ASPRO2: *A MODERN TOOL TO PREPARE OPTICAL INTERFEROMETRY OBSERVATIONS*

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THE JMMC

The Jean-Marie Mariotti Center is a network of French experts in optical interferometry and software engineers that develope, produce, document and maintain the software necessary for the exploitation and the follow-up of interferometric equipments, in particular the ESO/VLTI instruments.

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ASPRO2

ASPRO2 is the second version of the Astronomical Software to PRepare Observations created by the JMMC. It is quickly replacing its predecessor, ASPRO.

ASPRO was a complete observation preparation tool that allowed to prepare interferometric observations with the ESO/VLTI. ASPRO was based on a client-server model, with a light java display interface on the client side and a complex server side, relying on a special "network-aware" version of the GILDAS software suite, a series of FORTRAN and C programs and SIC scripts.

Initially intended as a demonstrator only, ASPRO had a long and useful life (10 years), but is now difficult to maintain and improve due to its dependency to obsolete components . Based on the numerous positive returns and evolution requests from the community, the JMMC Scientific Council started in september 2009 the revewal of ASPRO...

Enters ASPRO2

ASPRO 2 is a Java standalone program improving on all the functionalities of ASPRO and adding a dynamic graphical interface, the ability to use it off line, load and save observation settings, generate Observing Blocks, and much more. ASPRO2 is developped in close relationship with a panel of users, in a AGILE-like development environment .

ASPRO2 – THE COMPONENTS

- **JMCS** by S. Lafrasse, G.Mella (JMMC). Shared library providing GUI and common features.
- **Aspro2** core library
- **JskyCalc 1.2** by J. R. Thorstensen, Dartmouth College: ephemeris, astronomical coordinates conversions, etc: the only JAVA library available
- **nom.tam.fits** by Dr Thomas A. McGlynn, HEASARC : FITS file handling. We added the to support of single and double-precision Complex values and handling of the COMMENT and UNIT keywords
- **JFreeChart** vector plots. Exports in SVG or PDF.
- **JSAMP 1.1** by Mark Taylor, AstroGrid : for the SAMP VO query protocol.
- **SIMBAD Service @CDS** to retrieve the relevant information (position, magnitude, proper motions, etc...) simply by entering the object's name.
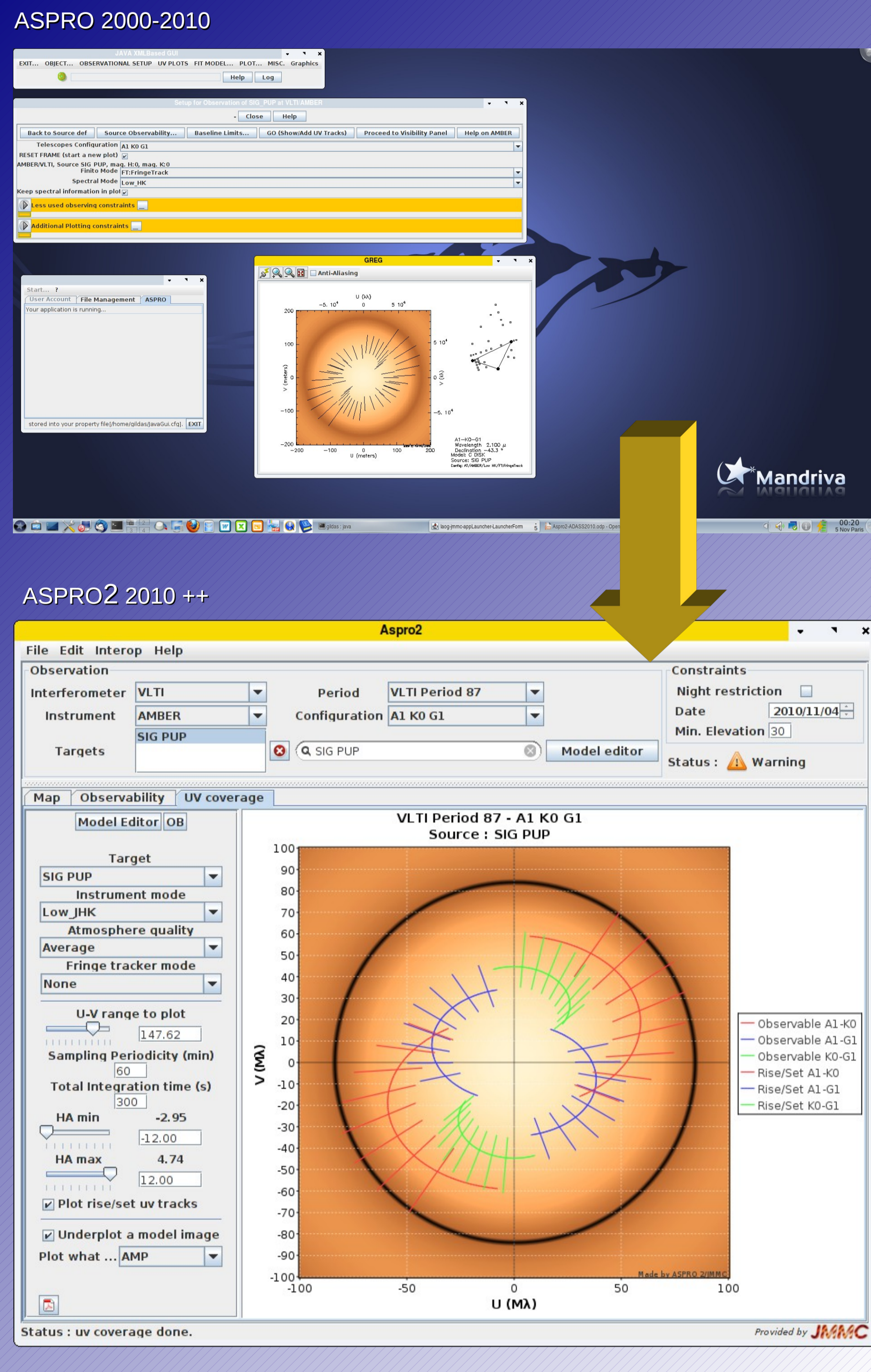
ASPRO2 – The Data Model

ASPRO2 is based on a Data Model (xml configuration files) to easily maintain and update the configuration for interferometers, instruments and observations:

- **The interferometer itself** Telescopes sizes, Stations positions, Optical Paths, Delay lines, Atmospheric conditions, etc... example: CHARA, VLTI...
- **The instrument used** Transmissivity, bandwidth, number of spectral channels and resolution, detector properties... example: AMBER, MIDI, VEGA, CLIMB,CLASSIC, MIRC.
- **The instrument noise** At this time we have an all-purpose "generic" noise model valid for any fibered recombiner (monoaxial/multiaxial).
- **The Object** based on a collection of simple parametric models. Exemple: point source, elliptical disk, gaussian...
- **We use the OI-FITS format** to store the simulated observations. OI-FITS is the first attempt at a norm for the data exchange of Optical Interferometry data and is widely used in the OI community.
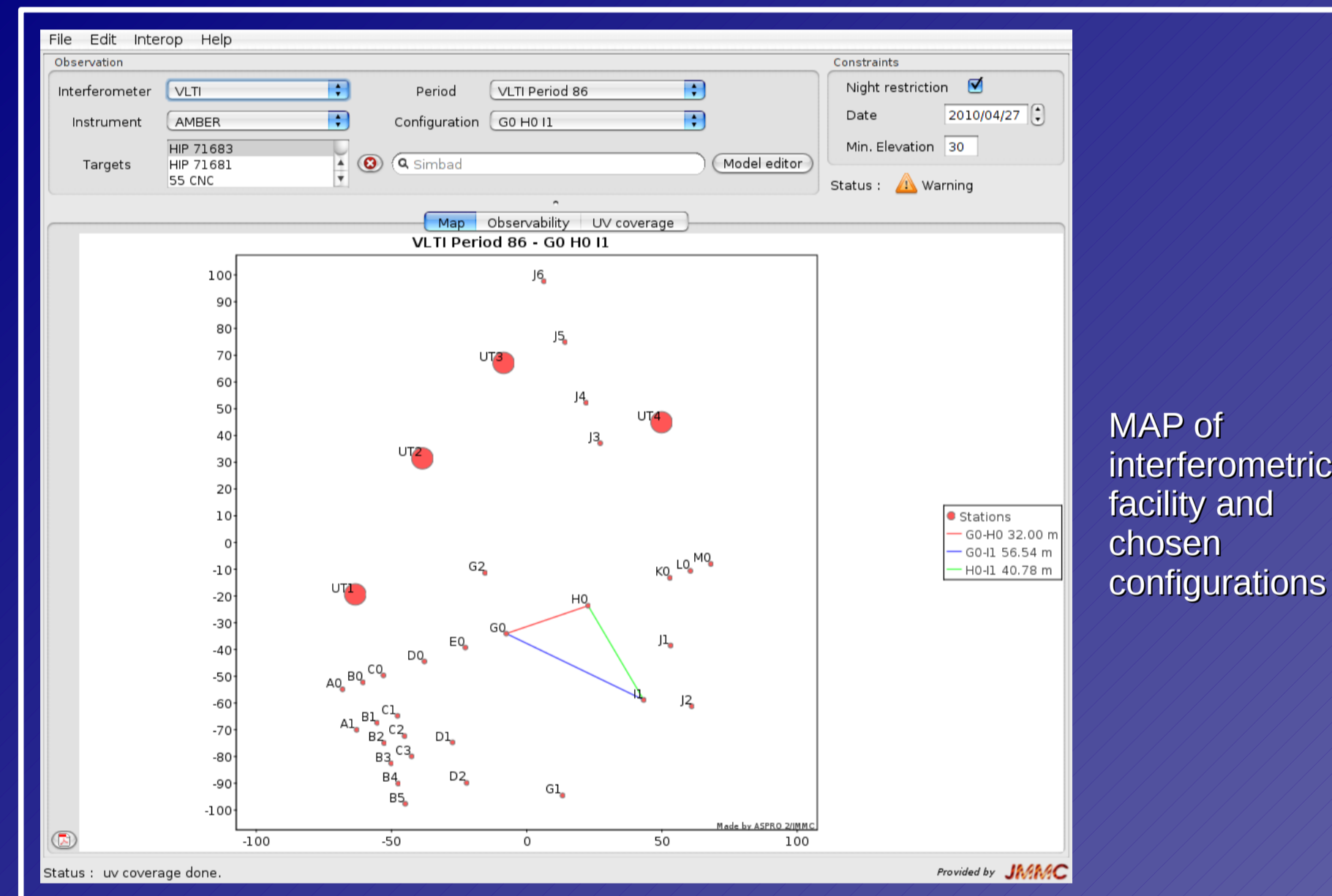
REFERENCES

ASPRO:
- Duvert G., Bério P., Malbet F., 2002, SPIE, 4844, 295
- Mella G., Duvert G., 2004, SPIE, 5496, 582

SearchCal:
- Bonneau, D., Clausse, J.-M., Delfosse, X., et al, 2006, Astron. Astroph. 456, 789.

LITpro:
- Tallon-Bosc, I., Tallon, M., Thiébaut, E., Béchet, C., et al, 2008, SPIE, 7013.

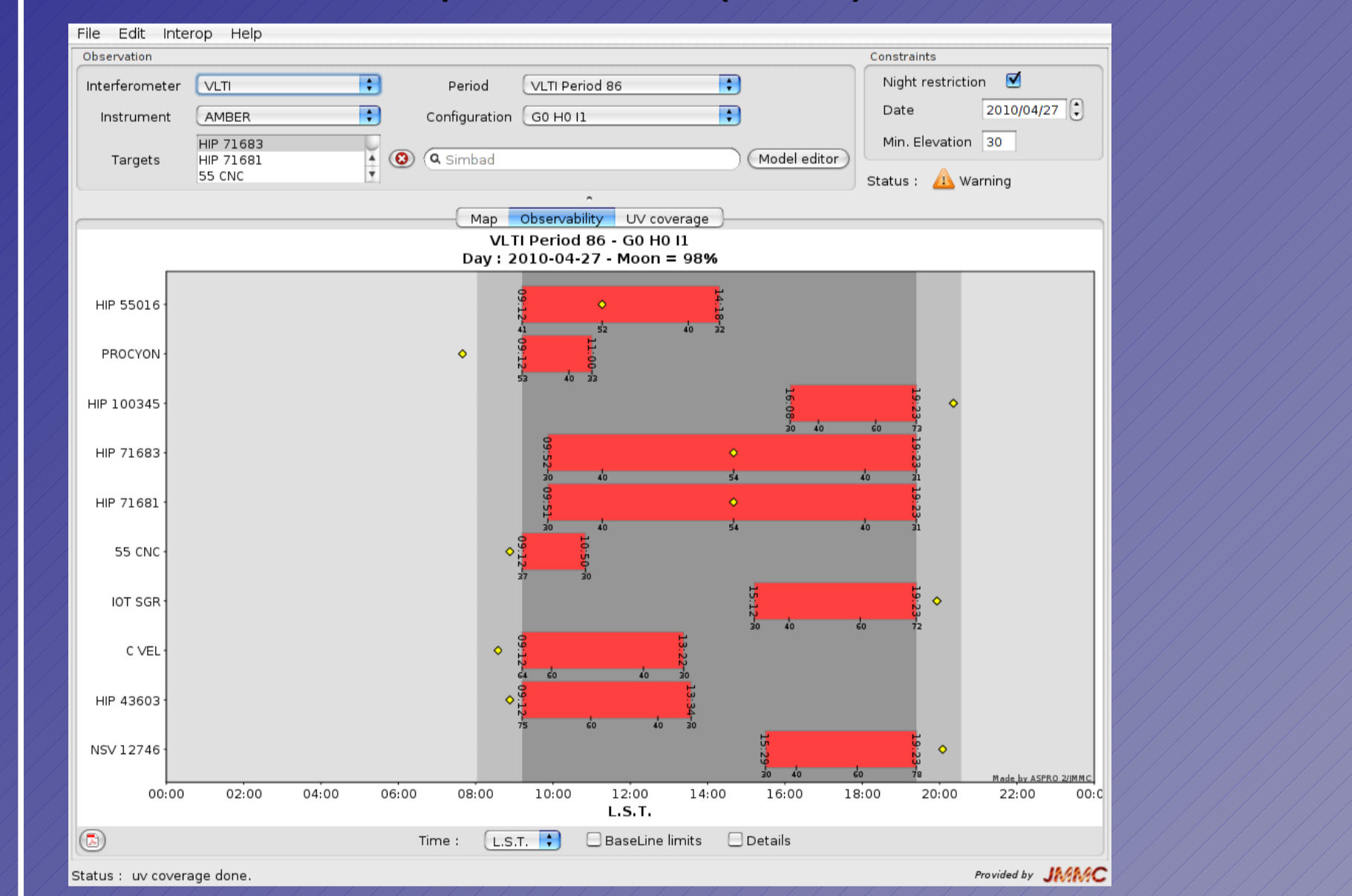## NON NOVA SED NOVAE: A NEW, SIMPLER, CLEARER USER INTERFACE

ASPRO 2000-2010

ASPRO2 2010 ++

Feature	Aspro	Aspro 2	Comments
Dynamic Single Frame Interface	No	Yes	Plots updated on the fly without blocking user inputs
Standalone	No	Yes	Aspro2 does not depend on the JMMC server
Use Remote file transfer protocol	Yes	No	Aspro requires an account on the JMMC server to exchange files
Load / Save Settings	No	Yes	Useful to save your work and use it later off line or send it to collaborators
Export plots	Yes	Yes	PDF format
Object definition			
List of objects	No	Yes	
CDS Query	Yes	Yes	Both use SimBad service
Manual edition	Yes	Yes	Only coordinates in Aspro 2
Analytic models	Yes	Yes	Aspro 2 Model editor uses a GUI similar to LITpro and associates a model per object
User-provided model	Yes	No	Fits or 3D Data cube (multi wavelengths)
Observability			
Observability of Sources	Yes	Yes	
Observability limits due to delay lines	Yes	Yes	
All-sky Observability limits	Yes	Yes	
Find best PoPs	No	Yes	CHARA
UV Coverage	Yes	Yes	Aspro 2 does not support the superposition of several baseline configuration
UV Plots			
Export to OIFits format	Yes	Yes	Includes noise modelling
Advanced features			
Knows about limiting magnitudes	Yes	No	Includes AO, FT ...
Search Calibrators	Yes	(No)	Use SearchCal
Model Fitting	Yes	(No)	Use LITpro
OIFits explorer	Yes	No	To Be Done
Export to ESO OBs	No	Yes	VLTI AMBER / MIDI Compatible with P2PP
Export to CHARA OBs	No	Yes	CHARA VEGA Compatible with VEGA_PLAN

ASPRO2 – GUI INTERFACE

MAP of interferometric facility and chosen configurations

OBSERVABILITY Based on:
- Interferometer configuration
- night restriction for the observation date
- chosen minimum elevation
- delay line compensation for the selected base lines
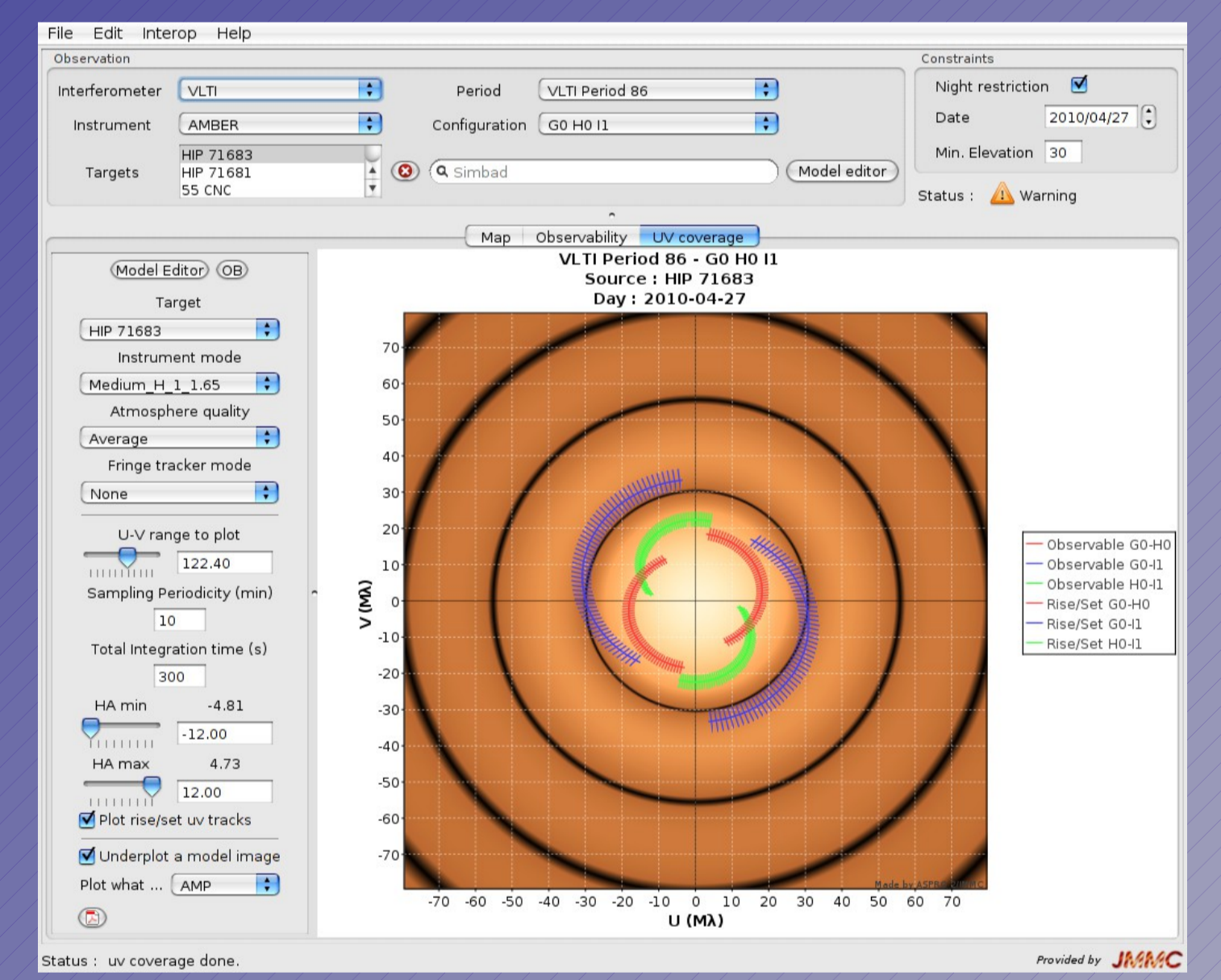- telescope shadowing (VLTI), zenihtal constraints
- CHARA'S Pipes Of Pan (PoPs)

UV COVERAGE Based on :
- Object's observability
- Object's analytical model
- Instrumental configuration
- Geometrical delays & constraints

ASPRO2 shares its model editor with our model-fitting program LITpro

INTEROPERABILITY

ASPRO2 uses SAMP (VO protocol) to interact with:
- **SearchCal**, the JMMC tool to find calibrators for the planned observations (and get back star list) (message fr.jmmc.searchcal.start.query)
- **LITpro**, the JMMC tool to fit models in interferometric observables (message fr.jmmc.litpro.start.setting, passes OI-FITS produced, star data and model data)
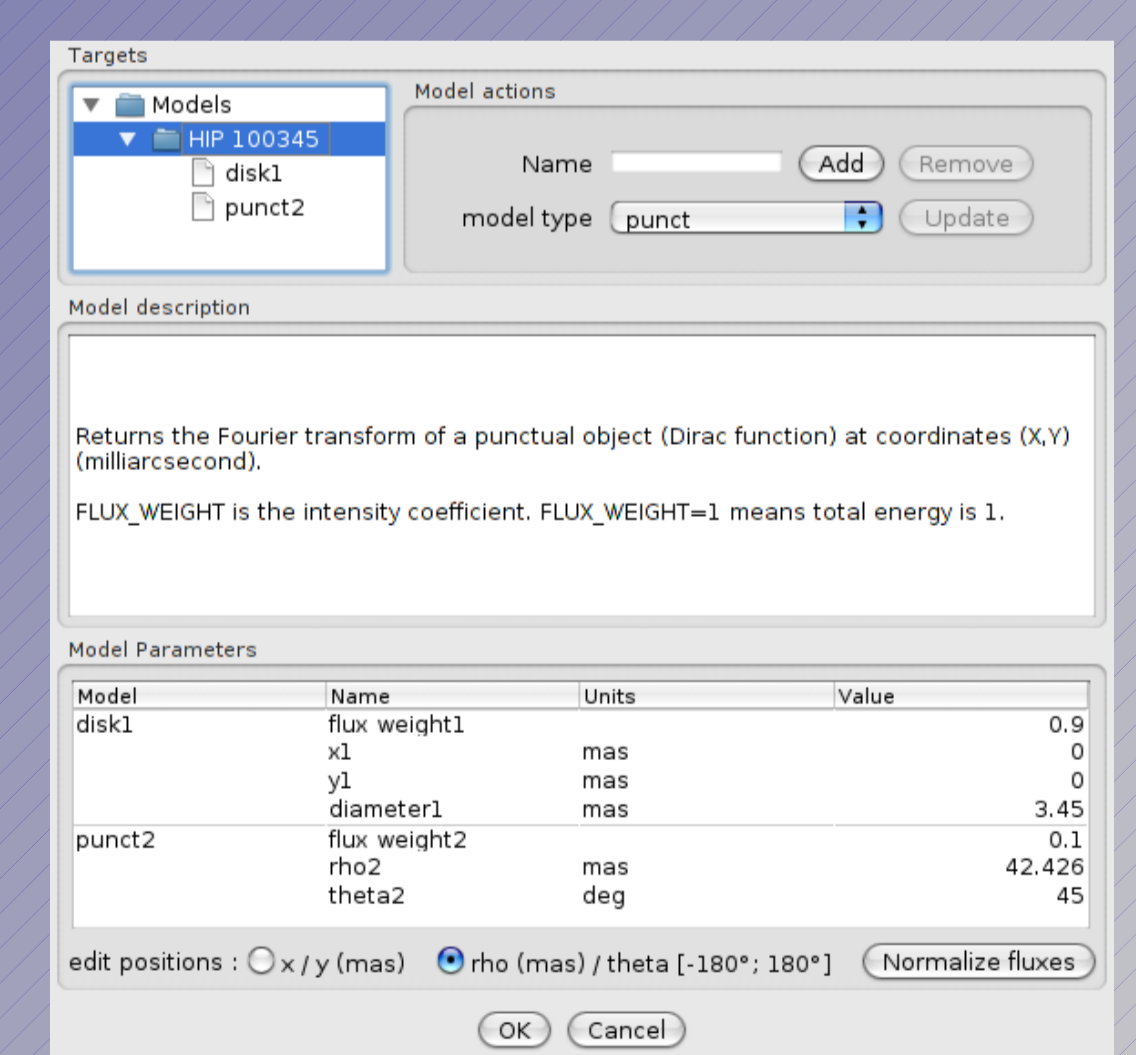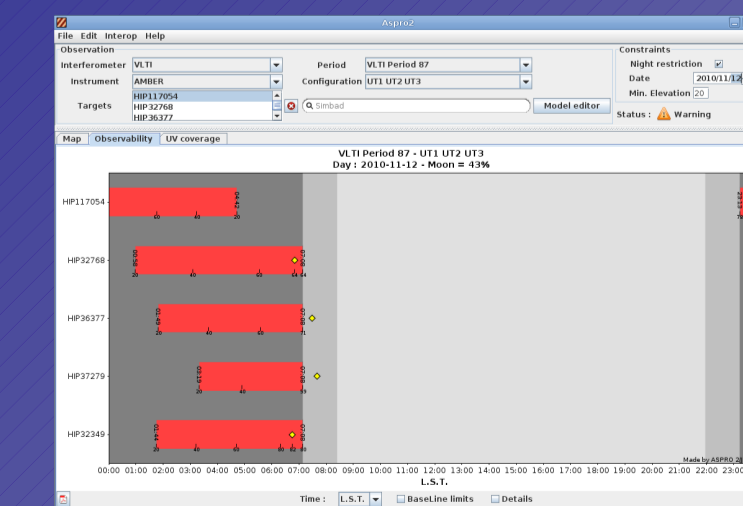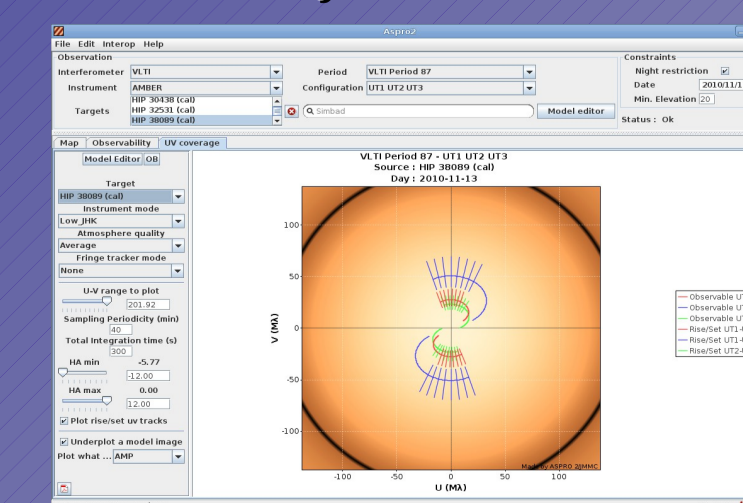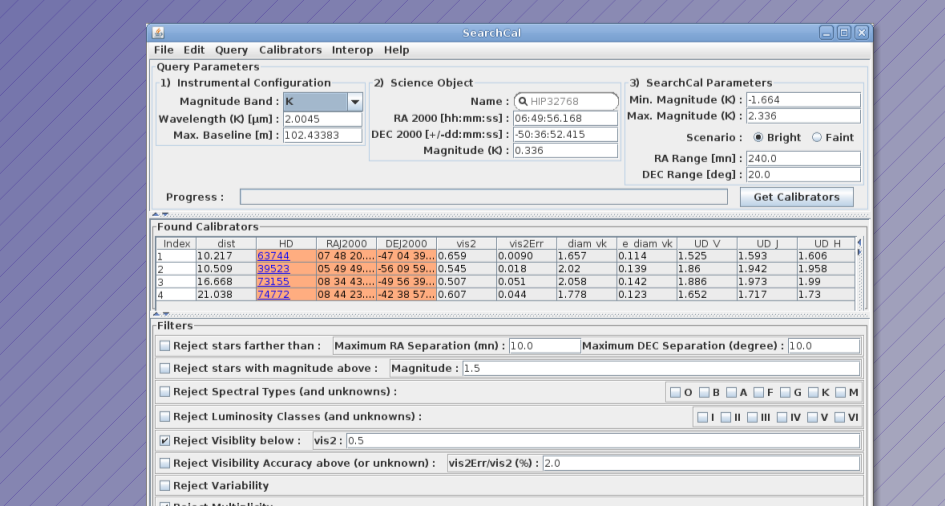- **VOTables** to, e.g., **Aladin**

Aspro 2 sends target 'HIP 32768' to SearchCal...

SearchCal searches calibrators and sends a VOTable back...

Aspro2 shows calibrators with an uniform disk model of the diameter returned by SearchCal

Aspro 2 displays returned calibrators in blue