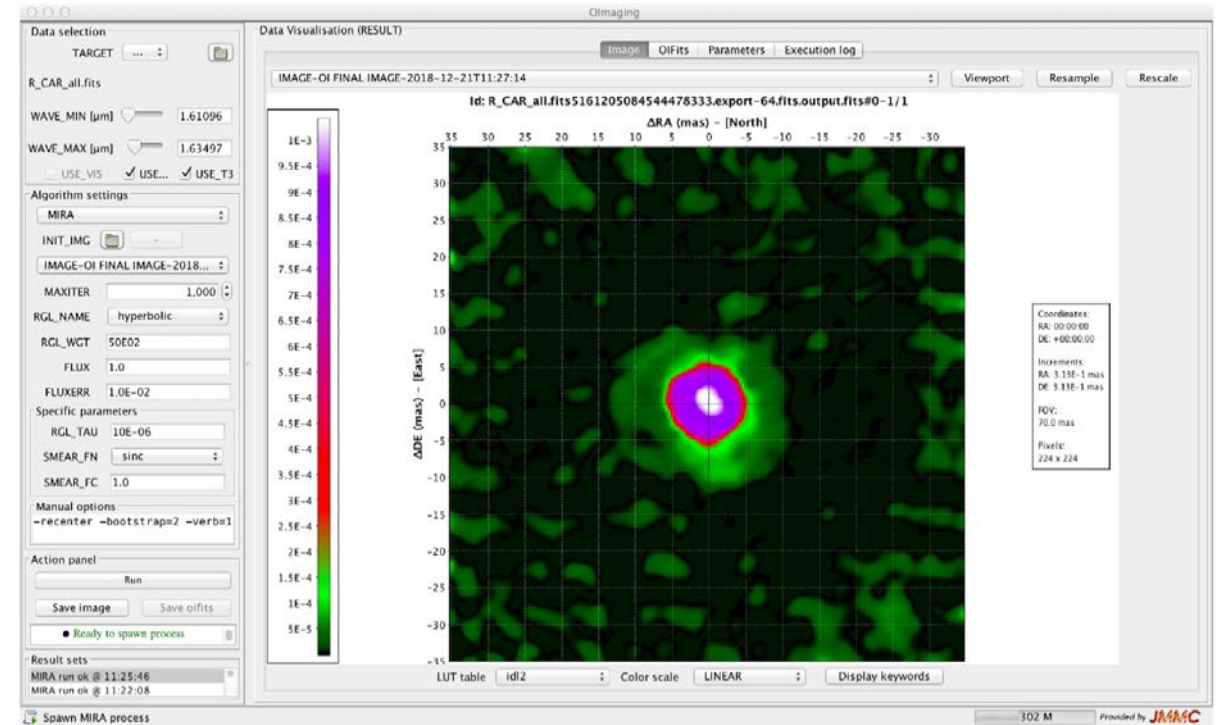


Plotting parameters

# Olmaging

- No developments in 2023
- Little community feedback

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



# AMHRA

- 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 !

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.

## Circumstellar dust-disc parameters

Grid parameters

(Grid parameter under test)

**Inner radius :**

Min :  Max :

Number of points :  Sampling type :  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

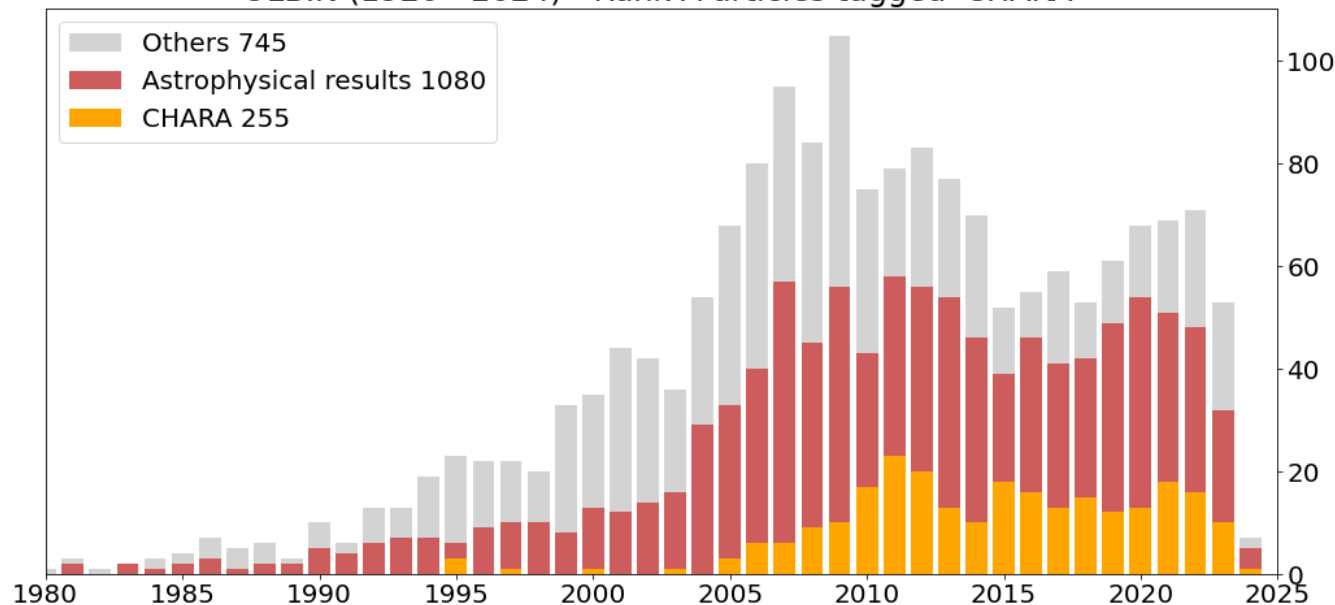
name	description	primary-key	ucd	datatype	arraysize	unit	utype
spicadb_id	SPICA-DB identifier	true	meta.id;meta.main	LONG			
target_main_id	Identifier understood by SIMBAD		meta.id	CHAR	*		
piname	PI name		meta.id.pi	CHAR	*		
programe	Program name		meta.code.class;meta.id	CHAR	*		

# 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**

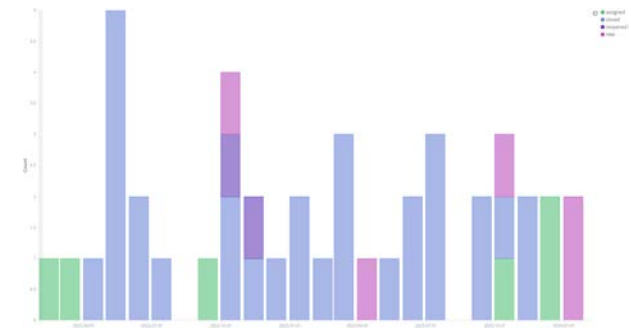
41 matching articles [\(view on ADS\)](#)

Astrophysical results (41)

YEAR 2024

# JMMC User Support

- Historically 1 mailing list: [jmmc-user-support@jmmc.fr](mailto: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](mailto:jmmc-user-support@jmmc.fr)

# Thanks for your attention!