

ESO / VLTI-Expertise Centres meeting
2019/12/04 - Garching



JMMC *Tools & Services*

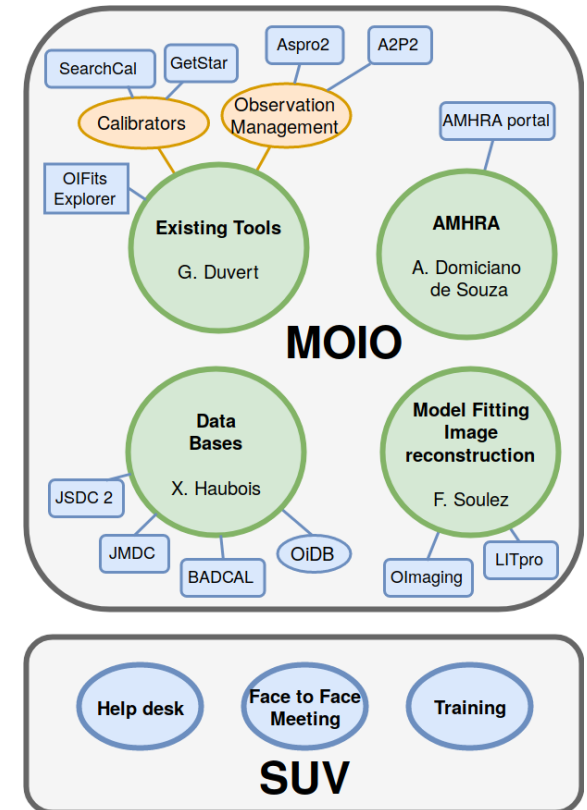
**Gilles Duvert,
Laurent Bourgès, Guillaume Mella**



JMMC = MOIO + SUV services

The Jean-Marie Mariotti Center is the French Center for Infrared & Optical Interferometry:

- MOIO service: Software & Service provider
 - R&D network (4 sites ~ 20 scientists)
 - Services are « VO » compliant & interoperable
- SUV service: French VLT Center
 - Support center: face-to-face help to reduce data, perform data analysis
 - Training network



Service overview

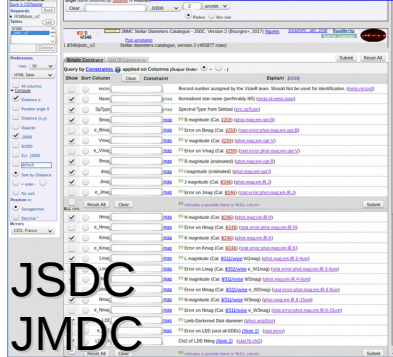


VLT

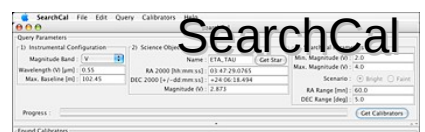


CHARA

CDS Catalogs

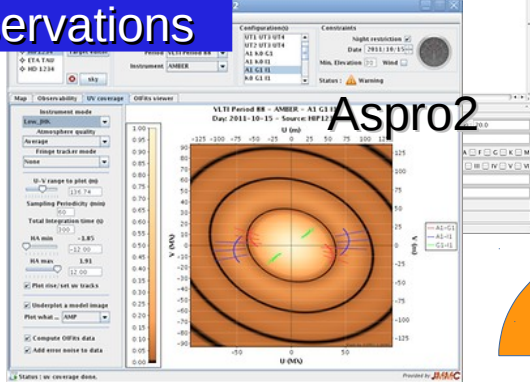


JSDC
JMDC



SearchCal

Prepare Observations

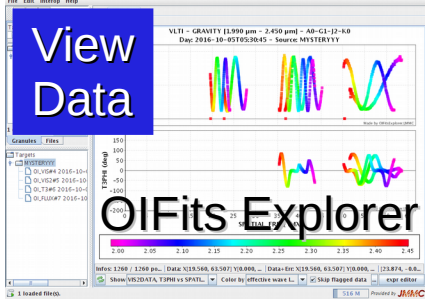


Aspro2

Reduce data
amdlib
pndrs



View Data

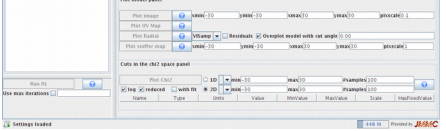


OIFits Explorer



Fit Models

LITPro



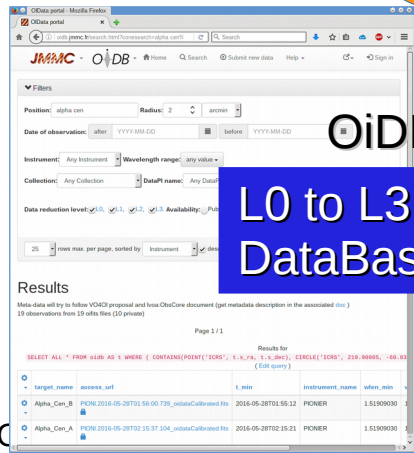
+ Training

+ User Support

2019/12/04

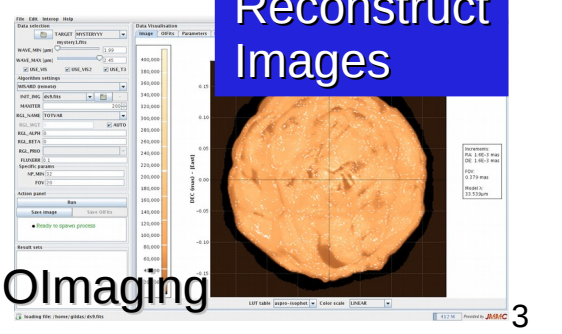
ESC

L0 to L3
DataBases



OiDB

Reconstruct Images



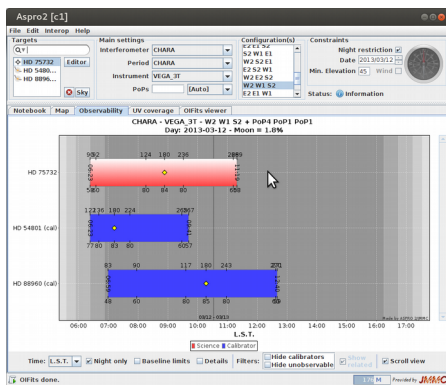
OImaging

3

ASPRO2: Astronomical Software to PRepare Observations

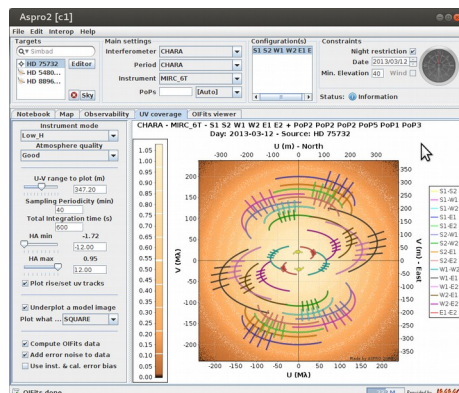
Complete observation preparation tool for VLTI / CHARA (all instruments)

- Estimates observation feasibility (proposal preparation)
- Simulates data sets with proper noise modeling in OIFITS format
- Feeds directly OBs to ESO p2: use A2P2
- Handles & shares your large source lists, helps night scheduling

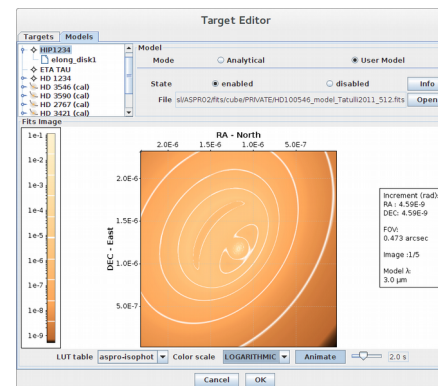


Observability

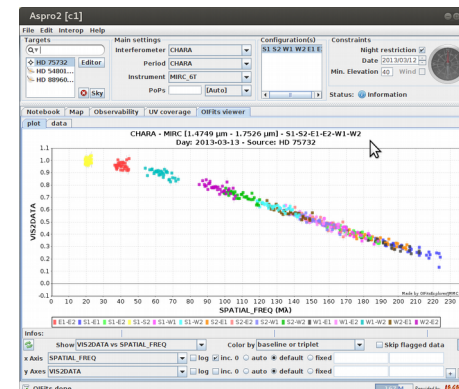
2019/12/04



UV plane

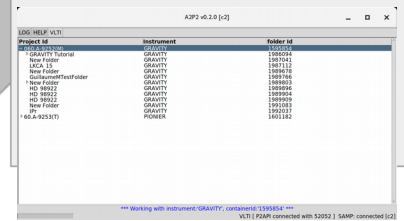
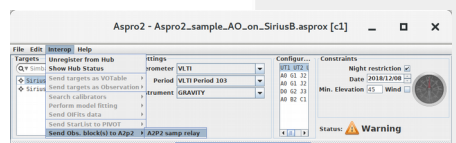
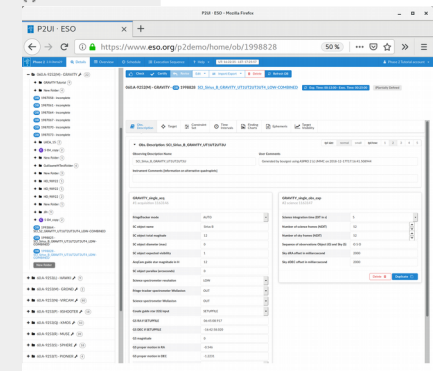
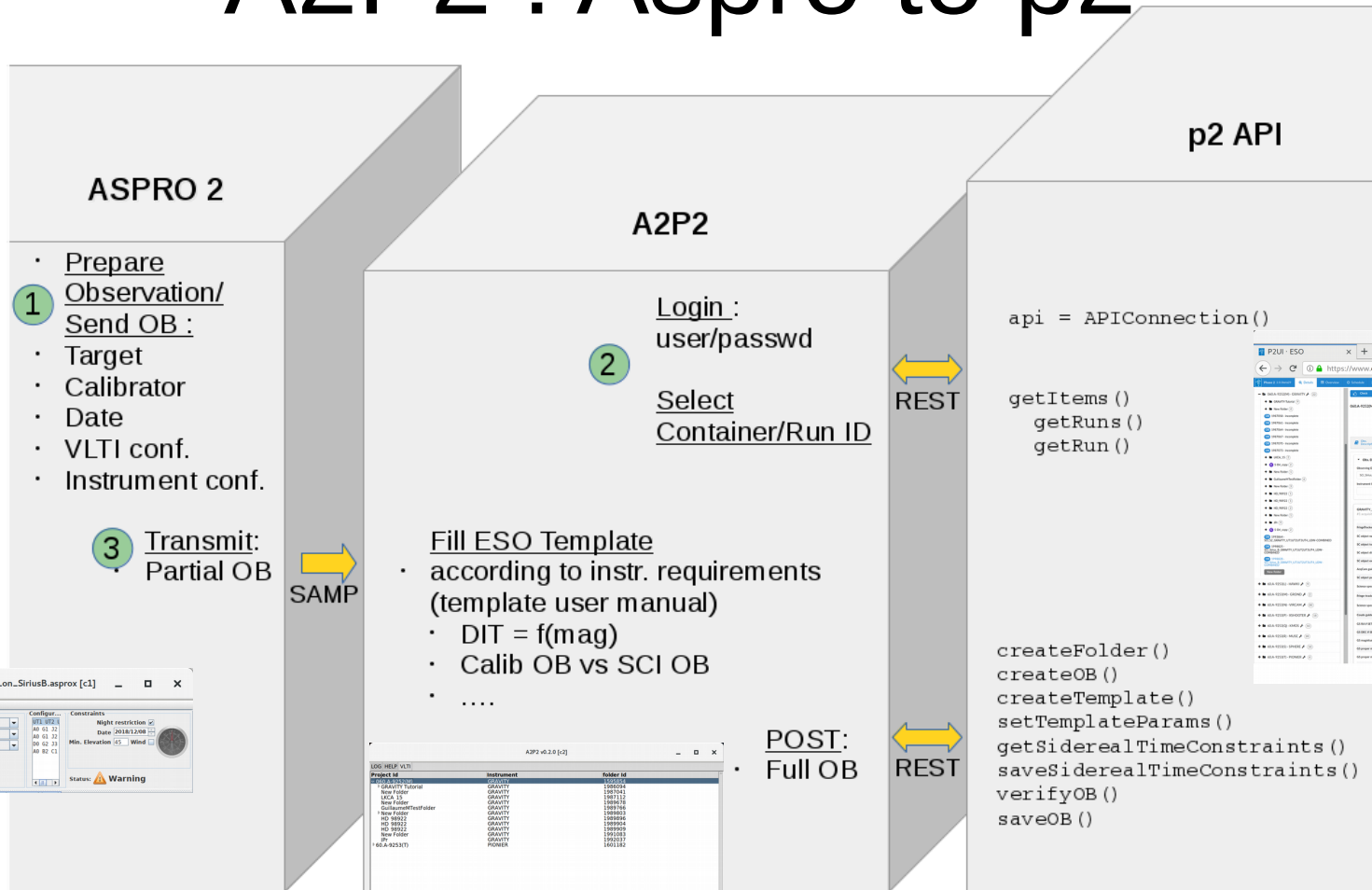


Target Model



Data simulation

A2P2 : Aspro to p2





SearchCal / JSDC 2



- SearchCal service: 20 years of expertise in finding calibrator stars i.e. expected visibility is accurately known
- Search Calibrator stars close to your science object and its photometry
- Filter results (SP type, luminosity, V2 ...)
- Based on JSDC 2 + Faint mode (2.5m stars)
- JSDC 2: CDS [Vizier II/346](#) ~ 465 877 stellar diameters => ESO calibrator list

"Pseudomagnitudes and differential surface brightness: Application to the apparent diameter of stars." by Chelli A., Duvert G., Bourguès L. et al., 2016, A&A, 589, 112

The screenshot shows the SearchCal interface with the following details:

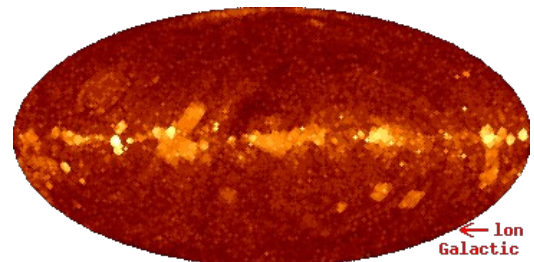
- Query Parameters:**
 - 1) Instrumental Configuration: Magnitude Band: V
 - Wavelength (Å) [µm]: 0.6562
 - Max. Baseline [m]: 216.84477
- 2) Science Object:**
 - Name: HD 75732
 - RA 2000 (hh:mm:ss): 08:52:35.811
 - DEC 2000 (+/-dd:mm:ss): +28:19:50.951
 - Magnitude (V): 5.95
- 3) SearchCal Parameters:**
 - Min. Magnitude (V): 3.95
 - Max. Magnitude (V): 7.95
 - Scenario: Bright
 - RA Range [deg]: 240.0
 - DEC Range [deg]: 20.0

The table below shows the first few rows of the 'Found Calibrators' list:

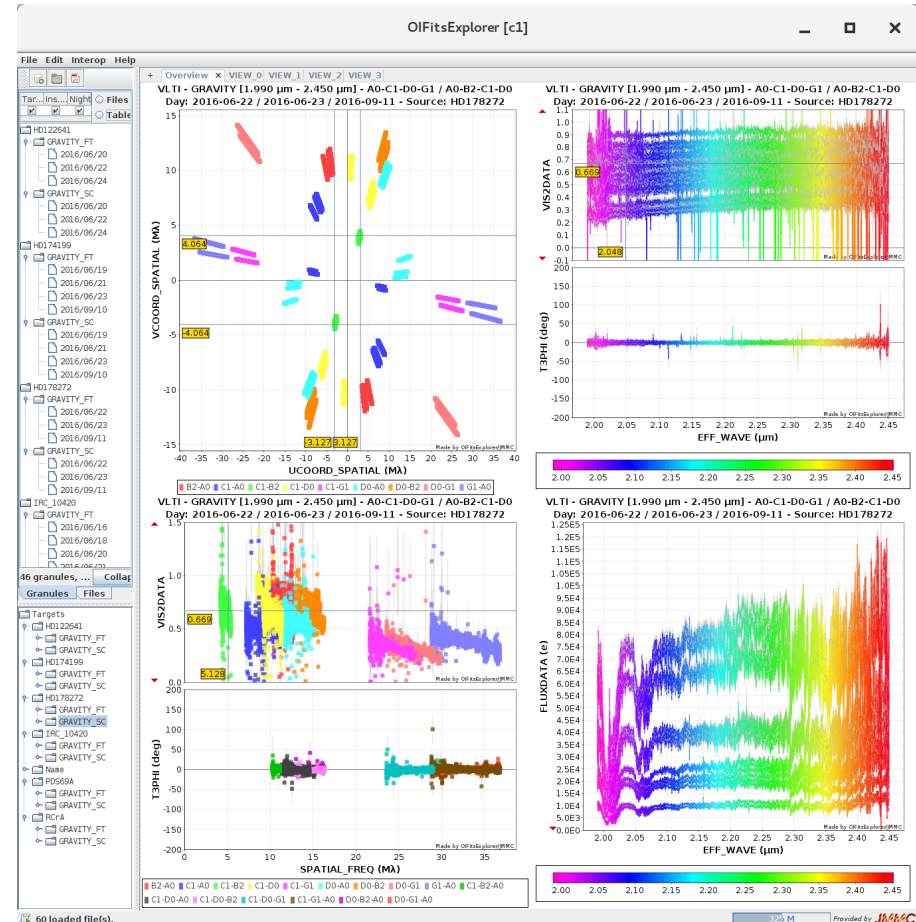
Index	ID	RA	DEC	SpType	V	K	HD_V	HD_R	H	HD_K	v12	v13	diam_bv	Category
180	81866	10 08 27	+24 18 3	F0	7.764	7.262	0.12	0.121	6.966	0.124	0.903	0.013	0.157	ASCC-1
181	88270	10 11 04	+20 01 4	F2V	6.831	5.67	0.284	0.287	5.732	-0.295	0.551	0.048	0.285	ASCC-1
182	84662	10 14 24	+28 00 0	A2	7.534	7.338	0.102	0.103	7.601	0.106	0.91	0.009	0.128	ASCC-1
183	88380	10 13 11	+21 25 1	F2	7.817	6.996	0.182	0.184	6.775	-0.189	0.789	0.026	0.18	ASCC-1
184	88077	10 14 10	+31 22 2	F0	7.602	6.835	0.158	0.159	6.865	0.163	0.838	0.021	0.175	ASCC-1
185	88321	10 13 09	+33 09 5	A8 V	7.336	6.867	0.142	0.143	6.9	0.147	0.888	0.017	0.153	ASCC-1
186	85500	10 14 44	+28 15 0	F0	6.713	6.517	0.078	0.079	6.513	0.083	0.958	0.022	0.082	ASCC-1

Filters section:

- Reject stars farther than: Maximum RA Separation (min): 10.0 and above: 10.0
- Reject stars with magnitude: below: 0.0 and above: 10.0
- Reject Spectral Types (and unknowns): B A F G K M
- Reject Luminosity Classes (and unknowns): I II III IV V VI
- Reject Visibility below: vis2: 0.5
- Reject Visibility Accuracy above (or unknowns): vis2Err/vis2 (0): 2.0
- Reject Variability
- Reject Multiplicity



- OIFITS standard has been instrumental in the success of Optical Interferometry
- OIFITS Explorer allows to load, select / merge & visualize OIFITS files (even a large collection)
- **New**: export selection to OIFits file
- Visualization:
 - UV plane
 - V2, T3, VIS, flux...
 - Extra quantities: HA, PA, SNR...

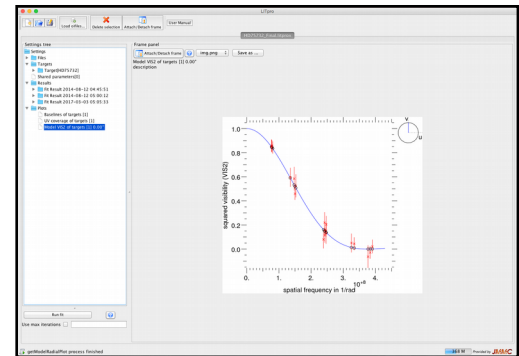
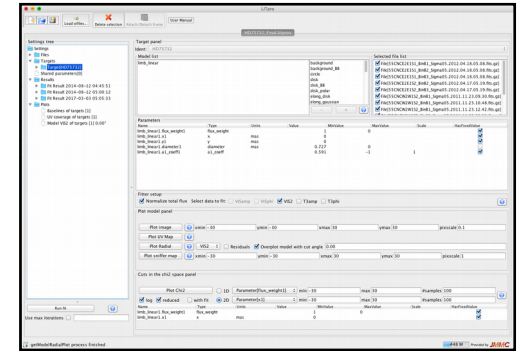


LITpro model fitting

LITpro fits a model, built from elementary analytical functions, on observation data (OIFITS)

- Provides lots of functions (disk, black-body, gaussian) + elongated / stretched variants
- Runs Fit:
 - Results: parameters with error bars + chi2
 - Plots: residuals + chi2 map
- Work in progress:
 - Genetic algorithm ~ global Fitter
 - User functions to expand existing model functions

=> astro-physical & polychromatic models



OImaging

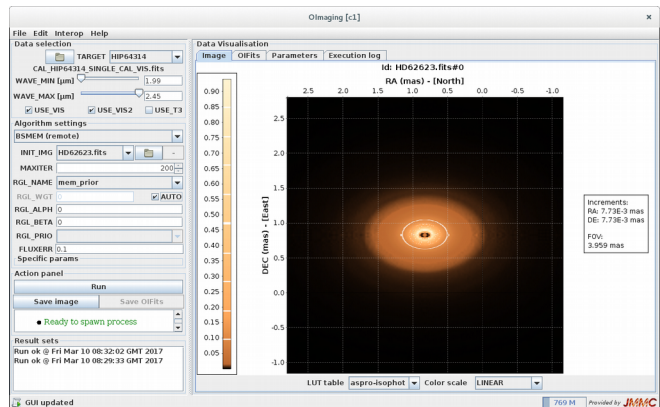
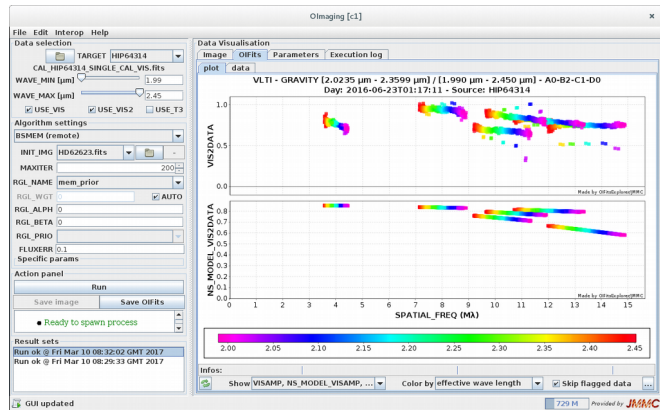
New: Oimaging provides a generic interface to run image reconstruction software:

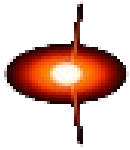
- Based on OIFITS + FITS image (OI_Image extension for parameters)
- Integration of BSMEM / WISARD / MiRA, MiRA + SPARCO running remotely on JMMC server (docker)

- Visualization of images, plots (residuals)

Future:

- Improve prior-image generation, data selection, image comparison, job processing





AMHRA "Analyse et Modélisation en Haute Résolution Angulaire"



New: AMHRA is a portal to the state-of-the-art models of stellar environment and surfaces.

- Provides polychromatic images, ready to use models in ASPRO, LITpro, Olmaging
 - Fast computation time: Kinetic Be Disk, Disc and Stellar Continuum, Evolved stars, Binary Spiral Model
 - Pre-calculated grid: Supergiant B[e]
 - *Soon:* stellar emission profiles (better than limb-darkening laws)
- Provides analysis tools to compare observation data with these models (OIFits Modeler)

<https://amhra.oca.eu/>

The worldwide database of Optical Interferometry observations

- Query & download OIFITS files
- Observation logs
 - ESO / VLTI
 - CHARA: Classic / Climb, Vega
- Observation data:
 - Reduced PIONIER data
 - Published data

SUV: private collections ?

OIData portal - Mozilla Firefox

OIData portal

OIDB - Home Search Submit new data Help Sign in

Filters

Position: alpha cen Radius: 2 arcmin

Date of observation: after YYYY-MM-DD before YYYY-MM-DD

Instrument: Any Instrument Wavelength range: any value

Collection: Any Collection DataPI name: Any DataPI

Data reduction level: L0, L1, L2, L3. Availability: Public Restricted All

25 rows max. per page, sorted by Instrument descending. Search Reset

Results

Meta-data will try to follow VO4OI proposal and Ivoa:ObsCore document (get metadata description in the associated doc)
19 observations from 19 oifits files (10 private)

Page 1 / 1

Results for

```
SELECT ALL * FROM oidb AS t WHERE ( CONTAINS(POINT('ICRS', t.s_ra, t.s_dec), CIRCLE('ICRS', 219.90085, -60.83
```

(Edit query)

target_name	access_url	t_min	instrument_name	wlen_min
Alpha_Cen_B	PIONI.2016-05-28T01:56:00.739_oidataCalibrated.fits	2016-05-28T01:55:12	PIONIER	1.51909030
Alpha_Cen_A	PIONI.2016-05-28T02:15:37.104_oidataCalibrated.fits	2016-05-28T02:15:21	PIONIER	1.51909030

Last word ...

<http://www.jmmc.fr/>

- Visit www.jmmc.fr to get software & access freely JMMC services
- Feedback is welcome:
 - Bug reports & Enhancement requests
 - User support
- SUV helpdesk is now open !
- JMMC contributes to Open-Source: <https://github.com/JMMC-OpenDev>

The screenshot displays the JMMC website interface. At the top, the JMMC logo and the text 'JEAN-MARIE MARIOTTI CENTER Infrared and Optical Interferometry for Astronomy' are visible. A navigation menu includes links for Home, Links, Search, Documents, Mailing lists, Wiki, Trac, Bdl, and a copyright notice for Jean-Marie Mariotti. A sidebar on the left lists various services and categories such as 'Who are we?', 'JMM?', 'Partners', 'Structure', 'Working Groups', 'EIL - JRA4', 'Training', 'Proposal Preparation', 'ASPRO', 'SearchCal', 'VLT', 'Proposals', 'Data Processing', 'VINCI', 'MIDI', 'AMBER', 'PIONIER', 'OIFs', 'Explorer', 'Oifits', 'Validator', 'Data Analysis', 'LITpro', 'Iper', 'Wisard', 'Virtual Observatory', 'AppLauncher', 'BadCal', 'CalEx', 'OIDB', 'JSDC', and 'User Support'. The main content area features a 'Welcome to the JMMC' section with a photograph of a mountain peak at sunset and a news item titled 'JMMC NEWS : Aspro2 release notes: Aspro2 version 0.9.9.2'. Below this, a row of partner logos is shown, including CIFS, CDA, LAGRANGE, IPAG, Observatoire de Paris LESIA, and ONERA. The website has an orange header with navigation tabs for THE JMMC, TOOLS, USER SUPPORT, PUBLICATIONS, TRAINING, and NEWS. A search bar is located in the top right corner. The main banner area features a large image of the night sky with the text 'Welcome at JMMC' and a 'Read more' button. At the bottom, a row of service buttons is displayed: ASPRO, LITPRO, OIFITSEXPLORER, OIMAGING, OIDB, and SUV HELP. The footer contains copyright information and a row of partner logos.

Thank you for your attention !