



Tools and services for observation preparation

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Summary

- ASPRO2
- SearchCal / JSDC
- a2p2



ASPRO 2

Astronomical Software to PRepare Observations



JMMC-PRE-0000-0038

ASPRO 2: Feature overview

- Observation preparation = **VLT**I / CHARA & their instruments
- Target & calibrator list with their models (geometric / FITS image/cubes, eg. from **AMHRA**)
- Target observability, UV coverage => info, but used also for scheduling
- **Noise modeling** & OIFits data simulator => **OIFITS data (v1)**
- Interoperability :
 - SearchCal (calibrator search), Vizier / Simbad (VOTable targets)
 - Export OB (VLT) to ESO p2 through a2p2 (obxml)
 - OIFits Explorer, LITpro or Olmaging ...

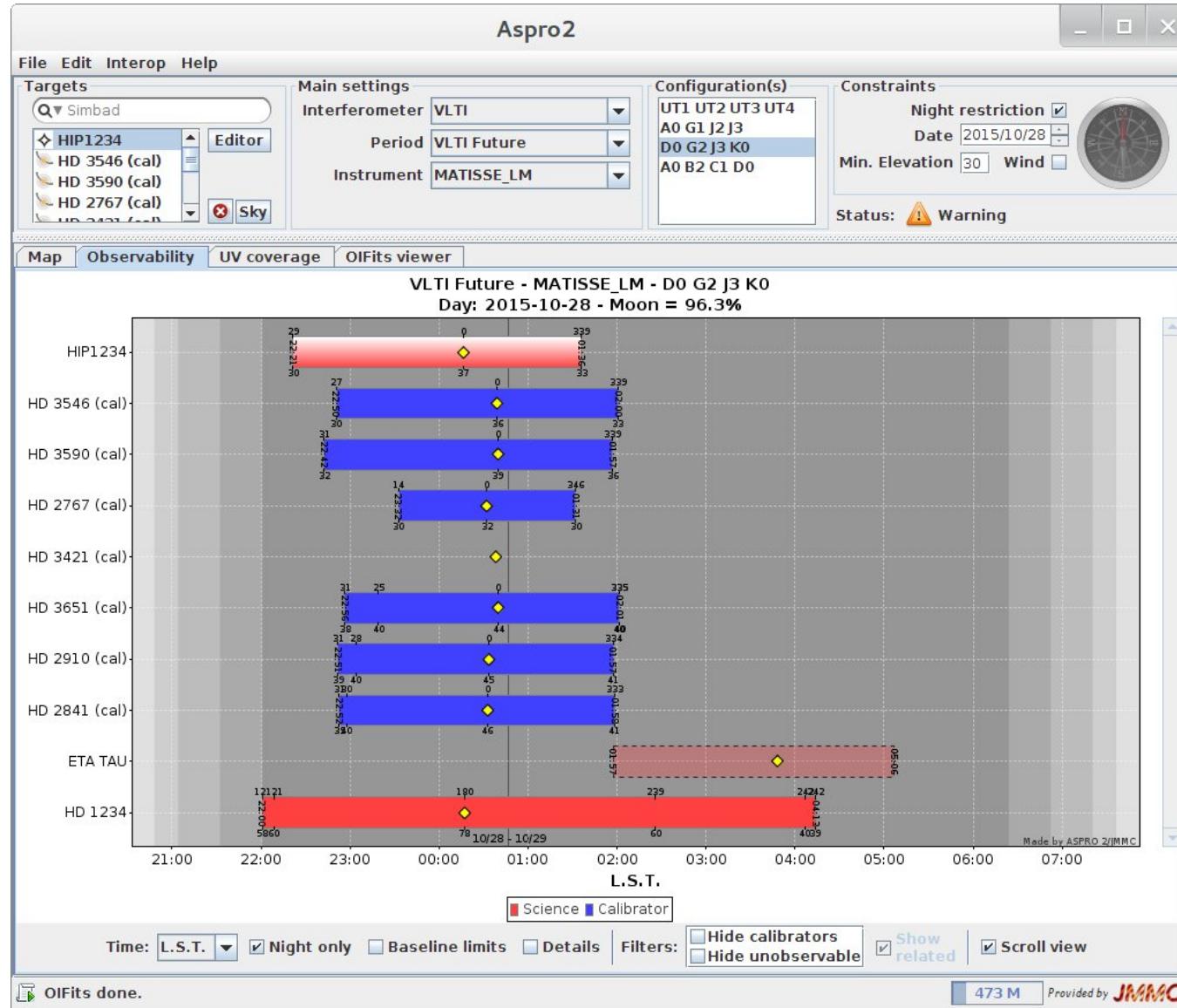
ASPRO 2: Configuration

Configuration files : XML based

- Interferometer (telescope + horizon profiles, stations, delay lines, switchyard = optical paths between stations and lab)
- Instruments (instrument modes, noise parameters)
- Period : offered baselines per instrument
 - VLTI (Period 84 - 108)
 - MIDI (2T) until Period 94
 - AMBER (3T) until Period 101
 - PIONIER (4T) starting from Period 86
 - GRAVITY (4T) starting from Period 98, (GRAVITY_FT to check the fringe tracker ability to track faint or unresolved targets)
 - MATISSE (4T) starting from Period 103, (MATISSE_LM & MATISSE_N to describe the internal L/M & N instruments)

See <http://apps.jmmc.fr/~swmgr/AsproOIConfigurations/> and [aspro-conf](https://github.com/aspro-conf) @ github

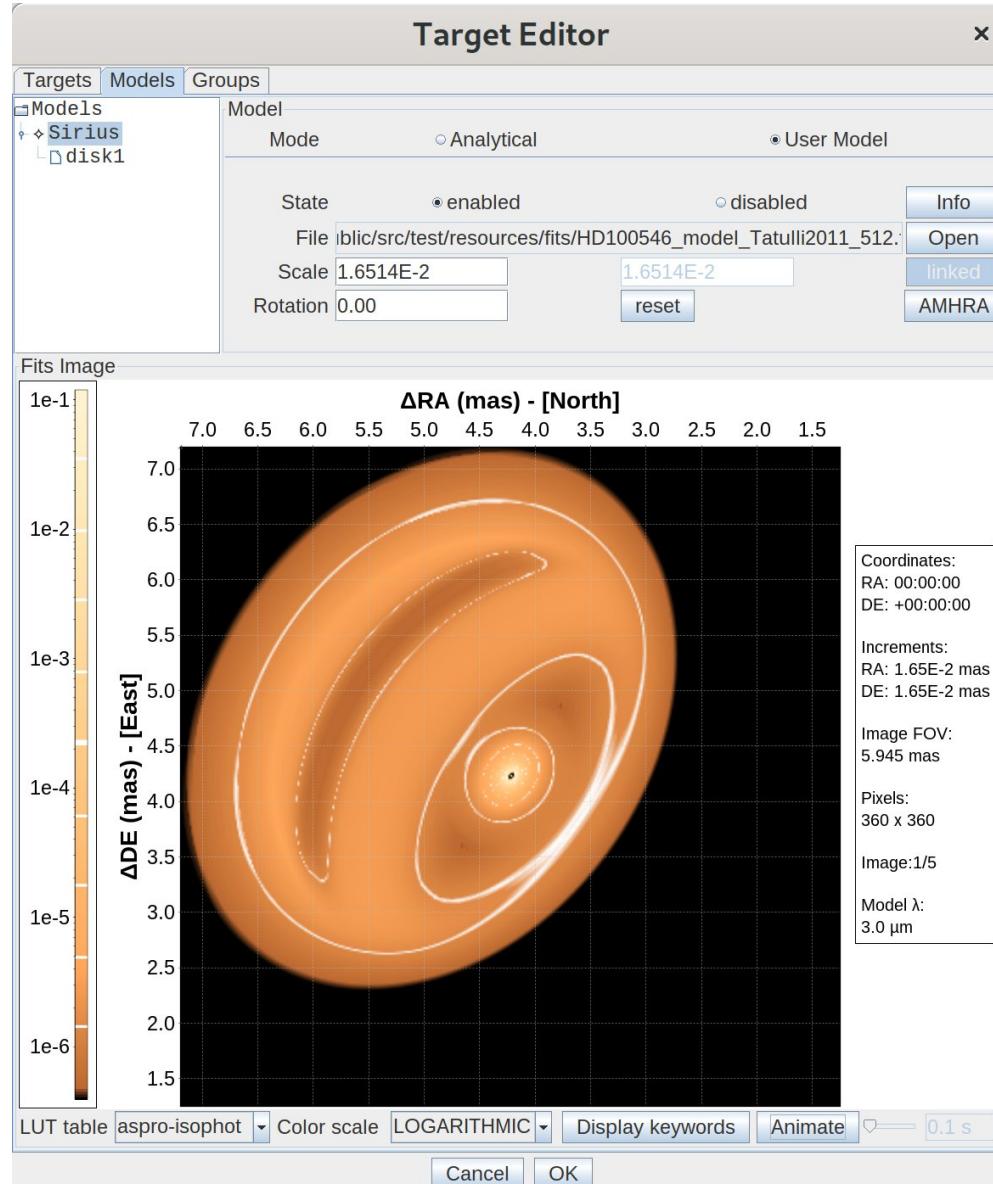
ASPRO 2: Observability



Observation:
Targets, array & instrument
setup, baselines...

- SCI / CAL
- Horizon, DL, moon & wind constraints
- Baseline comparison
- Groups (FT, AO, user)
- Time markers (night mode)

ASPRO 2: Target Editor

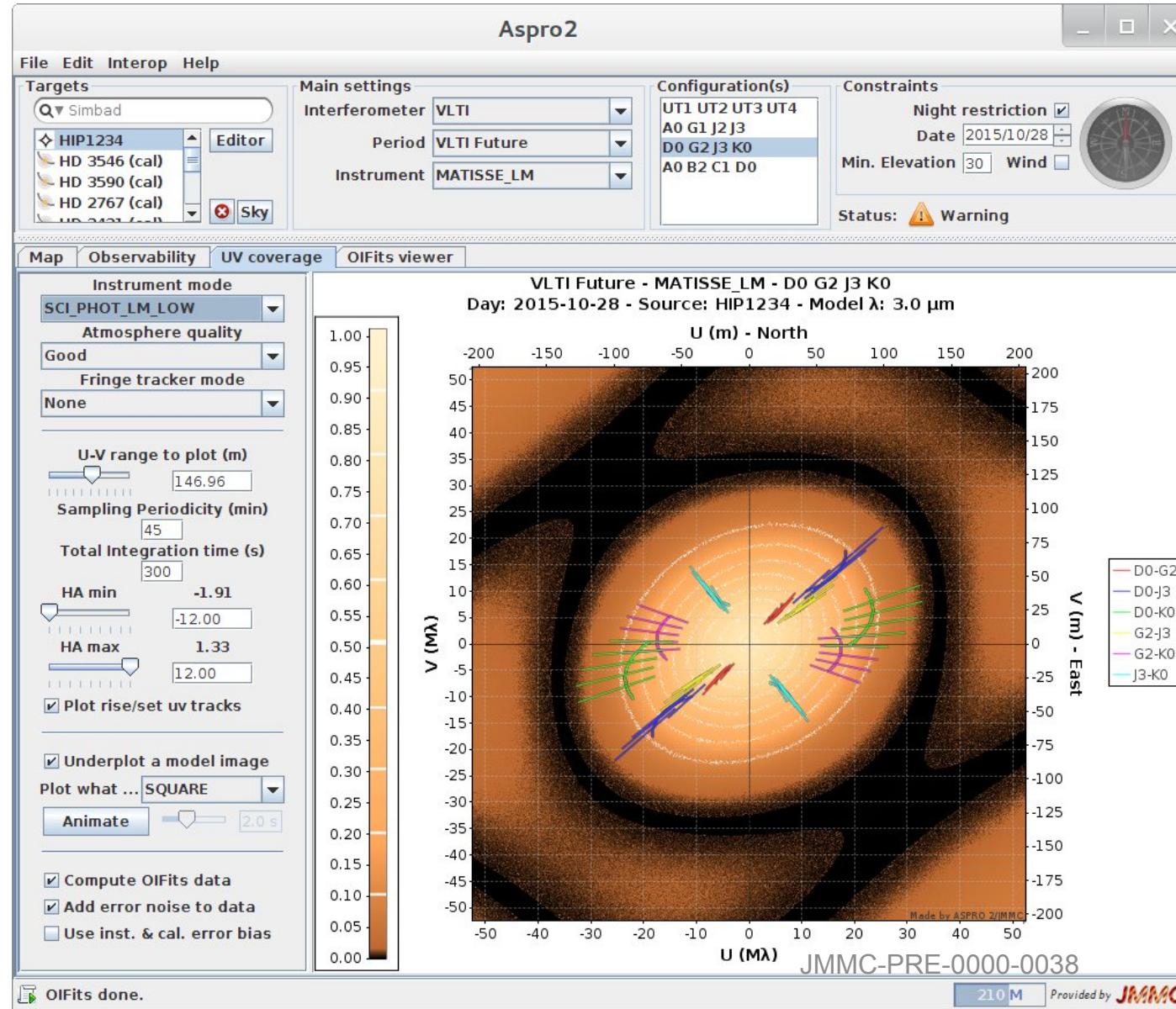


Target information:

- Position, pm, IDs
- Fluxes (mag / jy)
- Models
 - Analytical
 - or User model:

Interoperable with any fits cube
for polychromatic models

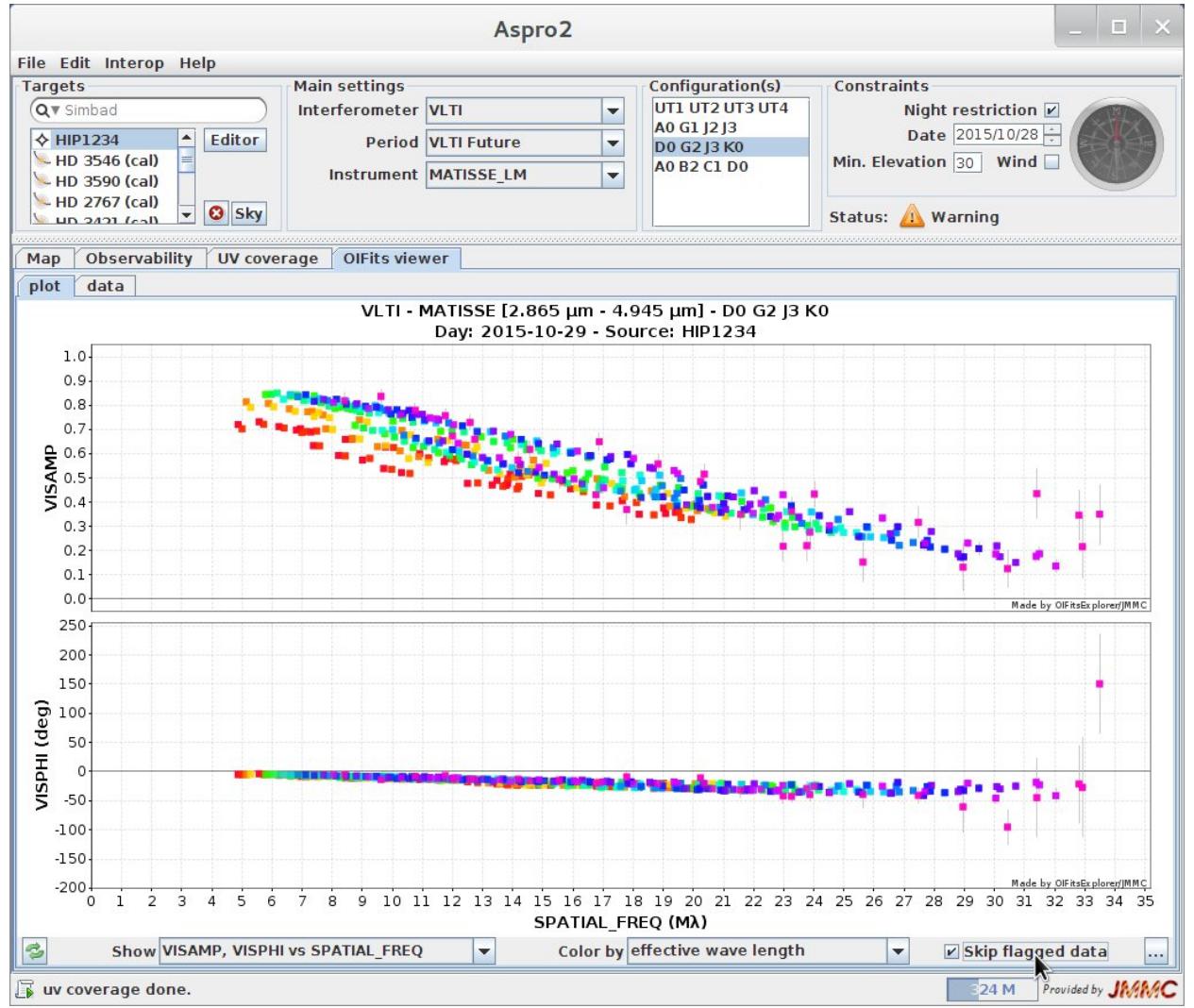
ASPRO 2: UV Coverage



Example for MATISSE LM_LOW mode :

- INSMODE:
Wavelength range / spectral channels
- Fringe tracker -> allowed max DITs
- Seeing quality
- Total integration time (s) on SCI
-> realistic noise

ASPRO 2: OIFits simulator



- Exact Fourier Transform from user model images
- Noise modelling:
 - Target photometry
 - Atm. transmission
 - Instrument parameters
- Export OIFits files:
 - enable further tests for detection of requested features, optimal integration time etc.

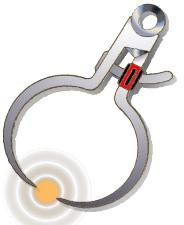
ASPRO2: advanced features

- GRAVITY dual field: set ancillary stars (FT, AO, GS)
- MATISSE errors checked with ESO's ETC (A. Matter)
- ASPRO2 Command line Interface to compute observables from data + user model (AMHRA)



SearchCal / JSDC

Search Calibrators
JMMC Stellar Diameter Catalog





SearchCal 5 / JSDC 2

SearchCal 5:

- Search Calibrators close to your target object and photometries
- Filter results (SP type, luminosity, V2 ...)
- Interoperability with ASPRO2, Aladin
- based on JSDC2: faster & more accurate
- BRIGHT / FAINT scenarios on [BVRJHKLMN] bands

The screenshot shows the SearchCal 5 software interface. At the top, there are three tabs: 1) Instrumental Configur., 2) Science Object, and 3) SearchCal Parameters. The Science Object tab is active, displaying search parameters: Name (Q V ETA TAU), Magnitude Band (K), Wavelength (K) [μm] (2.2), Max. Baseline [m] (102.45), and Magnitude (K) (2.636). The SearchCal Parameters tab shows filters for Min. Magnitude (K) (2.0), Max. Magnitude (K) (5.0), Scenario (Bright), RA Range [mn] (120.0), and DEC Range [deg] (5.0). Below these tabs is a progress bar and a "Get Calibrators" button. The main area displays a table titled "Found Calibrators (380 sources, 354 filtered)" with columns: Index, dist, HD, RA(J2000), DE(J2000), vis2, vis2Err, diam_chi2, and Catalogs. The table lists 26 rows of data. At the bottom of the interface are various filter options and a status message "searching calibrators... done."

Index	dist	HD	RA(J2000)	DE(J2000)	vis2	vis2Err	diam_chi2	Catalogs
1	2,263E-5	23630	03 47 29.0706404390	+24 06 18.497844846	0.916	0.014	0.008	ASCC-2.5
2	1,671	22886	03 41 18.0742818539	+25 00 29.392199918	0.955	0.002	0.695	USNO-B
3	2,281	24154	03 51 36.6219153619	+22 01 47.857677342	0.940	0.010	0.179	CIO
4	4,329	22269	03 36 04 9124944620	+27 35 35.494295025	0.959	0.002	0.320	IP11
5	4,445	25604	04 04 41.7150611356	+22 04 54.949468293	0.621	0.055	0.040	2MASS
6	4,839	21451	03 28 21.2735019019	+26 16 14.334799949	0.961	0.002	1.217	BSC
7	6,681	20680	03 20 38.2870127504	+26 55 38.526483761	0.966	0.002	0.242	Merand
8	6,978	26946	04 16 41.6003151653	+26 21 28.708766371	0.909	0.016	0.173	DENIS
9	8,017	27159	04 18 27.2856647798	+28 06 11.501369519	0.877	0.024	0.056	J-K DENIS
10	8,266	27482	04 21 15.2584063723	+27 21 00.898932053	0.504	0.064	0.269	HIC
11	8,807	19637	03 10 27.0469499641	+26 53 46.448565865	0.824	0.033	0.010	LBSI
12	9,606	27796	04 24 25.4870498943	+29 01 11.407163684	0.533	0.072	0.468	MIDI
13	10,036	28581	04 31 13.1735341443	+23 20 45.816337837	0.782	0.040	0.050	SIMBAD
14	10,843	04 33 22.5438376253	+21 40 00.014588272	0.945	0.003	1.688	WISE	
15	11,431	29246	04 37 24.5950236820	+25 43 38.536379888	0.934	0.010	0.092	WDS
16	12,753	20835	04 42 05 03.6475818	+26 14 35.060267158	0.963	0.002	1.494	AKARI
17	13,999	30354	04 47 47.9311150514	+22 08 21.901153704	0.532	0.076	0.271	HIP2
18	15,138	31059	04 53 34.0961385914	+23 18 56.409414285	0.939	0.011	0.095	HIP4
19	15,816	31363	04 56 06.6354930857	+22 34 35.628232468	0.946	0.003	0.383	SIMBAD
20	15,842	04 57 01.4479126789	+25 49 36.753621391	0.940	0.004	0.247	GAIA DR2	
21	17,649	15673	02 31 47.8254373213	+21 22 31.042928254	0.952	0.007	0.072	GAIA Dist
22	18,939	14876	02 24 00.0401028575	+27 39 34.311809449	0.941	0.009	0.539	MDFC
23	22,815	12897	02 55 55.9692938495	+26 19 24.210139643	0.968	0.002	0.558	Confiden...
24	23,594	12535	02 03 32.8699507408	+27 28 55.074393314	0.965	0.002	1.357	HIGH
25	25,051	12139	01 59 35.68393936200	+21 03 30.847166942	0.899	0.019	0.003	MEDIUM
26	25,490	05 37 01.0799431206	+20 45 50.461433599	0.910	0.014	0.314	LOW	

Filters

- Reject stars farther than : Maximum RA Separation (mn) : 10.0 Maximum DEC Separation (degree) : 10.0
- Reject stars with magnitude : below : 0.0 and above : 10.0
- Reject Spectral Types (and unknowns) : O 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 unknown) : vis2Err/vis2 (%) : 2.0
- Reject Variability
- Reject Multiplicity
- Reject Invalid Object Types
- Diameter quality : Maximum chi square : 2.0 Maximum relative error (%) : 10.0

searching calibrators... done.

JSDC 2 @CDS: [Vizier II/346](#) ~ 465 000 stellar diameters

a ~20 years of scientific improvement with published results in A&A

JSDC 3 : 475 000 stars ... to 2.5m stars !

Improvements in 2020:

- Crossmatch +++ : best in 3as neighbourhood + xmatch flags = No duplicates.
"CalFlag bit 3 set if the star has neighbours within 0.5 as (GAIA) or 1.0 as (2MASS)"
- Data: SIMBAD, GAIA DR2 (better ra/dec, pm, teff, dist), MDPC (flag, flux)
- [*JSDC3 BRIGHT EA*](http://jmmc.fr/~bourgesl/sclsvr_JSDC/JSDC_2020/LAST/) : http://jmmc.fr/~bourgesl/sclsvr_JSDC/JSDC_2020/LAST/
- [*JSDC3 FAINT EA*](http://jmmc.fr/~bourgesl/sclsvr_JSDC/JSDC_FAINT_2020/LAST/) : http://jmmc.fr/~bourgesl/sclsvr_JSDC/JSDC_FAINT_2020/LAST/

Services: [SearchCal 6 EA](#) and [GetStar EA](#)

TODO:

- Publish both Bright / Faint catalogs : 2.5m star in JMMC TAP + CDS
- Future: use JMDC and new colors GAIA (G, Bp, Rp) + All Wise (L, M, N)

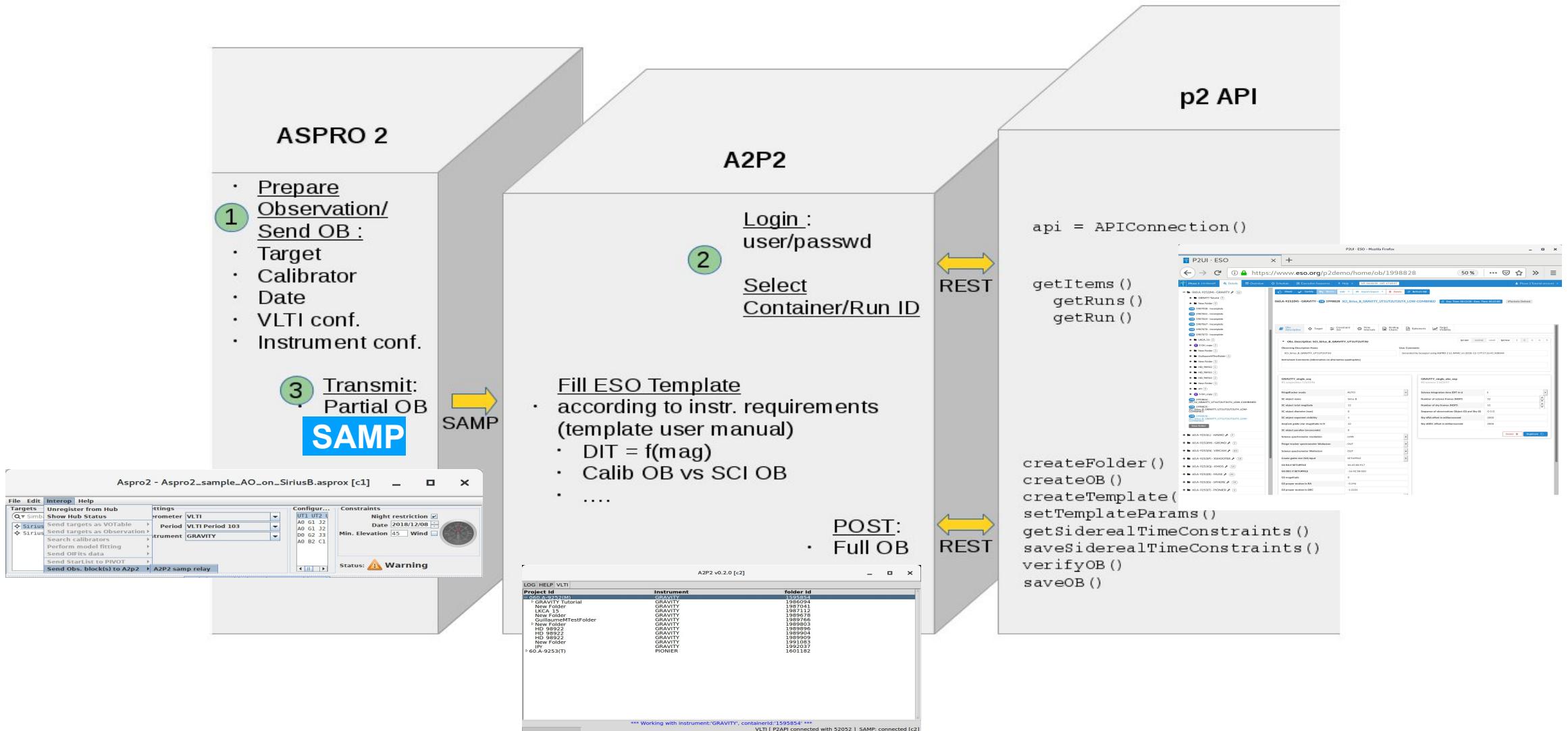


a2p2

A2P2: Automatic OB creation & submission

- A2P2 : open-source python tool
 - <https://github.com/JMMC-OpenDev/a2p2> to collaborate with instrument scientists
- SAMP gateway to complete & forward Aspro2's O.B. (obxml) to ESO P2 (p2api)
 - **handles concatenations, SCI+CAL, AO/FT/GS targets**
- basic support for PIONIER and GRAVITY, work in progress for MATISSE

A2P2 workflow



A2P2

- Still need work to properly support two rolling periods simultaneously
 - rely on a local configuration (json extraction of p2 config)
 - no formal schedule for updates
- Work required to properly cover and test implementation rules for templates to provide
 - Up-to-date instrument knowledge mandatory => need help from Instrument Scientists
 - Engineer help still required after first releases
- TODO :
 - handle multiple targets batch support from Aspro2 : survey mode (SPICA survey, Large Programs...)
 - feed CHARA observation control system

Next operations (mid / long term)

Enhance consistency with ESO :

- improve A2P2 for MATISSE (GRA4MAT)
- maintain Aspro Configuration up-to-date for VLTI & instruments
(shadowing, switchyard, observing modes, noise parameters)
- GRAVITY+

Questions ?



Future Preparation Project @ JMMC

ObsPrep db:

"Prepare, update, follow groups of observations"

- for Surveys or Large Programs
- in a collaborative way
- linked to existing tools

SPICA-DB Project @ JMMC

SPICA-DB is developed on top of (OiDB + ObsPortal + TAP) services + JSDC data + few specific SPICA services to ingest data and manage database (authentication + specific web interface) :

- . SPICA query interface
- . ASPRO2 enhancements:
 - Handle large programs (**filters**) + target extra informations
 - Manage observations with different instrument, modes (**multi-setup**)
 - **Improve interoperability** (votable / CSV) with VO tools
- . Obs Portal: SPICA / CHARA logs + data quality flags
- . OiDB: index SPICA OIFITS files (raw, calibrated, data links)

=> **New JMMC TAP server : JSDC + obs portal + OiDB (unified view) !**

SPICA-DB Project @ JMMC

Early result:

Import SPICA's Science DB in ASPRO2:

~ 3000 sources grouped by Work Package

(votable + samp : large table)

