

From the observation design to data

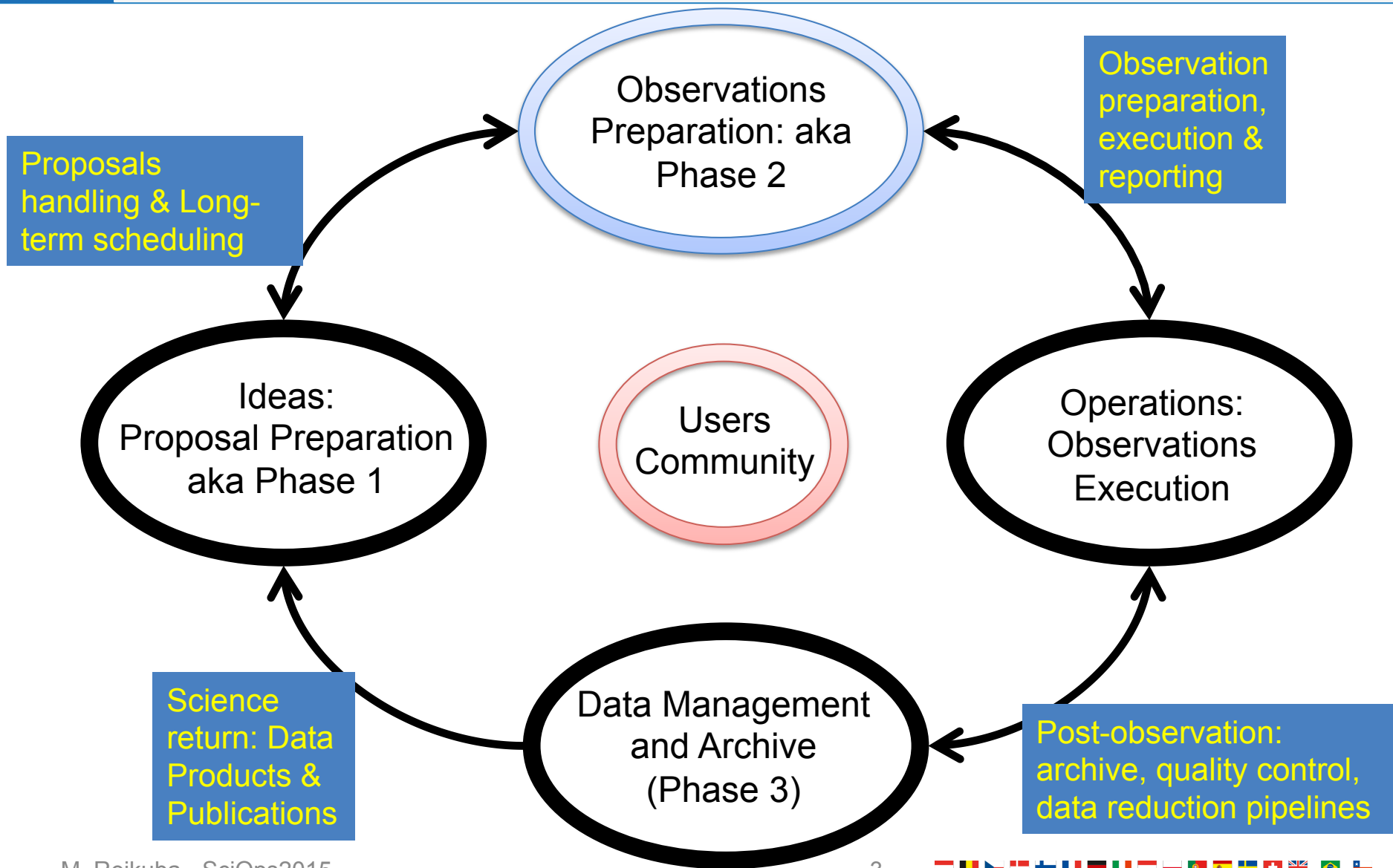
Marina Rejkuba

ESO User Support Department Head

Overview

- User Support Department in the context of VLT end-to-end operations model
- 15 years of operations of VLT operations
 - Service and Visitor Mode
 - Observations preparation tools
- Instrument Operations Teams
- Remote operations & engineering

Integrated VLT end-to-end system



User Support Department

User Support Department at ESO:

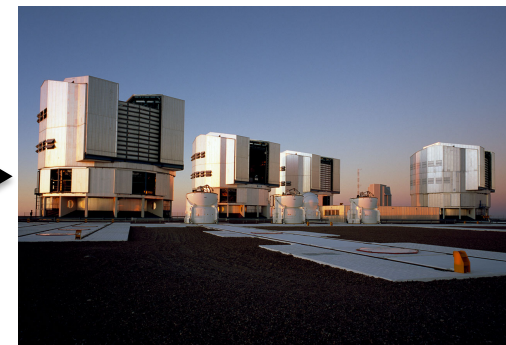
- Main interface between the **Observatory** and the **Astronomers Community**
- Support, review, and optimization of telescope time awarded in Service Mode
- Specifications and operation of the front-end infrastructure (tools, helpdesk)
- Compliancy with ESO policies, Users' Committee
- Visiting Astronomers travel
- Instrument Operations Teams participation



Astronomers
(Users Community)
Anywhere



User Support Department
Garching



Science Operations
La Silla Paranal Observatory

Observing Modes, Ranks and Types

■ Service Mode (Queue)

- optimisation of the schedule according to programme needs and availability of ambient constraints
- flexible execution: scientific priorities and constraints
- homogeneous programme preparation; calibration plan
- integrity of the archive and secondary use of data

■ Visitor Mode (Classical)

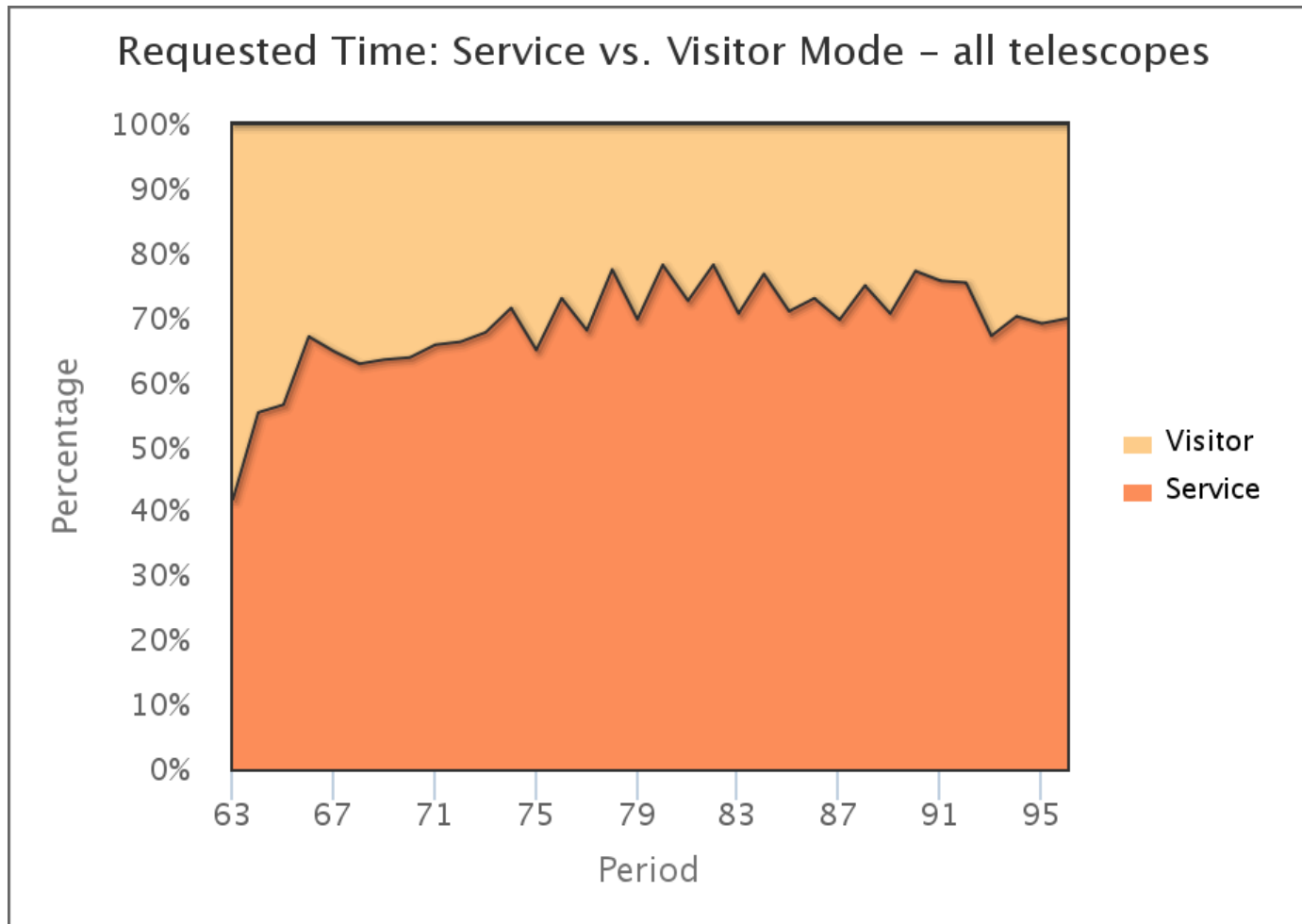
- real-time decision of the visiting astronomer
- hands-on experience at the telescopes
- technically challenging observations

■ Designated Visitor Mode

- Fixed slots, short programmes, limited interactions

15 Years of Service Mode Observing at ESO

- Primas et al, 2014, Messenger Article

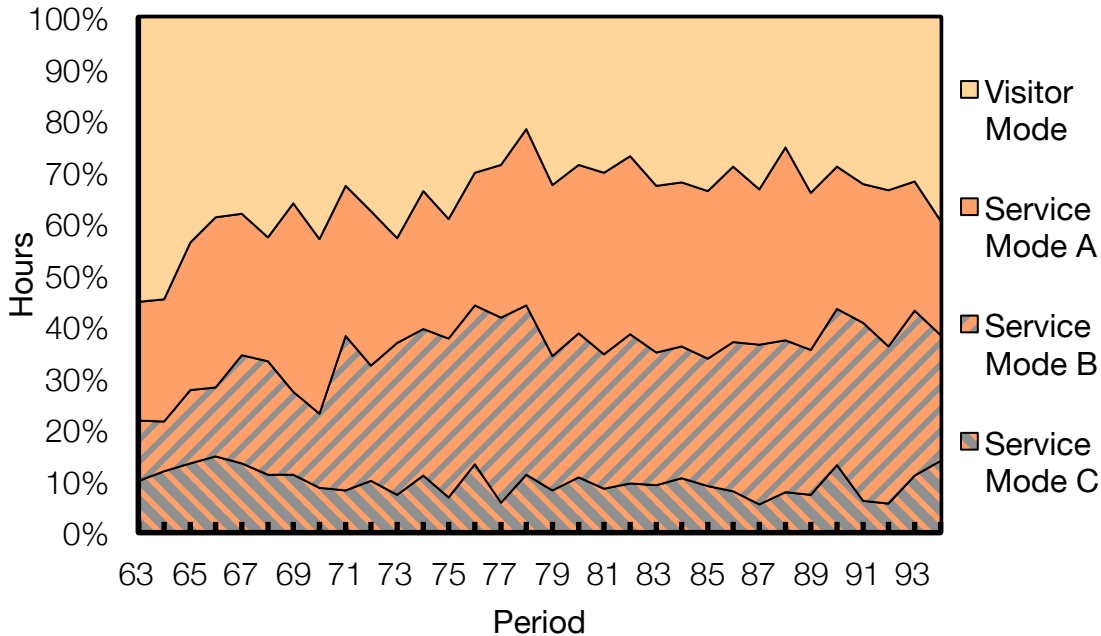




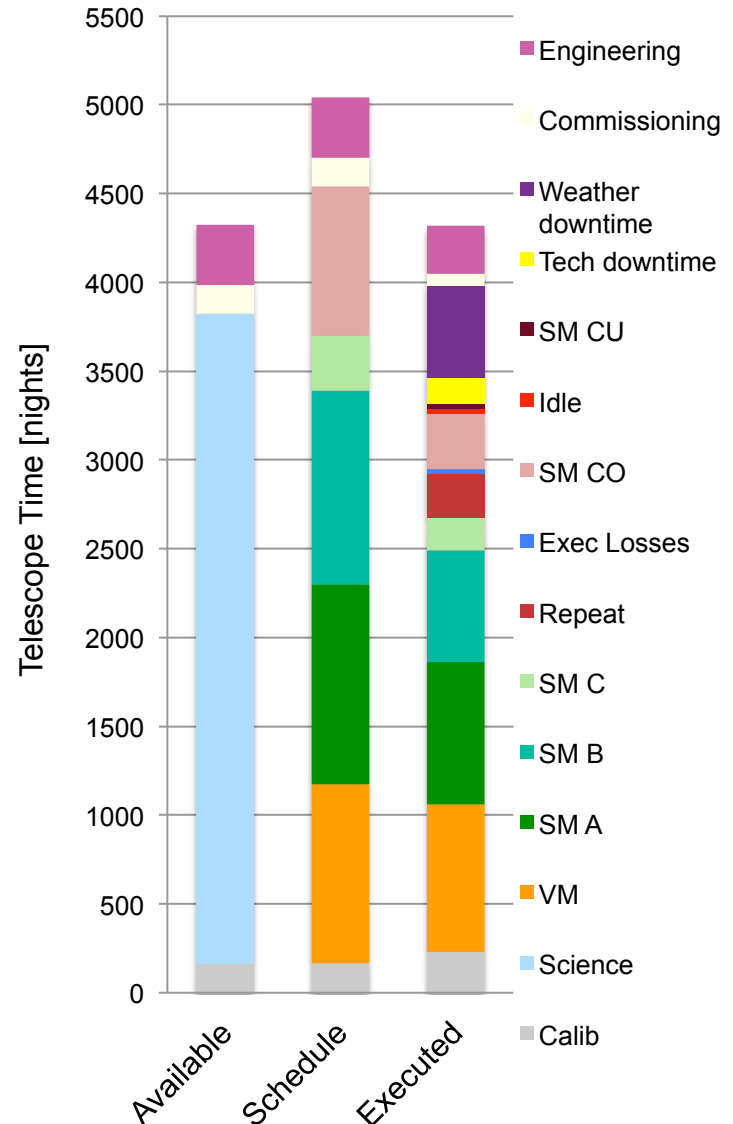
15 Years of Service Mode Observing at ESO

- Primas et al, 2014, Messenger Article

Allocated Time: Service vs. Visitor Mode (all telescopes)

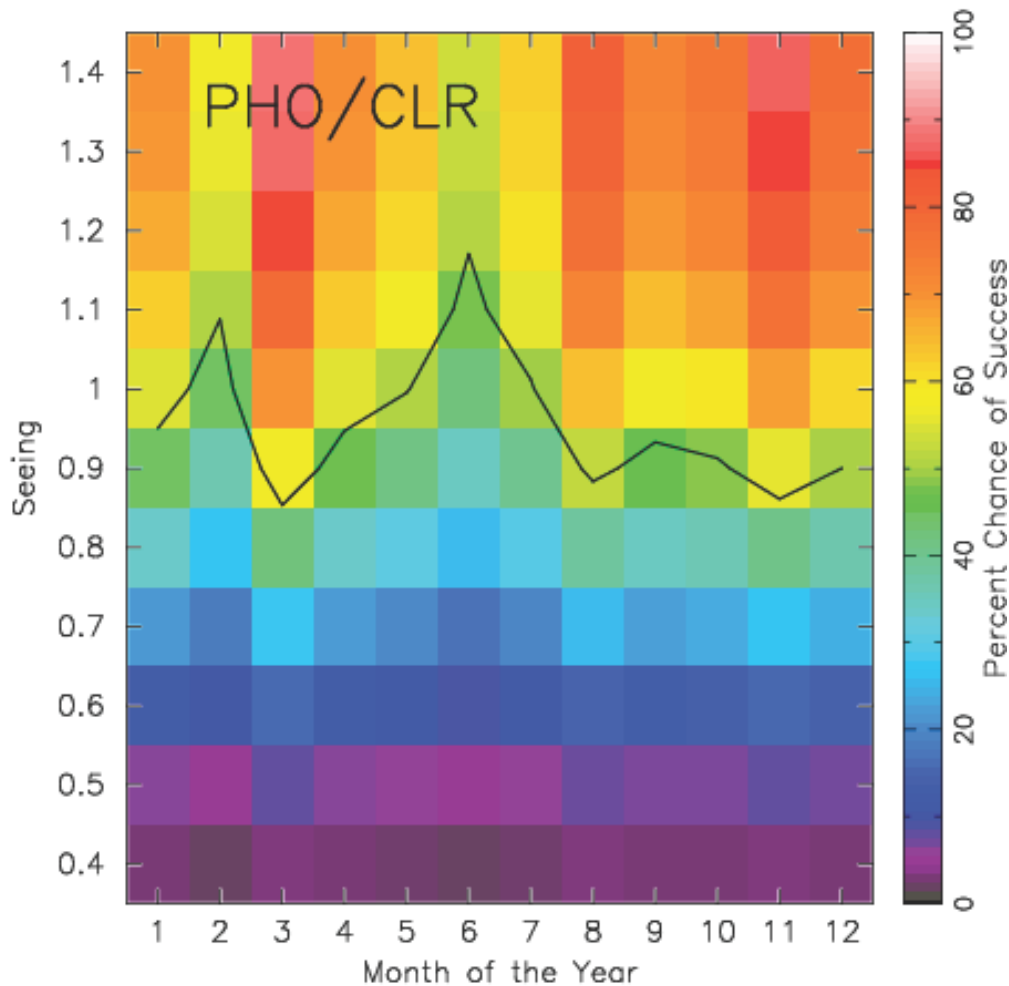


- Completed: ~80% A-rank runs, 45% B, 35% C
- among 20% A-rank half are >50% complete
 - fraction of non-completed are DDTs



15 Years of Service Mode observing at ESO

■ Primas, F. et al., Messenger Article (Dec 2014)

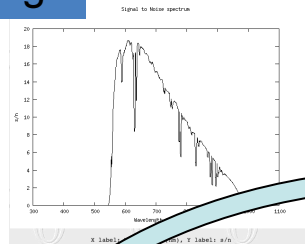
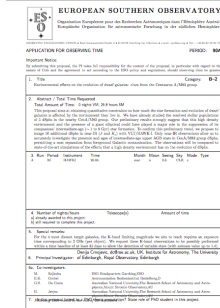


- Image quality vs. seeing
- Combined probability of realisation of observing constraints
- Improved planning of the observations & short-term scheduling

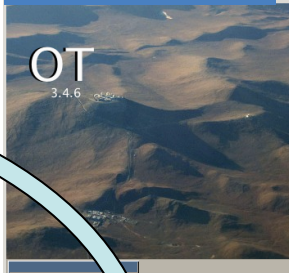


Data flow end-to-end tools

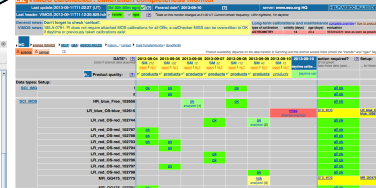
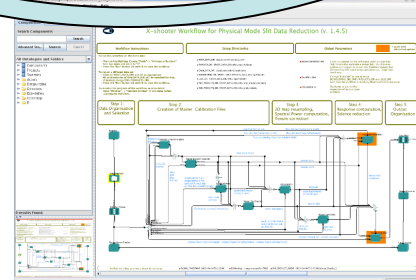
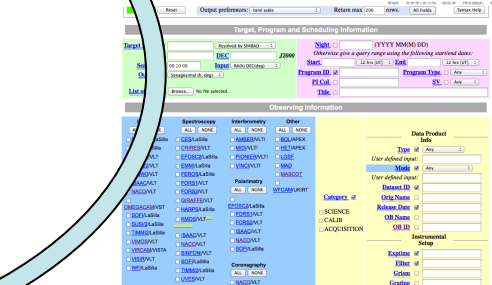
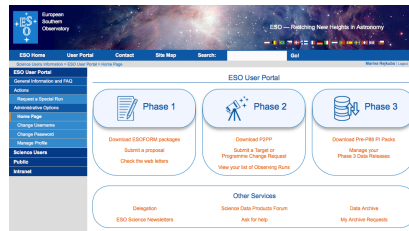
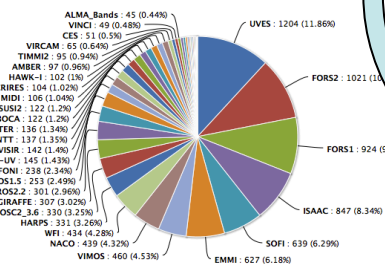
Proposals handling & Long-term scheduling



Observation preparation, execution & reporting



No. of papers per instrument
Source: telbib
Query: published:1



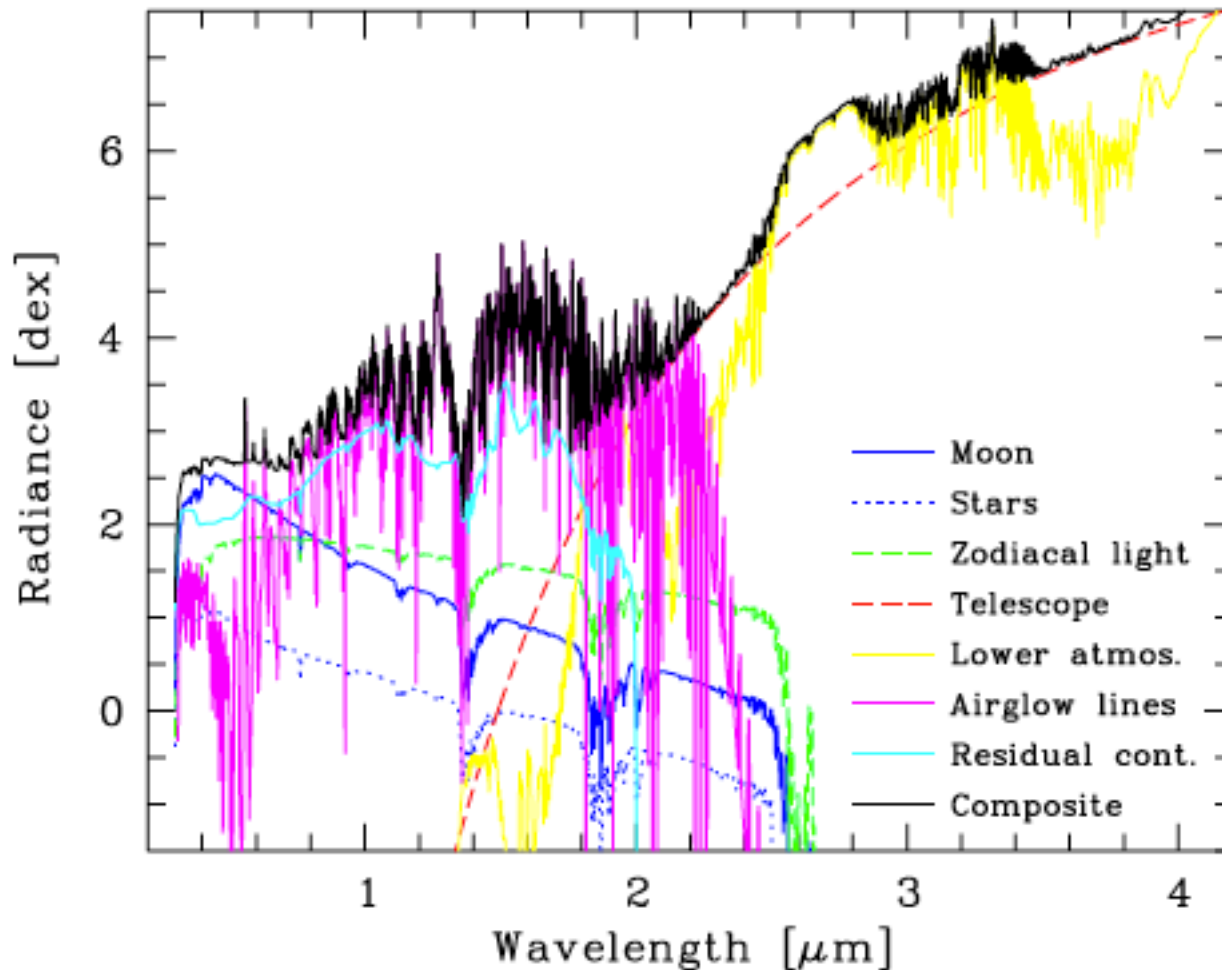
Science return: Data Products & Publications

Sort	Column	Constraint	Unit	Description	UCD
+	DP_ID			ESO Data set Identifier	meta:dc:meta:main
+	OBJECT			Object designation	meta:id
+	TARGNAME			Target designation	meta:id
+	RAJ2000		deg	Telescope pointing (right ascension, J2000)	pos:eq:ra:meta:main
+	DECJ2000		deg	Telescope pointing (declination, J2000)	pos:eq:dec:meta:ma

Post-observation: archive, quality control, data reduction pipelines



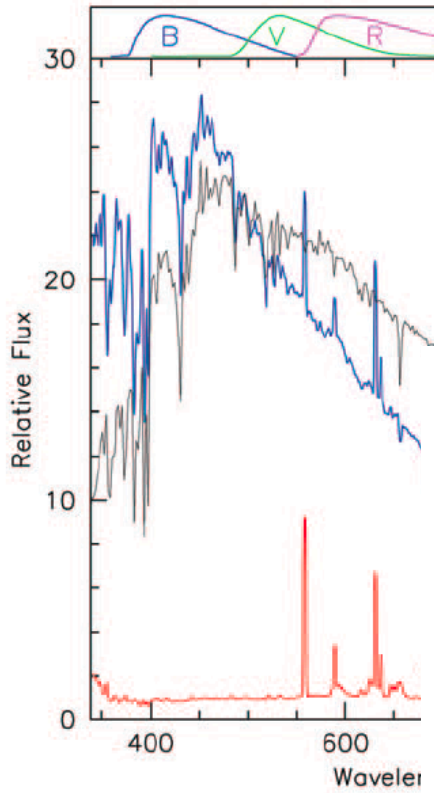
Planning the observations: Cerro Paranal Sky Model



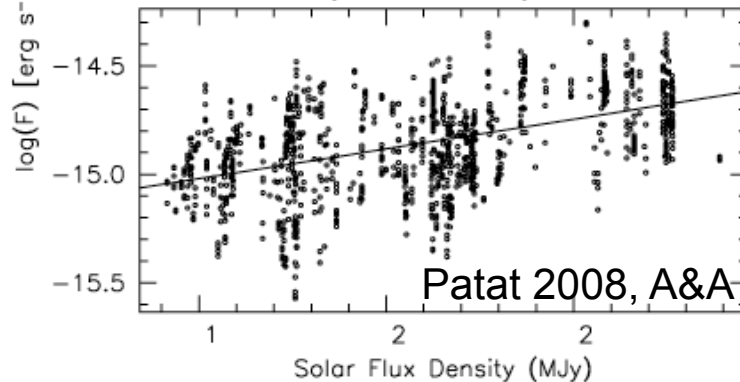
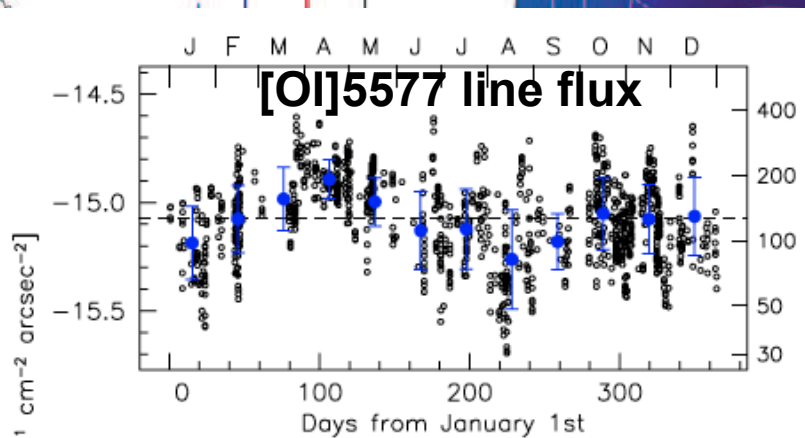
- Moon above the horizon:
- scattered moonlight
 - scattered starlight
 - zodiacal light
 - thermal emission
 - molecular emission of the lower atmosphere
 - airglow emission of the upper atmosphere
 - airglow/residual continuum

Noll et al. 2012

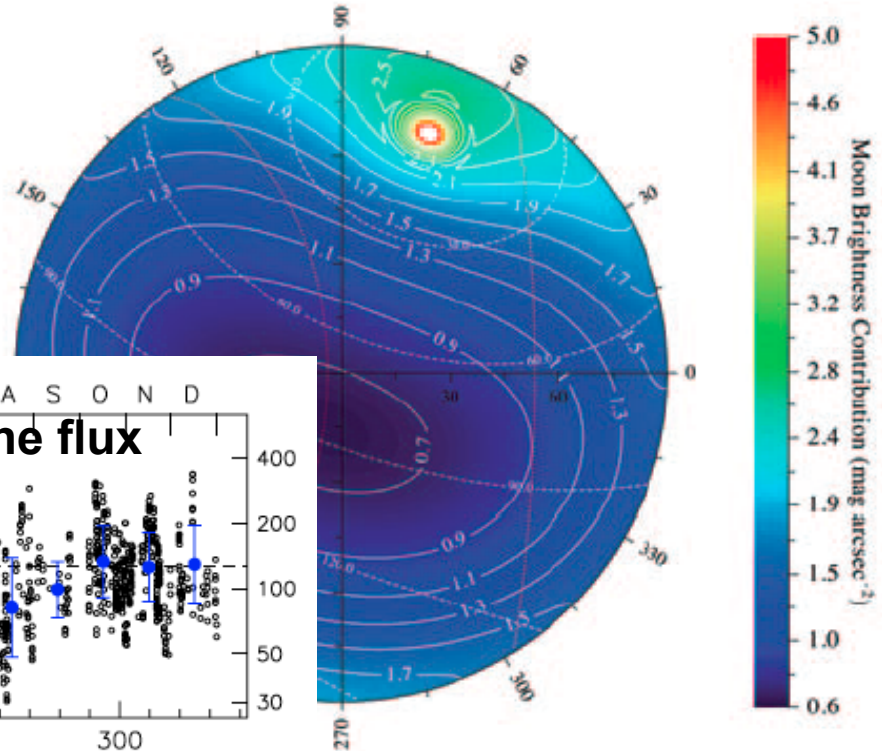
Bright or Dark Sky



Patat 2004, Messenger

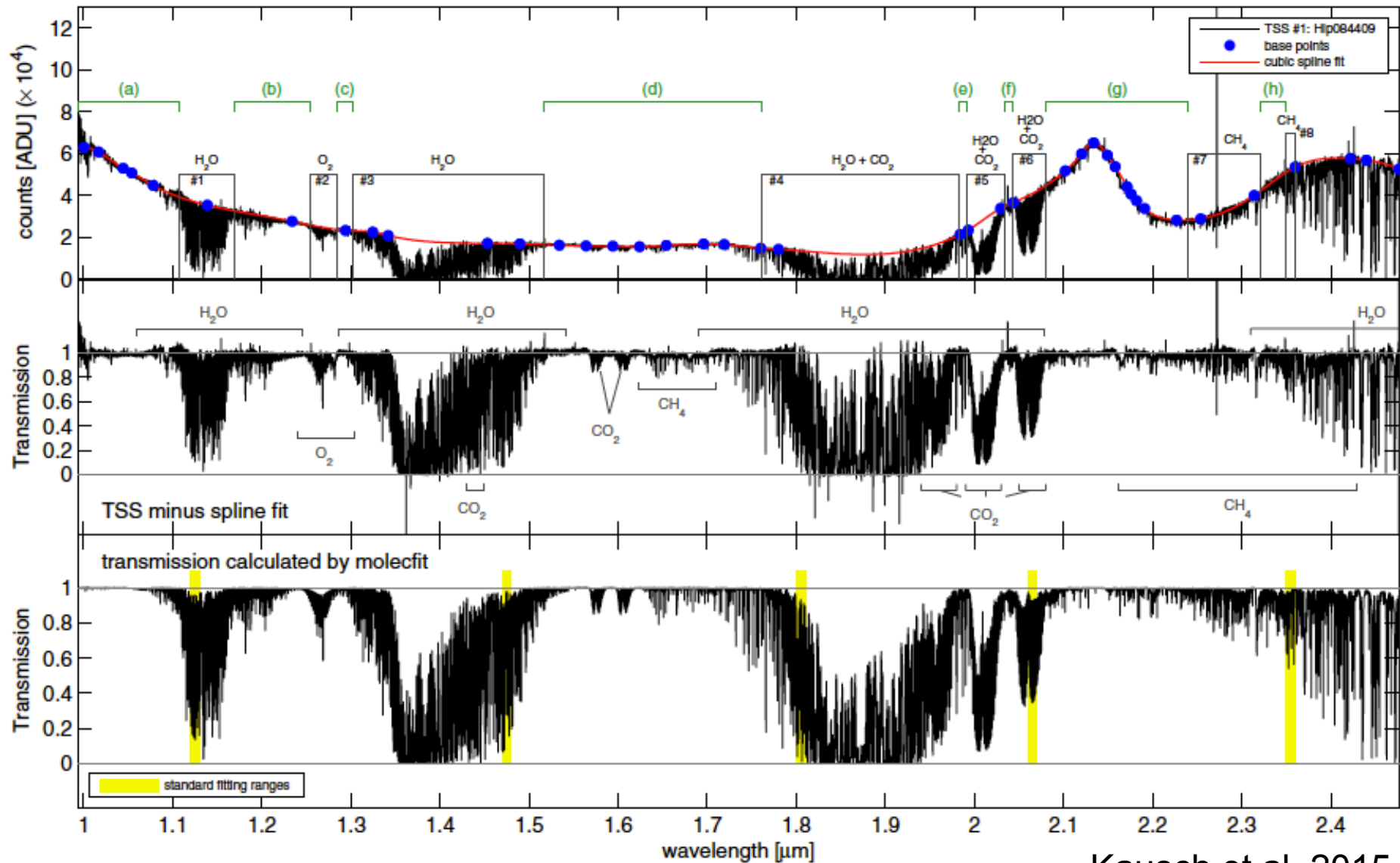


Patat 2008, A&A

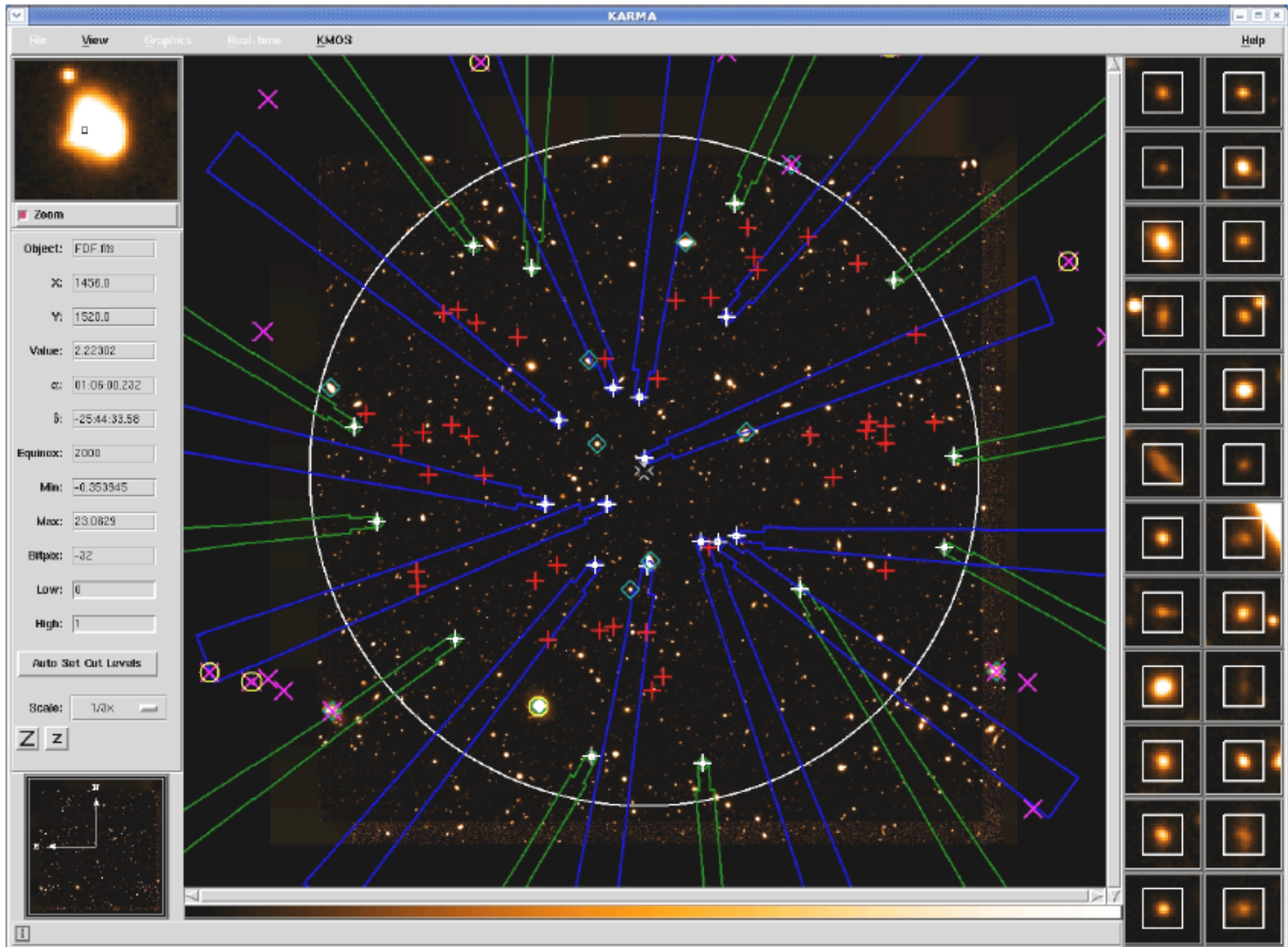


B-filter, FLI=0.5, moon elevation 20

Tools: Molecfit & Telluric Correction



Tools: selecting the targets





Unified GuideCAM Tool

GuideCamTool

Fetch OB info from P2PP

Instrument: VIMOS

Mode: PRE

Target field center:

Object:

RA: 10:00:00.000 Dec: -03:00:00.000

Rotation: 90.0

Point Telescope/Update View

Tool: VLT guide stars

Magnitude filter:

Min: 11 Max: 13.5 Refresh

Selected star:

RA: 10:00:16.109 Dec: -03:09:33.588 Add

Show proper motion Alternate probe position

RA	Dec	Pos
10:00:16.1...	-03:09:33....	POS

Move Up

Move Down

Remove

Save finding chart

Aladin v8.0

Location Frame ICRS

DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Simbad NED

DSS

select assoc
pan crop
dist cont
phot pixel
draw prop
tag del
filter
cross
x-y
rgb

InstruFoV
TelFoV
VLTGuideStars
PMFilterGS
MagFilterGS
CatalogGS
DSS

epoch
size
opac
zoom

Frame: ICRS

10:00:00.13 -02:59:59.5
43.47 x 33.56"

Search

grid wink north multiview match

(c) 2014 UDS/CNRS - by CDS - Distributed under GNU GPL v3

0 sel / 109 src 250fps / 86Mb

Instrument Operations Teams

- authority and responsibility to define, monitor and optimize instrument operations
 - instrument modes and calibration plan
 - documentation and tools
 - monitoring efficiency, reliability, maintainability
 - raw and reduced data quality, pipelines
- maintain and update the instrument performance with a goal of maximizing the quality and quantity of scientific output
- define upgrades and improvement projects



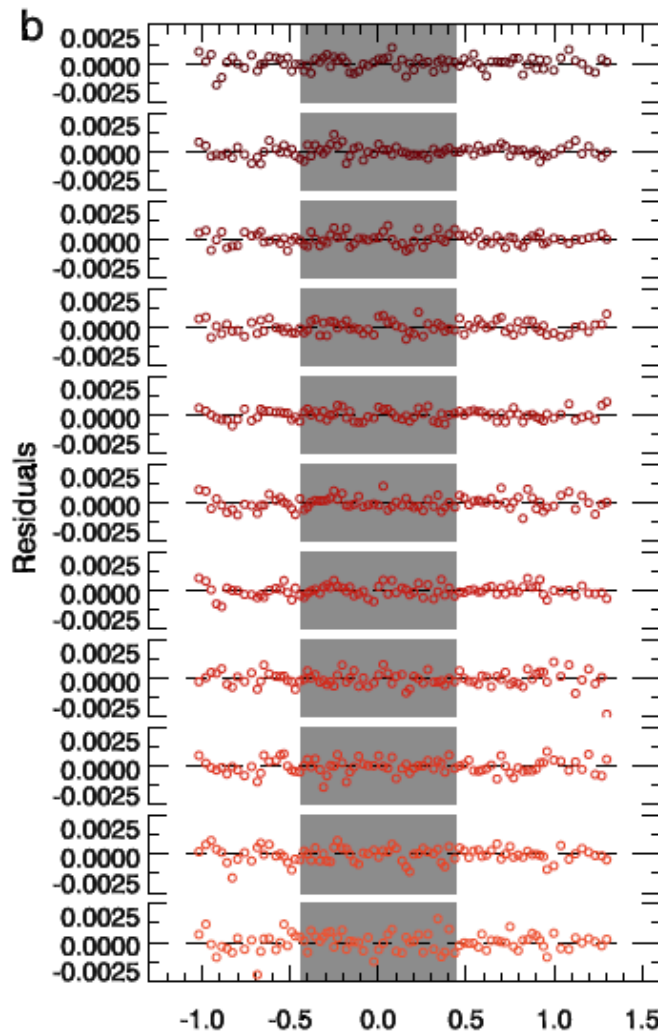
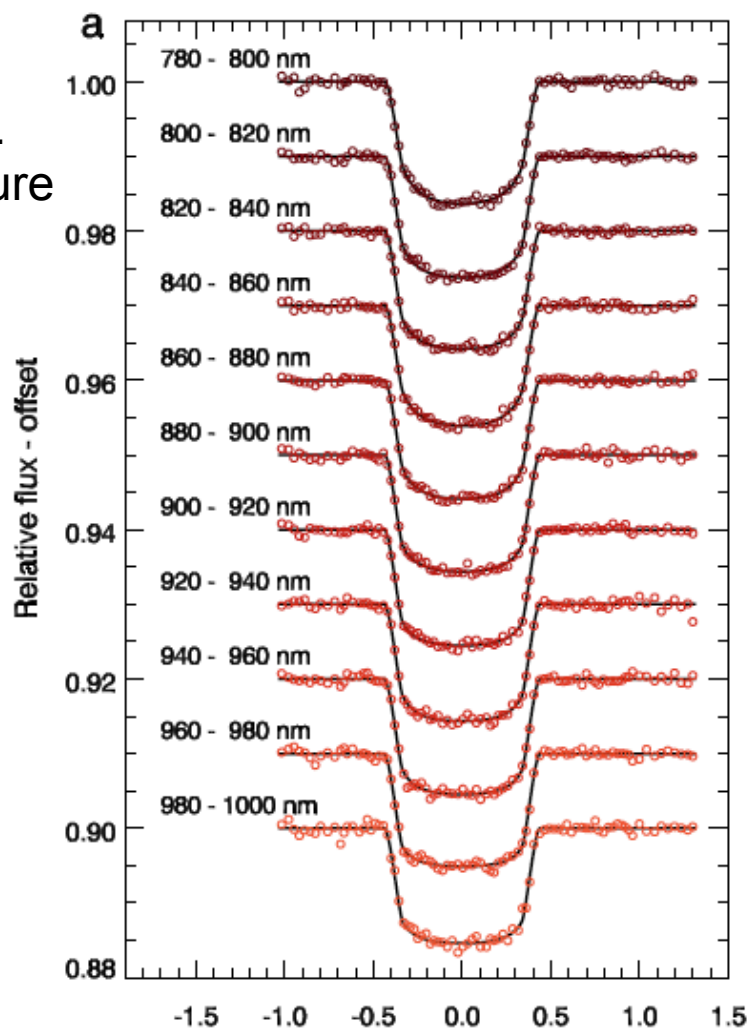
A ground-based transmission spectrum of the super-Earth exoplanet GJ 1214b

Bean et al.
2010, Nature

FORS2
MXU

Star:
 $0.209R_{\odot}$
 $0.157M_{\odot}$

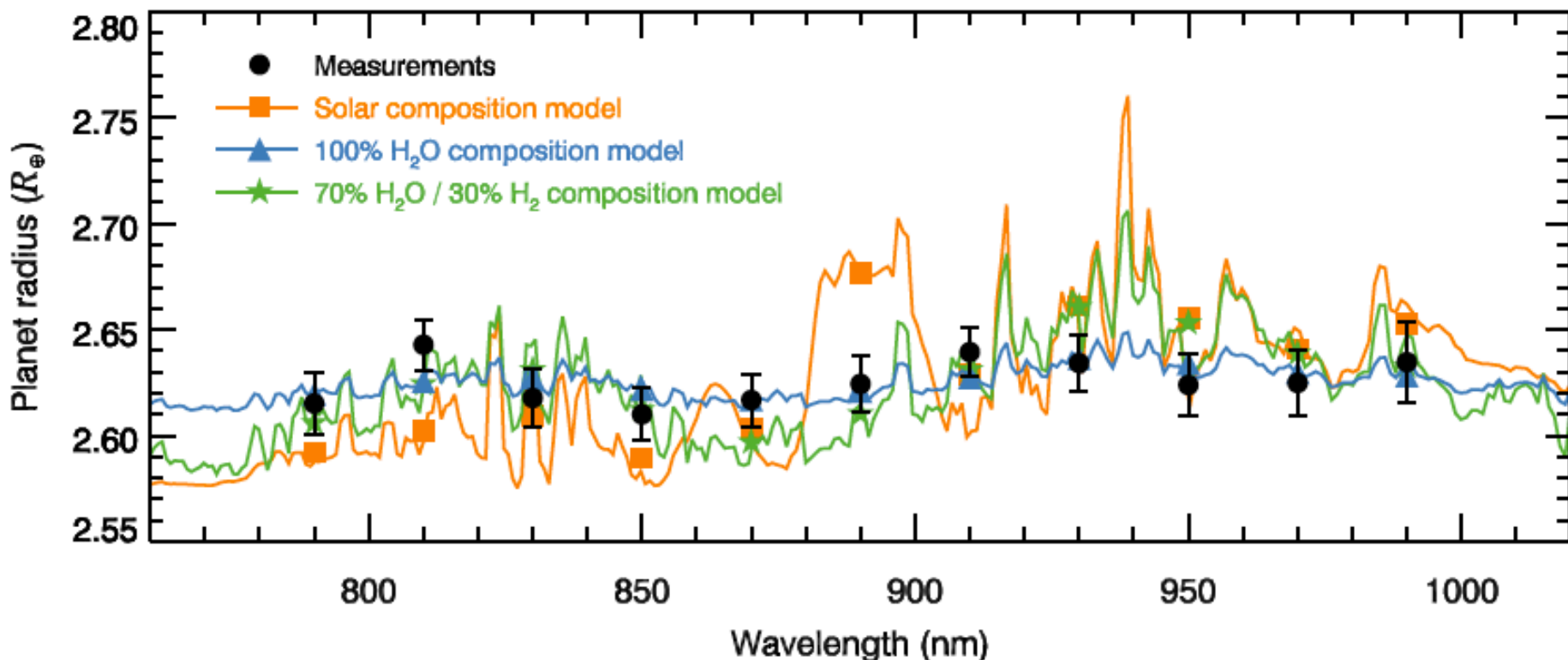
Planet:
 $2.63 R_E$





A ground-based transmission spectrum of the super-Earth exoplanet GJ 1214b

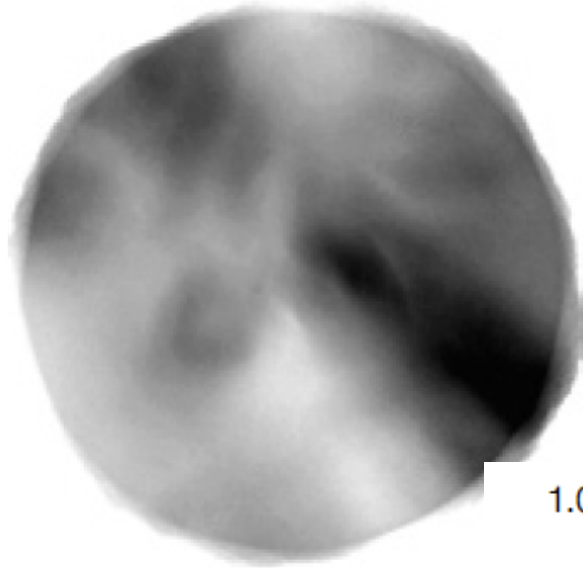
Bean et al. 2010, Nature



GJ 1214b data: consistent with the model for the water vapor atmosphere, or a hydrogen-dominated atmosphere with optically thick clouds or hazes.



FORS Instrument Operation Team

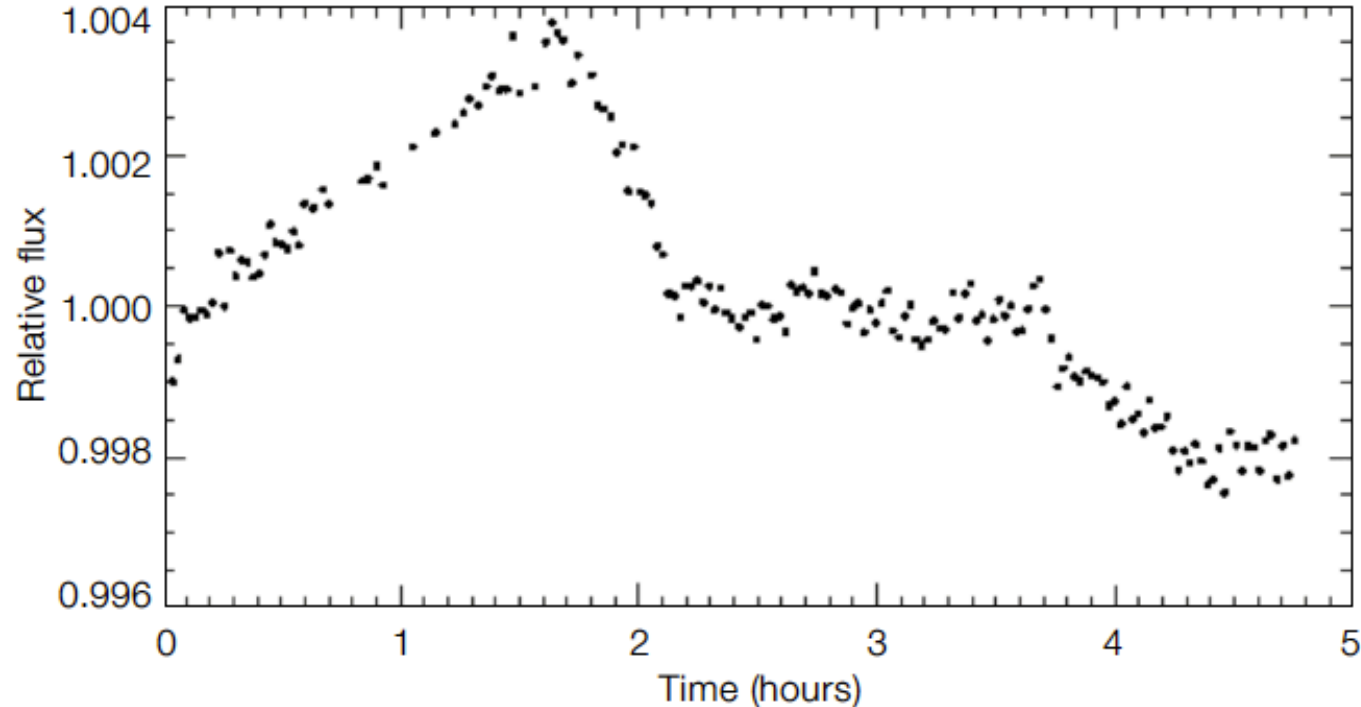


Freudling et al. 2007:
Towards Precision Photometry with FORS

FORS1: stack of B-band sky flats
after rotational alignment
1% intensity scale

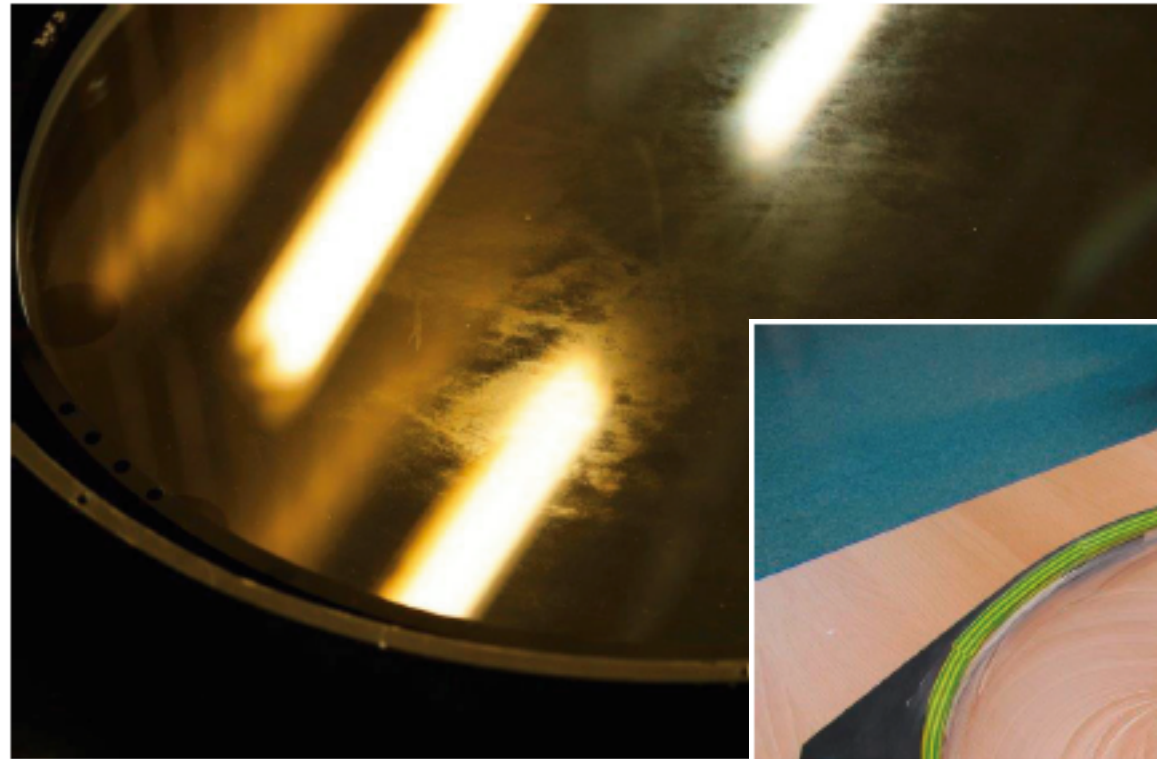
Boffin et al. 2015:
Making FORS2 Fit for
Exoplanet
Observations (again)

WASP 4: Differential
z-band lightcurve
FORS2 MXU,
Dec. 2011



FORS2 LADC

FORS2 LADC prism:
degradation of anti-reflection
coating



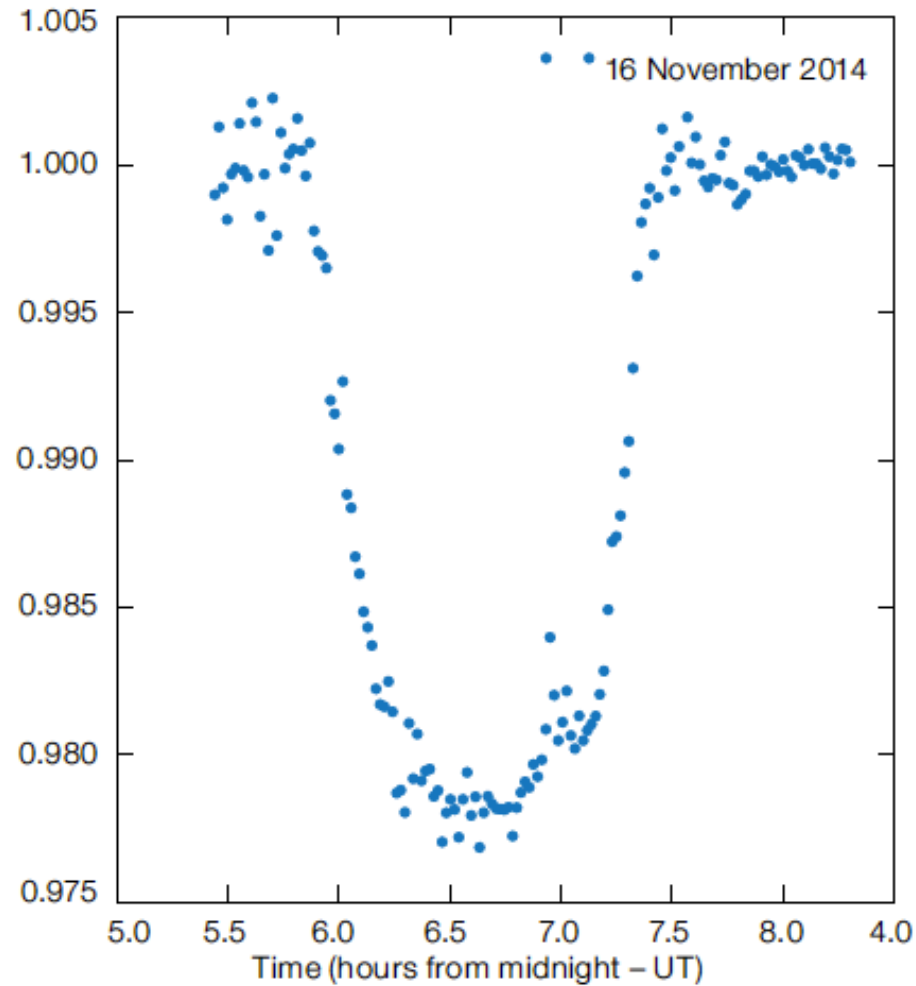
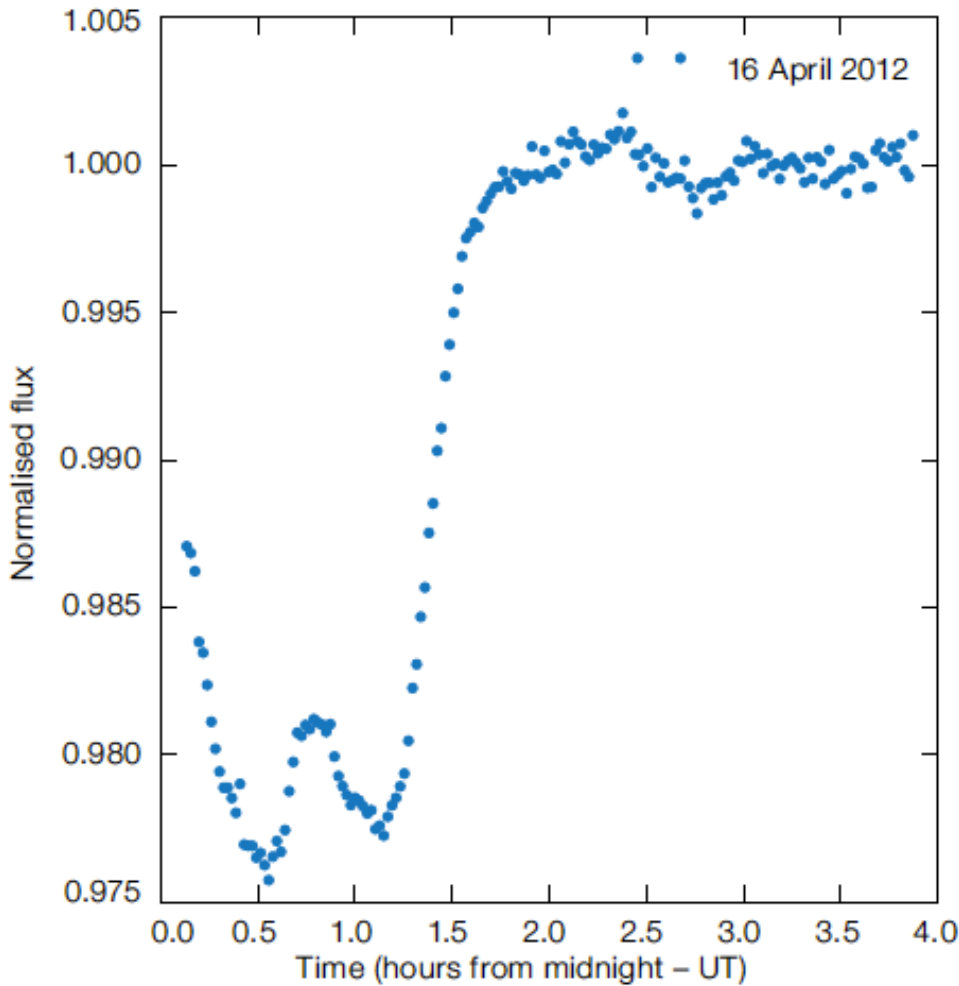
Boffin et al. 2015:
Making FORS2 Fit for
Exoplanet Observations (again)

Removal of the coating
on the FORS1 LADC prism



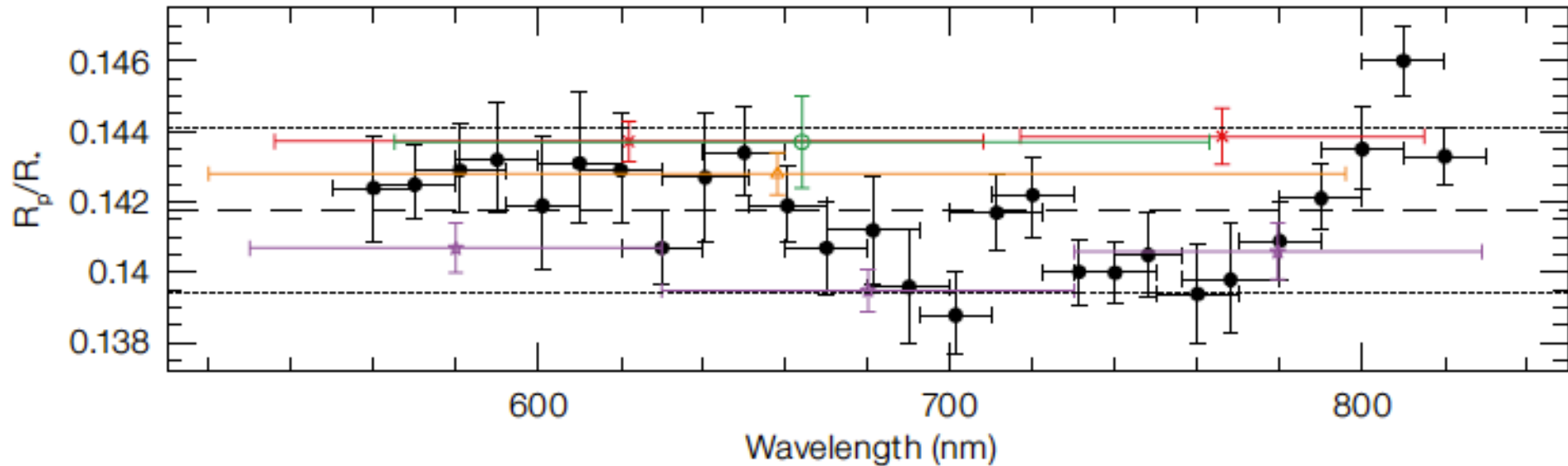
WASP-19 before and after

Improved photometric precision – large systematics in the middle of the transit before



Transmission spectroscopy with FORS2 (again)

WASP-19



Boffin et al. 2015

■ Remote Access Facility in Vitacura, Santiago

- Troubleshooting & emergency situations
- Facilitating work in different shifts



■ Garching Remote Access Facility

- Engineering, support to Commissioning
 - VST/OmegaCAM engineering tests to validate a novel method of active optics control → improved wavefront sensing and PSF across the entire OmegaCAM field
 - Adaptive Optics Facility commissioning
 - GRAVITY instrument commissioning

