

The SPICA Database and Associated Tools *(before observations)*

David Salabert, Denis Mourard, Nicolas Nardetto

in collaboration with :

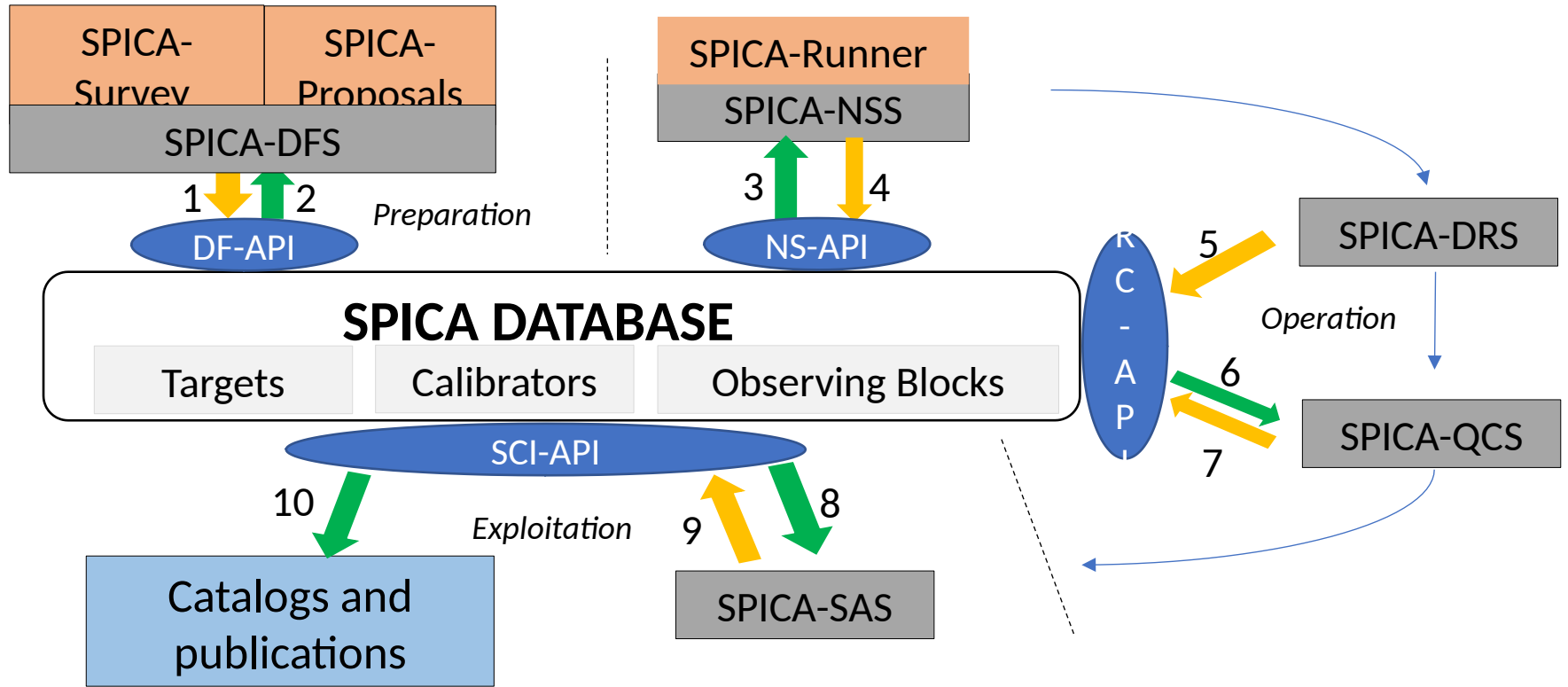
**Guillaume Mella et Laurent Bourgès @JMMC
and Karine Perraut @IPAG**



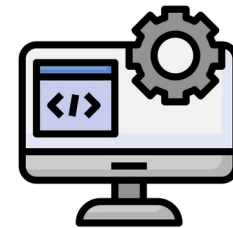
The SPICA database so far...


- The SPICA-DB contains the list of targets of the ISSP survey,
 - The PIs of each program provided their list of targets :
 - **S01** : *The study of exoplanet host stars* (40)
 - **S02 + S03**: *Combining asteroseismology and interferometry* (330 + 227)
 - **S04** : *Calibration of new surface brightness colour relations* (868)
 - **S05** : *Limb darkening across the HR diagram* (812)
 - **S06** : *Stellar masses and binary stars* (35)
 - **S07** : *Stellar rotation across the HR diagram* (97)
 - **S08** : *Winds and environments* (102)
 -
- [Total number of targets = 2511](#)
- It was created using the API **Catalog** from the **JMMC** and can be consulted through TAP protocol.
 - About 1000 of these targets will be observed during the 3-year survey.
 - The SPICA database will evolve with the addition of new targets (survey + open-time) using the API **Catalog**.

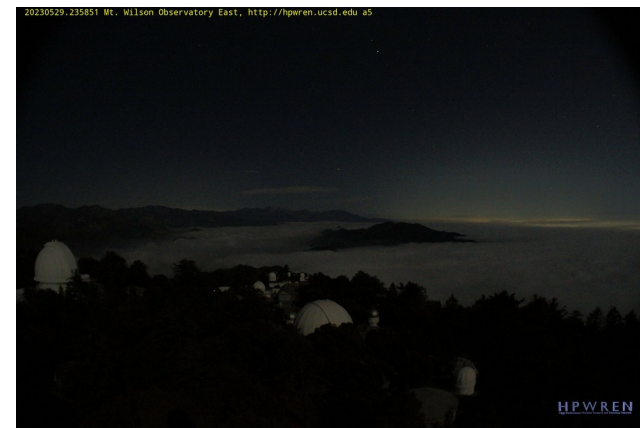
The SPICA database and its tools



Softwares developed for the ISSP Survey



- **Night Scheduler Software (NSS)**
 - To prepare the observations along with **aspr²** and to send the Observing Blocks to CHARA with a2p2.
- *(Observations + EndOfNight script)*
- **Data Reduction Software (DRS)** [see Philippe's talk]
 - From the raw images to the L1 data
- **Quality Check Software (QCS)**
 - To calibrate the L1 data to the L2 data
 - Estimate the transfer function (CAL-SCI-CAL)
 - Perform the fit of simple models: uniform disk, gaussian (environment), fast rotator and binary system
 - Return fitting results (figures and statistics) to help to flag any activity
- **Data Feeding and Querying Software (DFQS)**
 - To consult the observations and validate them
 - To add new targets in the SPICA database
 - To follow the evolution of the ISSP survey: figures, histograms, statistics...
- All the tools are developed in  making optimal use of **JMMC** tools and APIs.



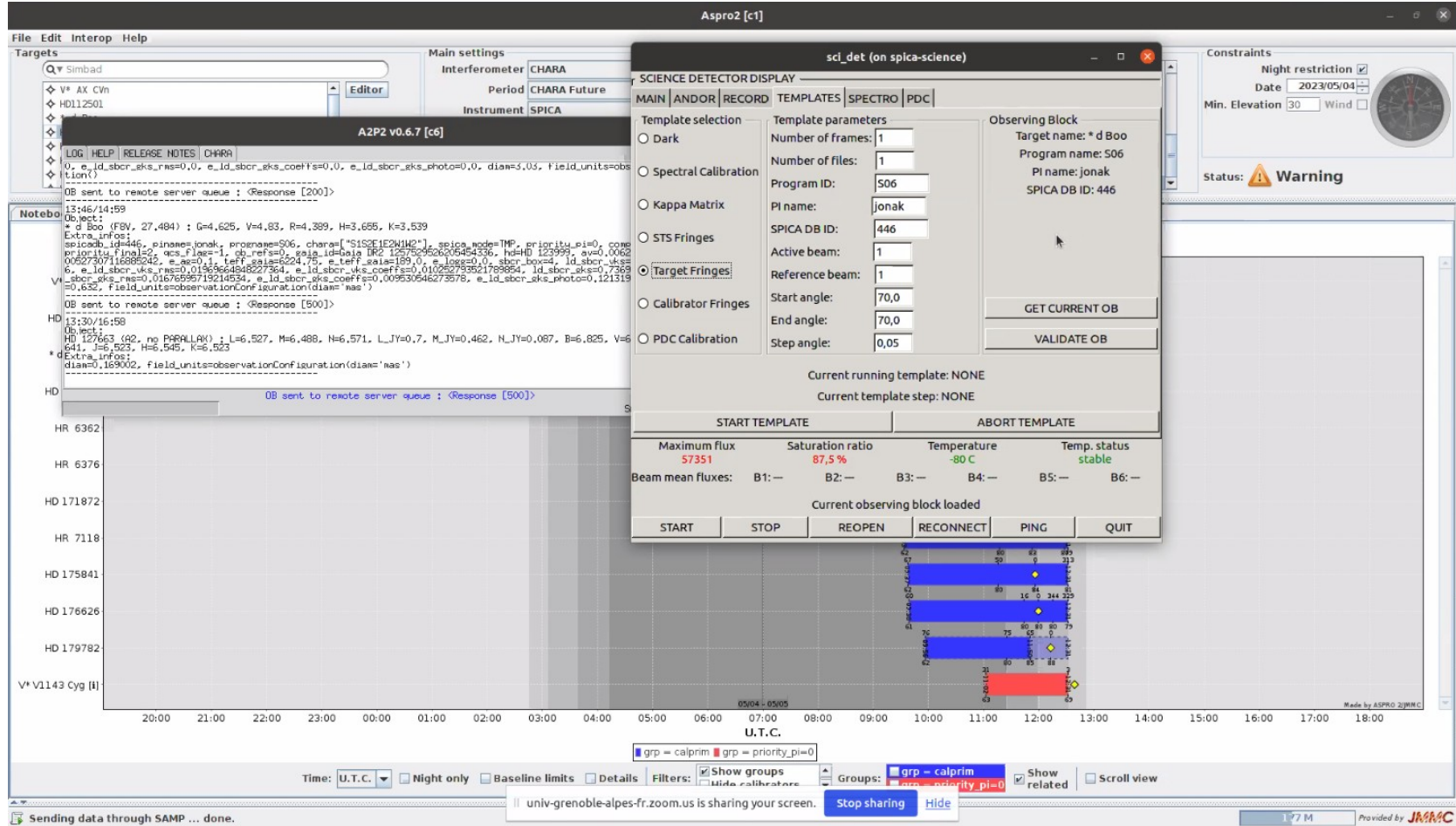
Mount Wilson Observatory
05/30/2023

Demo :

How to prepare your observations with the NSS + Aspro2 + A2p2

- **NSS** (night of 2023-05-30) :
 - Selection of TARGETS
 - Selection of PRIMARY CALIBRATORS + SECONDARY CALIBRATORS
 - Log (to be moved/included in the DFQS)
- **Send selection to Aspro2** :
 - Notion of group/color : priority0, priority1, calprim, and calsec
 - Geometrical models in Aspro2 are provided by the SPICA catalog
 - Targets notes (+ extra infos) from the SPICA-DB catalog
 - New tab « Targets »
- **Send OB to Chara with A2p2**
- (*Observations*) + (*Script EndOfNight*)

Communication A2p2 → CHARA



The screenshot shows the ASPRO2 [c1] interface with a 'sci_det (on spica-science)' window open. The window is divided into several sections:

- MAIN | ANDOR | RECORD | TEMPLATES | SPECTRO | PDC**: Navigation tabs.
- Template selection**: Radio buttons for 'Dark', 'Spectral Calibration', 'Kappa Matrix', 'STS Fringes', 'Target Fringes', 'Calibrator Fringes', and 'PDC Calibration'. 'Target Fringes' is selected.
- Template parameters**:
 - Number of frames: 1
 - Number of files: 1
 - Program ID: 506
 - PI name: jonak
 - SPICA DB ID: 446
 - Active beam: 1
 - Reference beam: 1
 - Start angle: 70,0
 - End angle: 70,0
 - Step angle: 0,05
- Observing Block**:
 - Target name: * d Boo
 - Program name: 506
 - PI name: jonak
 - SPICA DB ID: 446
- Buttons**: 'GET CURRENT OB' and 'VALIDATE OB'.
- Status**: 'Current running template: NONE', 'Current template step: NONE'.
- Table**:

START TEMPLATE	ABORT TEMPLATE					
Maximum flux 57351	Saturation ratio 87,5 %	Temperature -80 C	Temp. status stable			
Beam mean fluxes:	B1: —	B2: —	B3: —	B4: —	B5: —	B6: —
- Buttons**: 'START', 'STOP', 'REOPEN', 'RECONNECT', 'PING', 'QUIT'.

The background shows a target list with stars like HD 12501, HD 12583, and V* V1143 Cyg (l), and a time-series plot of U.T.C. from 20:00 to 18:00. A 'Warning' icon is visible in the top right corner of the main interface.

Data Flow and Associated Tools (*after observations*)

David Salabert, Denis Mourard, Nicolas Nardetto

in collaboration with :
Guillaume Mella et Laurent Bourgès @JMMC
and Karine Perraut @IPAG



SPICA EndOfNight script



Step 1 : Raw data saved on the **Spica-Science** server@CHARA
`mv /DATA/IMG/SPICA.2023-05-30*.fits => /DATA/IMG/2023-05-30/`



Step 2 : Raw data transferred from **Spica-Science** to **Spica-Pipeline** server@CHARA
`rsync /DATA/IMG/2023-05-30/ => /DATA/RawData/2023-05-30/`

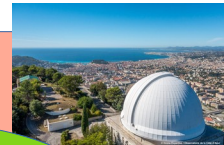
Step 3 : The **DRS** creates the L1 data (in RawOifits, contains uncalibrated V^2 , CP)
`/DATA/RawOifits/2023-05-30/`



Step 4 : The **QCS** creates the L2 calibrated data (in Results, contains calibrated V^2 , CP
+ Transfer functions + Ancillary files : figures & csv files)
`/DATA/Results/2023-05-30/`

`rsync spicavis.oca.eu:/DATA/RawOifits/ & /DATA/Results/`

Step 5 : Transfer the L1 and L2 data from CHARA to Nice (**spica-vis** server)
`/DATA/RawOifits/2023-05-30/` and `/DATA/Results/2023-05-30/`



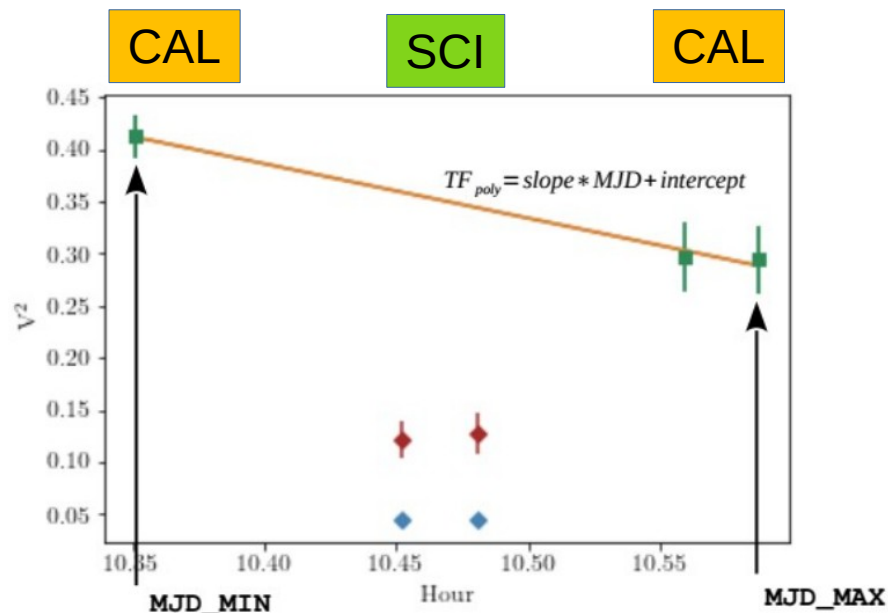
Step 6 : Updating the **SPICA database@OCA** and feeding **JMMC** tools :

JMMC ObsPortal



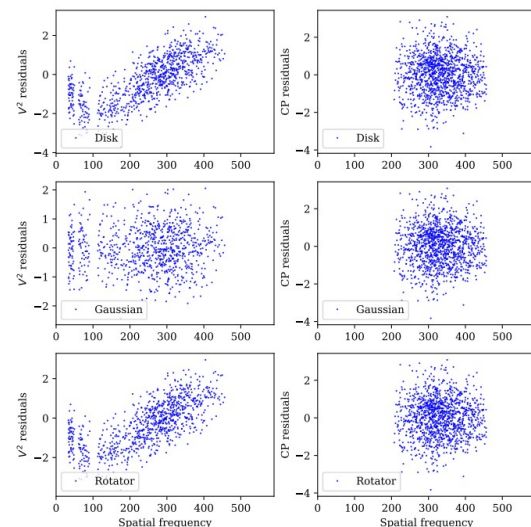
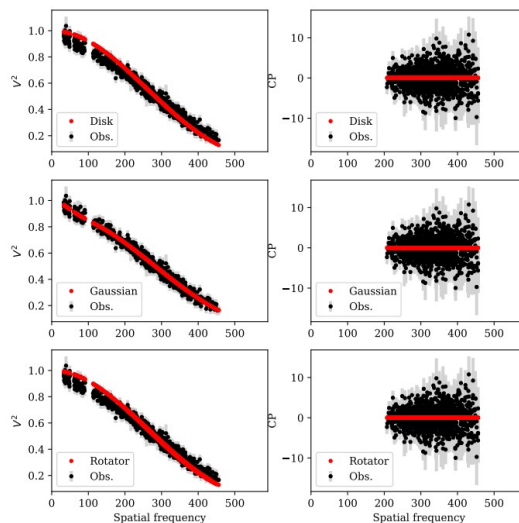
QCS : Transfer functions

- Transfer function :
$$TF = \frac{V_{cal}^2}{V_{theo}^2}$$
 - For each given instrumental configuration : DIT, gain, spectral resolution, FT status, nb_tel, ...
 - At each base and observed wavelength
 - Weighted linear regression of the closest calibrators around a science target (CAL-SCI-CAL)
 - The SCI V^2 extrapolated
- The bad calibrators are flagged and removed from the TF.



QCS : Activity flags

- Apply simple models on the V^2 and CP :
 - An *uniform disk*
 - A *disk + a Gaussian* == a star with wind and/or environment
 - An *ellipse* == a fast rotator
 - A *binary system* (with CANDID)
- Provides indication of the preferred model : figures + statistics
- Allow the PI to evaluate if a target deviates from its supposed model and to validate it or not through the DFQS.



Demo :

How to consult and validate your observations

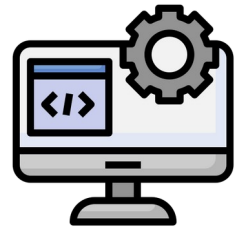
- (Observations) + (Script EndOfNight : **DRS** + **QCS**)
- Consultation of SPICA Database by the PIs with the **DFQS** (and links to OiDB by interop)
 - Data protection : restricted access to the data for the PIs, cols, and delegations
 - Validation of the observations and update of the « *completion_rate* »
 - Modification of the PI priorities
 - Possibility to add new targets with validation from administrators
- Observations accessible on OiDB-beta (L1 + L2 data) : collections and granules
 - Restricted access for the TARGETS (with a release date)
 - Public access for the CALIBRATORS
- Can send data from OiDB to Oifits_Explorer

Operational and Scientific Catalogs

- **Operational catalog:** this is the SPICA-DB catalog already existing
 - With all the infos needed to perform the survey (**NSS**, *Aspro2*, `messages_CHARA`, **DFQS**, ...)
 - Easy to update the database and add targets
- **Scientific catalog:**
 - One for each scientific program or a common one with wrappers to extract sub-section of the catalog for each PI?
 - Each scientific program needs to define the list of the different parameters to be included.
 - Some parameters might be in common with other programs: how is the information shared between PIs to have uniform sets and sources of parameters ?
 - The querying and feeding of these catalogs : do we a need a GUI or from the terminal ?
 - Are these scientific catalogs public ? Can all the PIs have access to these information ? If no, we need to have one catalog per PI.
- Example of S05 (the `binary_system` program) :

name	RAJ2000(deg)	DEJ2000(deg)	Vmag()	P(d)	HJD0	fluxratio()	q()	sepG(mas)	angdiameterG.P(mas)	angdiameterG.S(mas)	ecc()	inc(deg)	omega(deg)	OmegaN(deg)	Teff.P(K)	Teff.S(K)	d(pc)	SpType.P	SpType.S	Comment
HD 434	2.25	28.25	6.47	34.26241	54175.643	0.479	0.815	2.211	0.180	0.164	0.32		135.01				113.5	A4Vm		HD 434; SB*
HD 1383	4.57	61.73	7.63	20.28184	51414.8	1.000	1.017	0.165	0.054	0.054	0.116		178				2644.8	B0II	B0II	HD 1383; SB*

Softwares developed for the ISSP Survey



- In order to improve these tools, we need from you :
 - Inputs and ideas for improvements
 - Missing functionalities
 - Bug reports
 - How ? Google doc ?
- Future add-on: a python code to edit the **log of observations** of each night
 - This log will be included in the EndOfNight script
 - And will be associated to the data and accessible with the DFQS