The VLTI is easier than you think…

Christian Hummel (ESO)
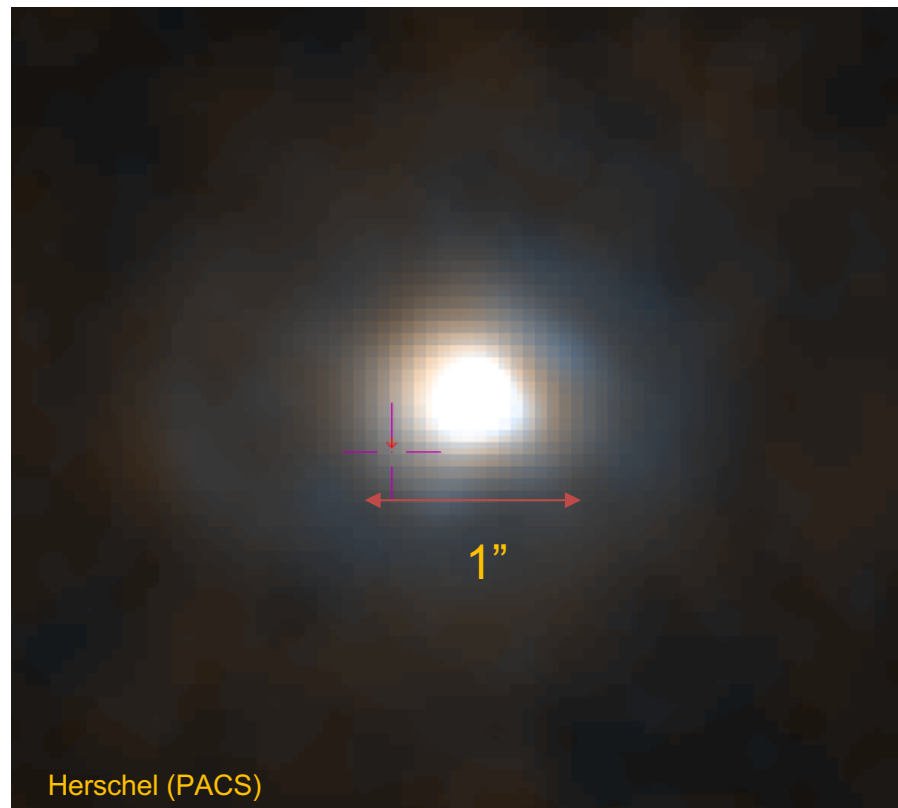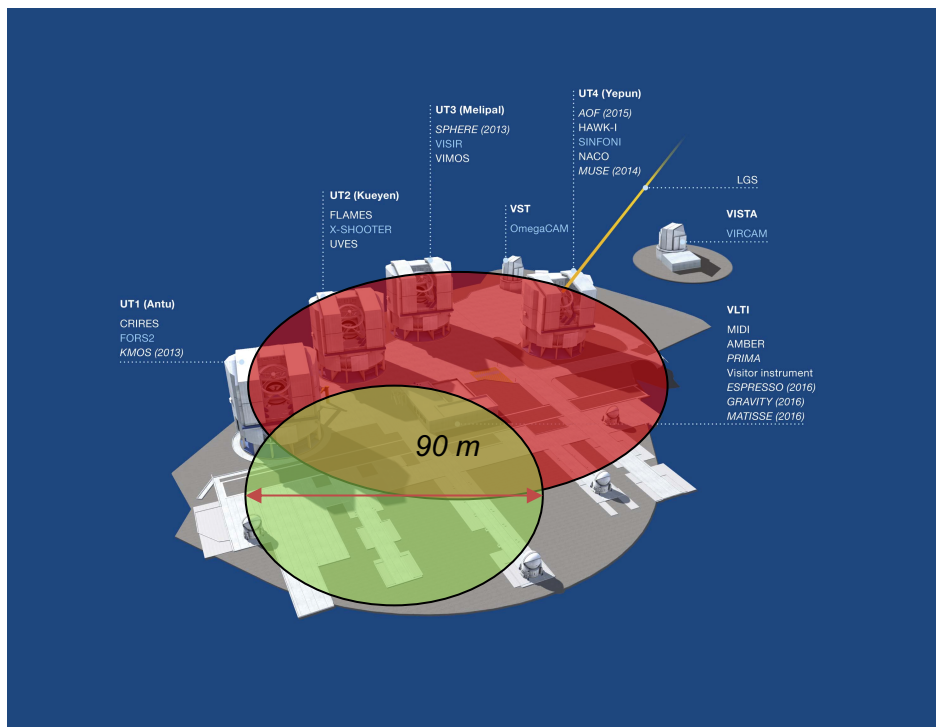
…if you have used other ESO telescopes before

- ■ Same Phase 1 (proposal) process
  - ➢ Additional support by JMMC tools

- ■ Same Phase 2 (service mode) process
  - ➢ Support by ESO and JMMC tools
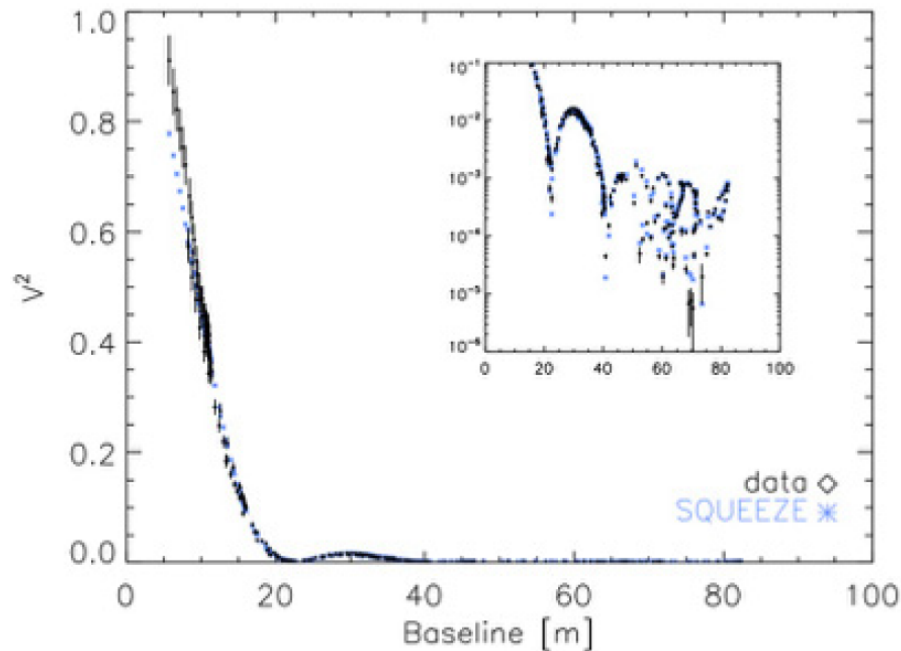
Your project here…

■ Choose your telescope size:

90 m

π 1 Gruis (AGB star, type S)

1"

Herschel (PACS)

V = 6.6, K = -2.0 => diameter = 0.02"

A wee bit of theory…

- In interferometry we say "the target is resolved" when the fringe visibility is less than unity

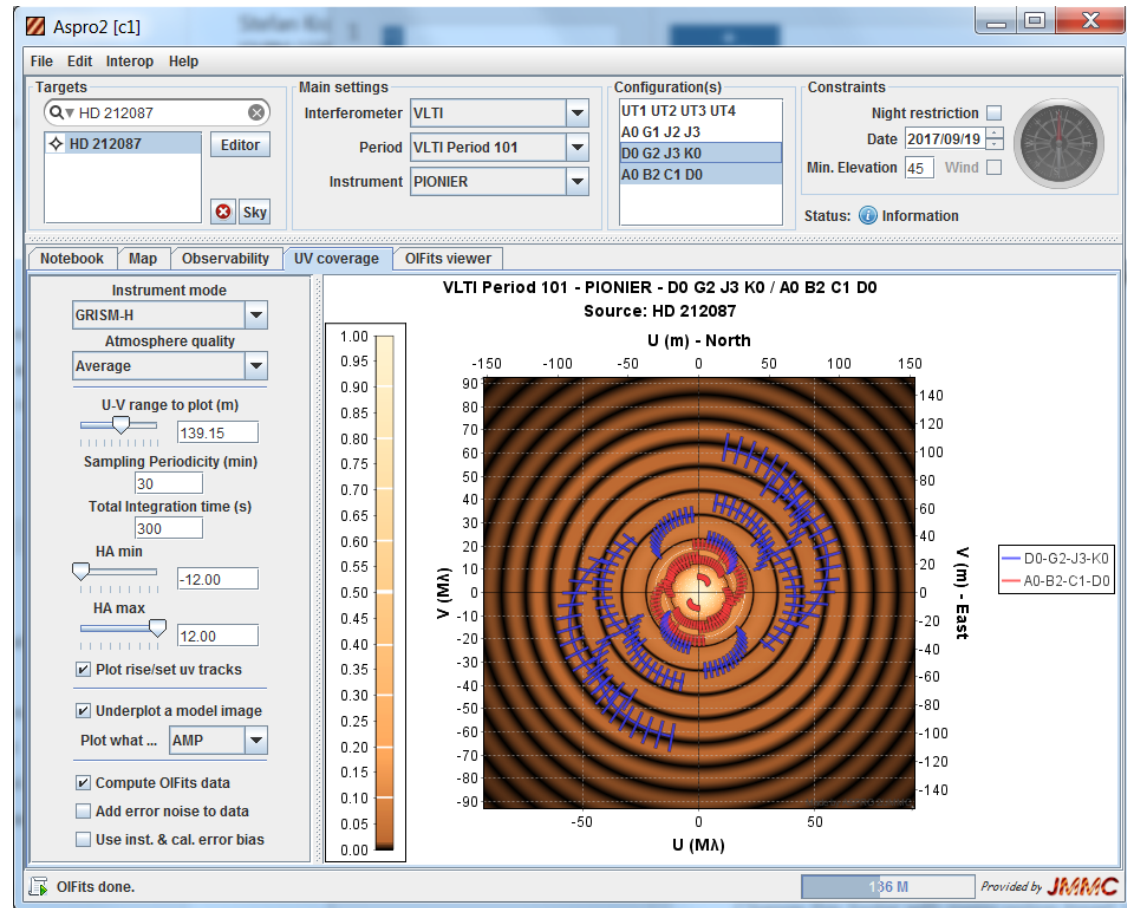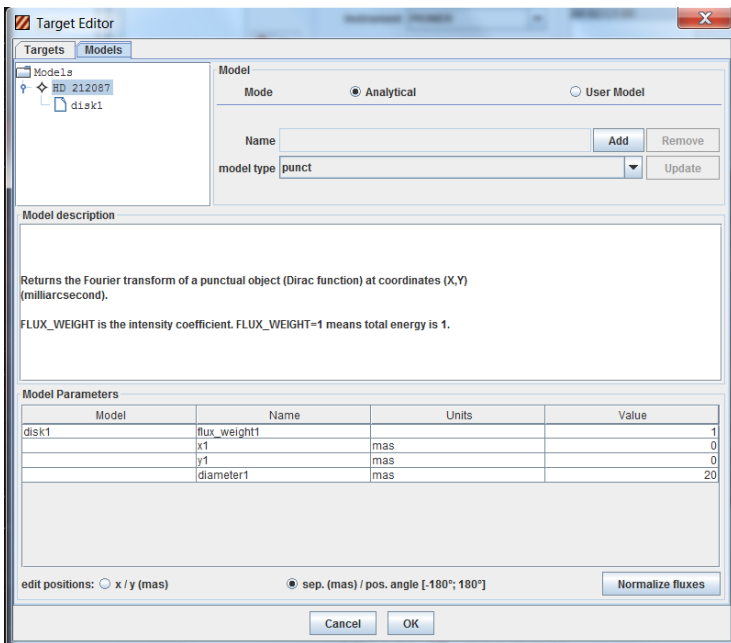- To see more detail on a stellar surface, we must measure beyond the first few visibility nulls

Help, please…!

■ Use ASPRO (JMMC) to simulate observation

➤ Edit target info

➤ Choose config.

➤ Look for V^2 nulls

Phase 1: proposal time!

- ■ "We would like to image the surface of a star.."

- ■ One run per configuration and per instrument

- ■ Check instrument web pages for limits, e.g.:
  - ➢ http://www.eso.org/sci/facilities/paranal/instruments/gravity.html

- ■ One additional table to fill in box 14:

14. List of interferometry targets proposed in this programme

| Run	Name	Vmag	mag(λ)	λ_obs	size(λ)	Baseline	Vis.	mag_c	Tot
A	Wd1-9	17.5	3.0	2.2	2.6	UT1-UT2-UT3-UT4	0.68/0.10	3.2/5.5	4

VLTI Target Notes: The target itself has V=17.5, therefore we will use as guide star Wd1-4 at RA=16:47:01.42 Dec=-45:50:37.3. This star has V=14.5 and K=4.4 and is 29" away from the target. This is the same guide star used for the MIDI observations. The correlated magnitudes are based on a diameter of 2.6 mas, which is half of the Brγ region size measured by Domiziano de Souza on CPD−57° 2874, which is at half the distance from Earth compared to Wd1-9. The continuum size is not expected to be larger than the size in the emission line.
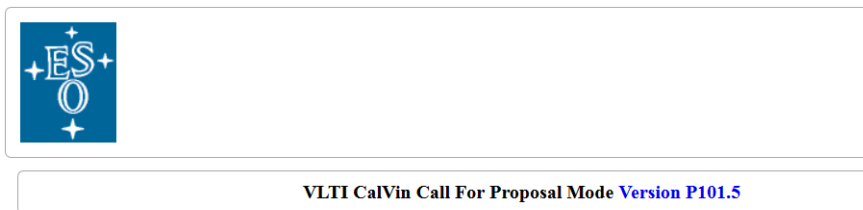
Phase 2: preparation is everything!

- Prepare concatenations of SCI_ and CAL_ OBs
- Use LST intervals to avoid shadowing…
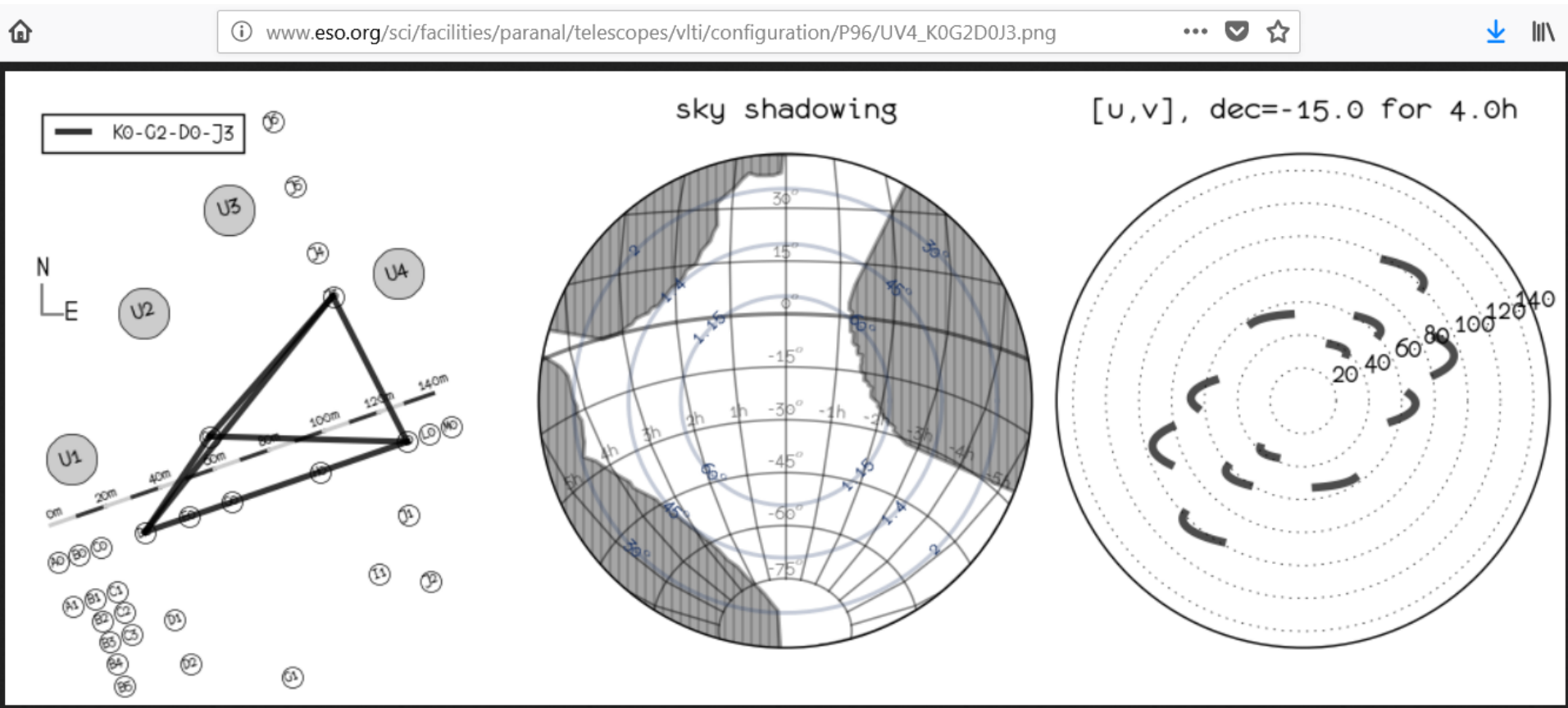
Selection of calibrators

- **Calibrators are stars with small angular diameters**

- **Being "unresolved", their visibility should be unity**

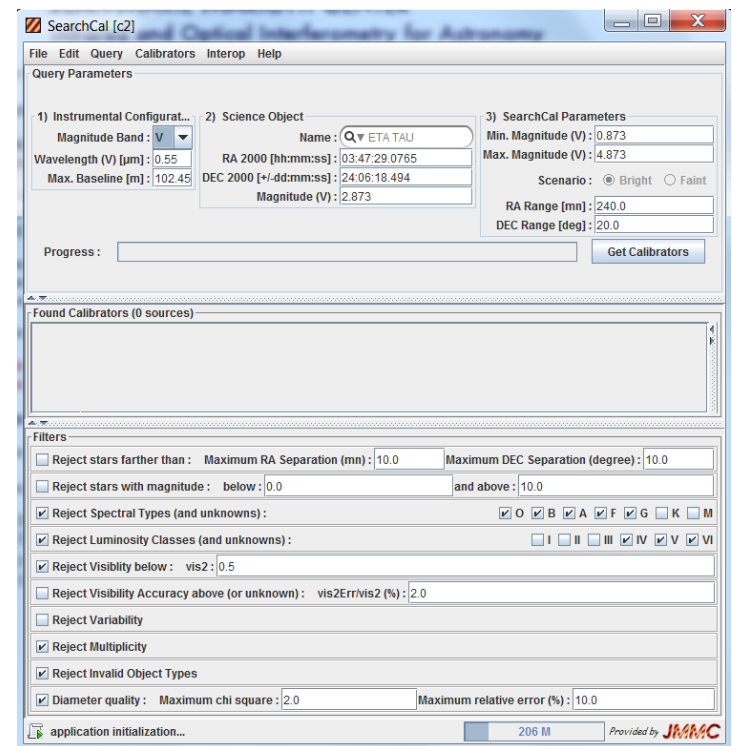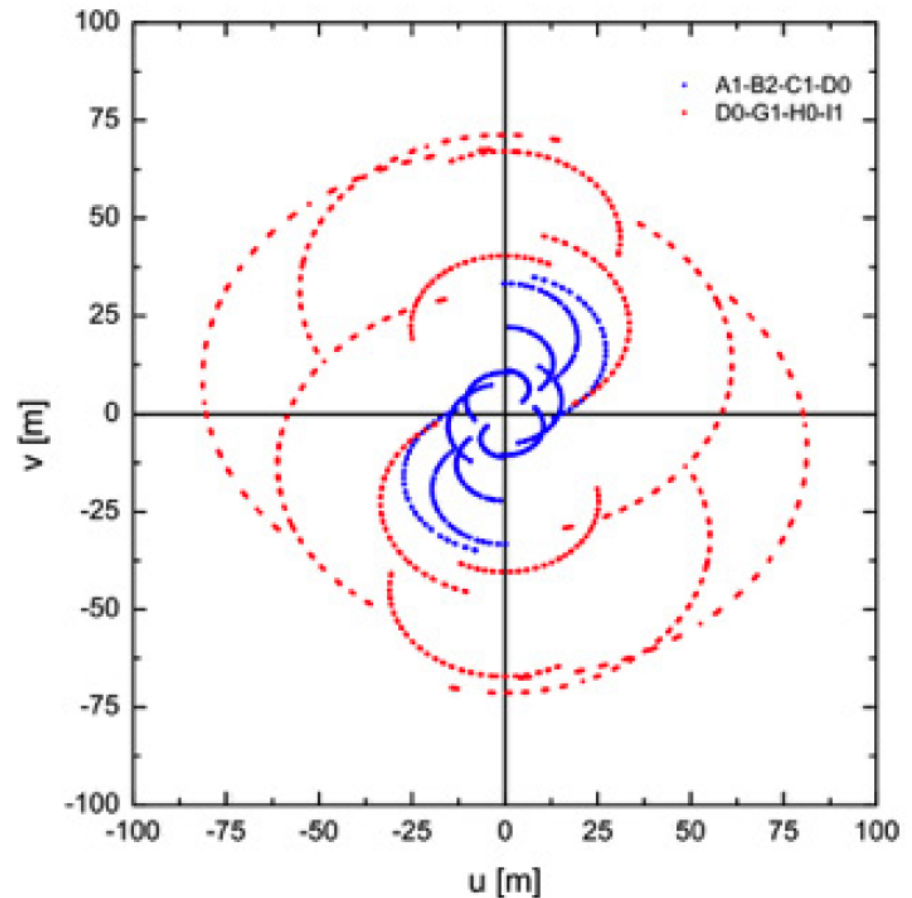- **Calibration means dividing the SCI visibility by CAL**

Paranal VLTI operations

- **uv-coverage**
  - PIs control via LST
    - Little flexibility
  - Imaging mode in preparation: optimization by OT
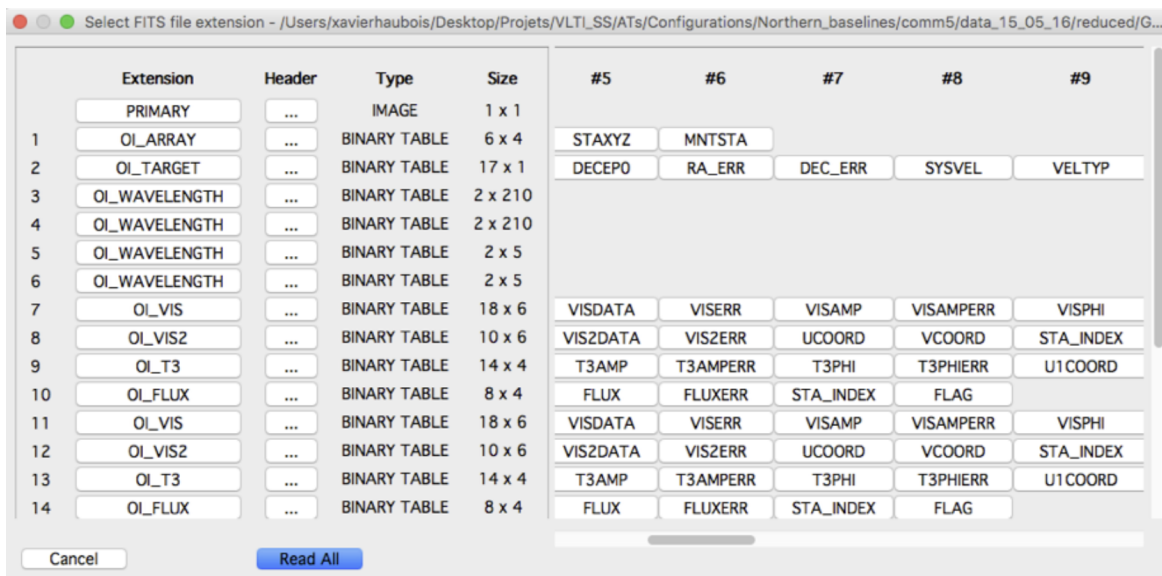   - Major code work
- **Challenges**
  - Reconfigurations
    - Use intermediate ones
  - Variable targets
    - Time constraints
  - Snapshot surveys

Observations completed…

■ Download data from ESO archive and run pipeline
  ➢ PNDRS (JMMC) for PIONIER automatically calibrates
  ➢ Reflex workflows for GRAVITY include one for calibration

■ Ask us for details… ☺

■ Data format: OIFITS (Pauls+ 2005, Duvert+ 2017)

Python:
- astropy.io.fits http://docs.astropy.org/en/stable/io/fits/
- Paul Boley: http://astro.ins.urfu.ru/pages/~pboley/oifits/
- Python tools for GRAVITY (merge, analysis, etc)
  svn co https://145.238.154.30/repos/DRS_gravity/python_tools

- Yorick (E. Thiébaut): https://github.com/emmt/YOIFITS
- Julia (E. Thiébaut): https://github.com/emmt/OIFITS.jl

Summary of OIFITS tools and libraries:
- http://www.astro.phy.cam.ac.uk/research/ResearchFacilities/software-for-astrophyiscs/oifits

Tools for visualization

- **OIFits Explorer**
  - www.jmmc.fr

- **FV**
  - https://heasarc.gsfc.nasa.gov/docs/software/ftools/fv/

- **GRAVIQL (GRAVITY quick look)**
  - https://github.com/amerand/GRAVIQL

Modeling

- LITpro (JMMC)
  - http://www.jmmc.fr/litpro

- mfit (John Young)
  - http://www.mrao.cam.ac.uk/~jsy1001/mfit/

- Visibility modeling tool (NExScI)
  - http://nexsci.caltech.edu/software/index.shtml

- OYSTER (Christian Hummel)
  - http://www.eso.org/~chummel/oyster/oyster.html

- CANDID (companion detection only)
  - https://github.com/amerand/CANDID

Image reconstruction softwares

- PAINTER: http://www-n.oca.eu/aferrari/painter/

- WISARD: http://www.jmmc.fr/wisard_page.htm

- MACIM: http://www.physics.usyd.edu.au/~mireland/MACIM/

- MIRA: http://cral.univ-lyon1.fr/labo/perso/eric.thiebaut/?Software:MiRA

- BSMEM
    - ftp://ftp.eso.org/pub/general/VLTI2017_School
    - www.mrao.cam.ac.uk/research/optical-interferometry/bsmem-software/

- SQUEEZE: https://github.com/fabienbaron/squeeze

- IRBIs:
—> Binary image to be used with VirtualBox(www.virtualbox.org/):
        ftp ftp.eso.org
        login: anonymous password: your email address
    > cd pub/general/VLTI2017_School
    > binary
    > get ubuntu14_matisse_18012017.ova

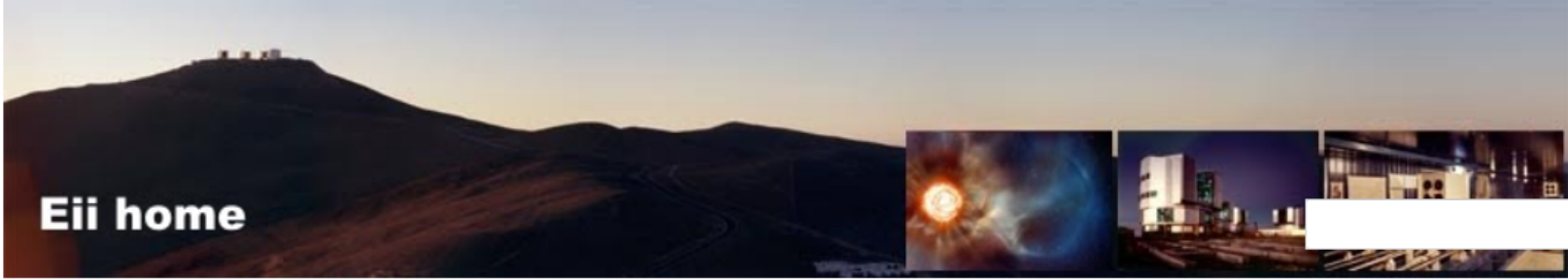- The OI imaging beauty contest (proceedings SPIE 2016, Sanchez+17)

Send paper to Nature…

π 1 Gruis

18 mas
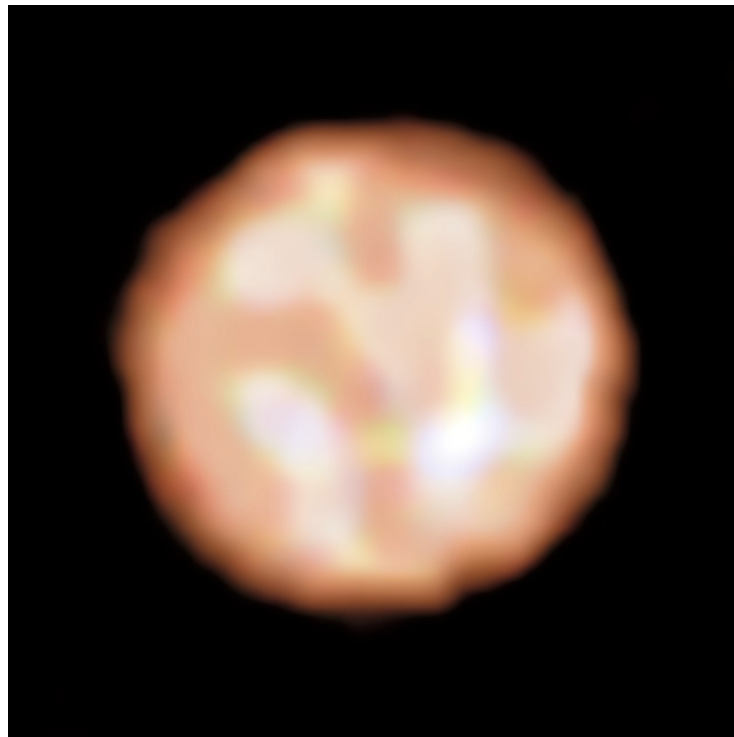
Paladini et al. 2018, Nature 553,310

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Search this site

VLTI Expertise Centres Network

A structured development of optical interferometry requires leaping towards a European network of VLTI Expertise Centres. These centres will be the backbone of dissemination activities to new VLTI users, by organising observing preparation and data reduction schools, by co-organising with ESO the VLTI community days, and being the end-points of the Fizeau staff exchange programme.

The leap aims at bringing the impact and return of the programme in spreading know-how in Europe to a new level. It follows at a smaller scale the successful experience of the ALMA Regional Centres, where researchers travel to the expertise centres to reduce their data. The centres will be the visible first contact point for astronomers interested in using VLTI.

The planned network of VLTI Expertise Centres includes the three partners from the OPTICON H2020 networking activity:

- Jean-Marie Mariotti Centre - Service aux Utilisateurs du VLTI, France,
- Portuguese VLTI Expertise Centre, Portugal,
- University of Exeter, United Kingdom,

as well as the three interferometry JRA (WP8) lead partners:

- Max Planck Institute for Astronomy, Germany,
- Observatoire de la Cote d'Azur, France,
- Université de Liége, Belgium.

Subpages (1):   JMMC - Service aux Utilisateurs du VLTI