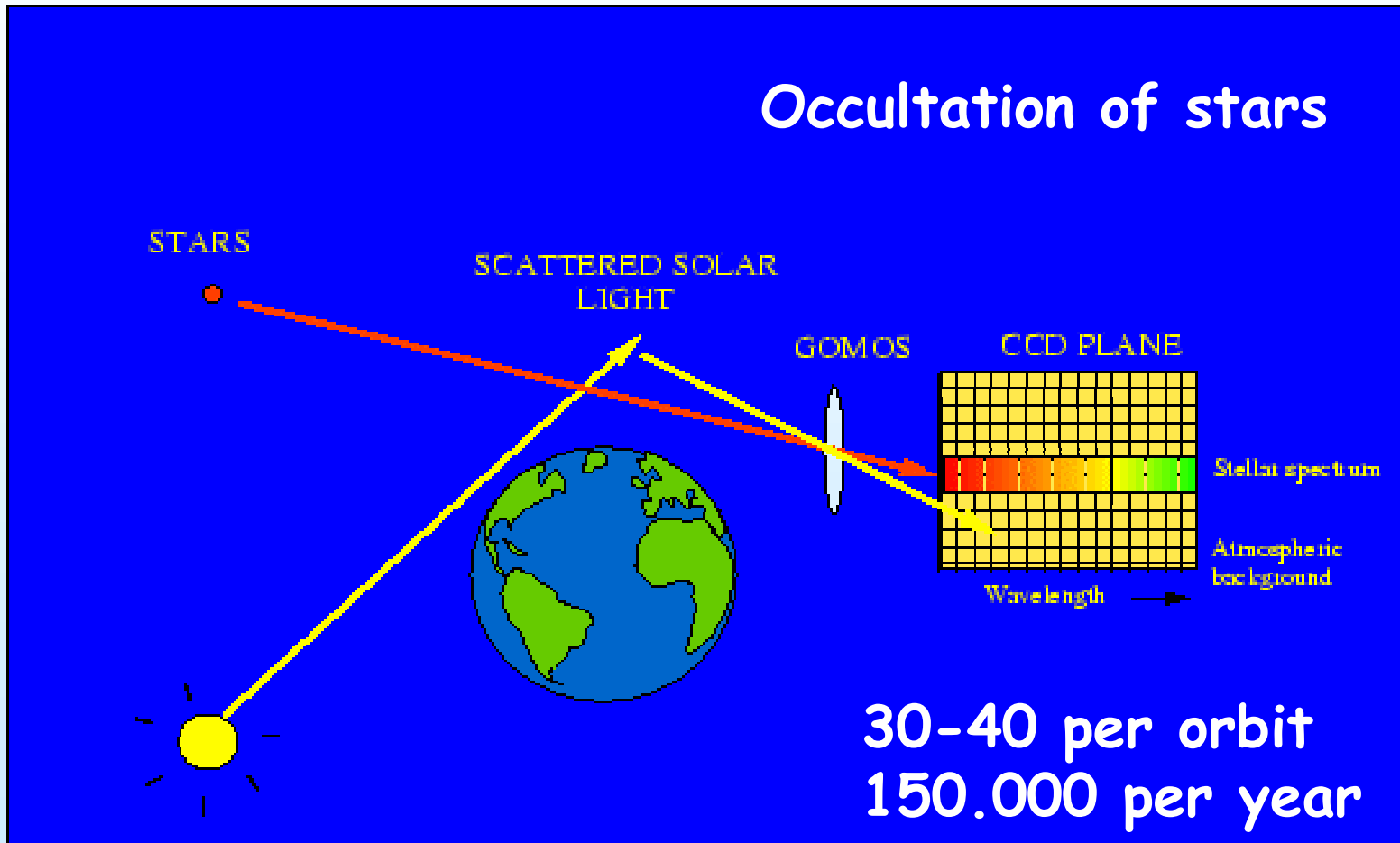


GOMOS level 1b processor improvements

Gilbert Barrot
ACRI-ST

GOMOS measurement principle



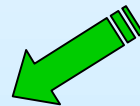
GOMOS data processing

**GOMOS measurements
(star+limb)
from high to low altitudes**



Level 1b

**Atmospheric transmissions
Error bars
Photometer signal
Geolocation, Datation**



Level 2

**Line densities of species
Local densities of species
Error bars, H RTP**

GOMOS level 1b tasks

- Provide the geolocalisation and the datation of the observations

need the data and an orbital model/data

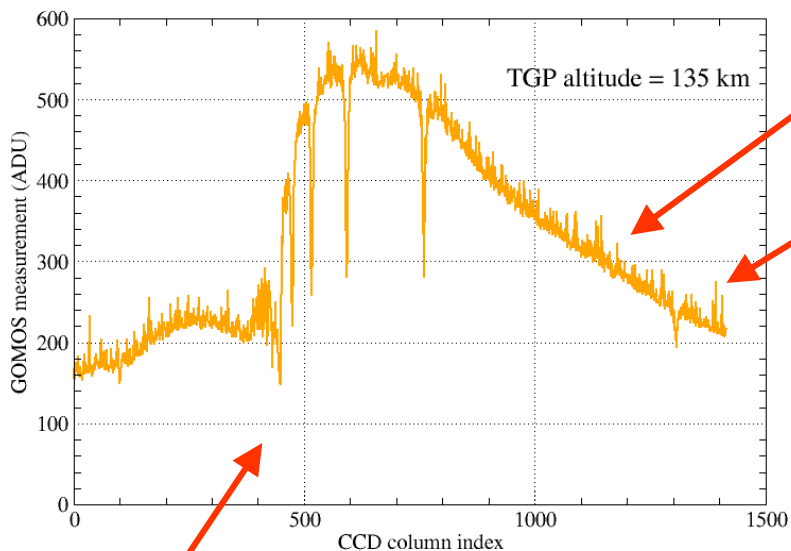
- Clean the GOMOS measurements from environmental and instrumental perturbations

need calibration tables and algorithm parameters

- Computes the atmospheric transmission and associated error bars at all tangent point altitudes

Instrumental perturbations

Level 0 data



Offset

Star 029
 $mv=1.67$

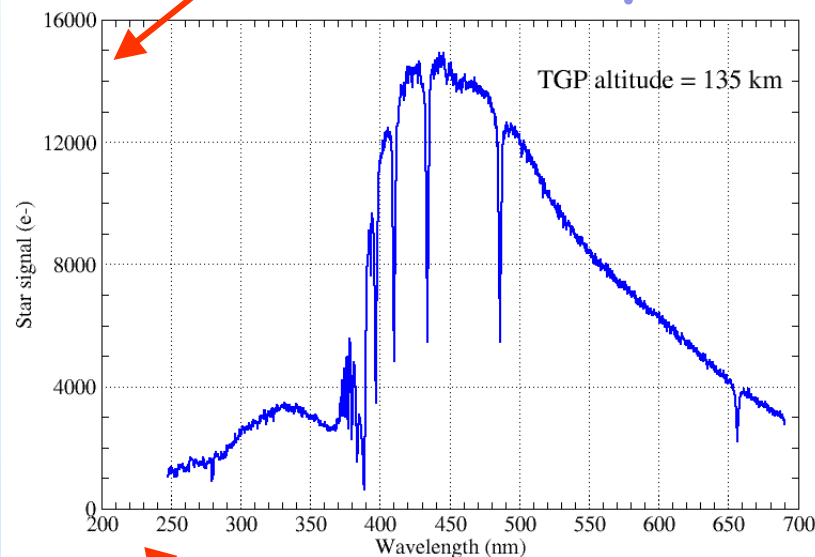
Wavelength assignment

Dark charge

RTS

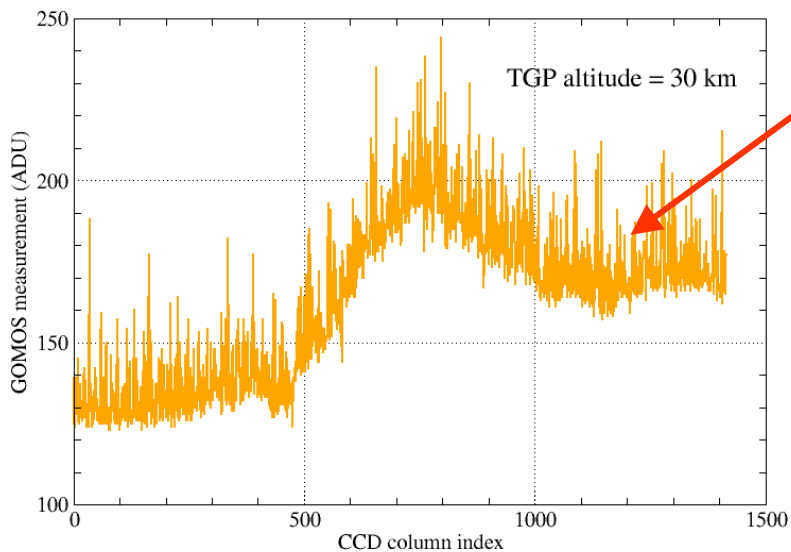
Electronic gain
 Non-linearity

Clean spectrum



Instrumental perturbations

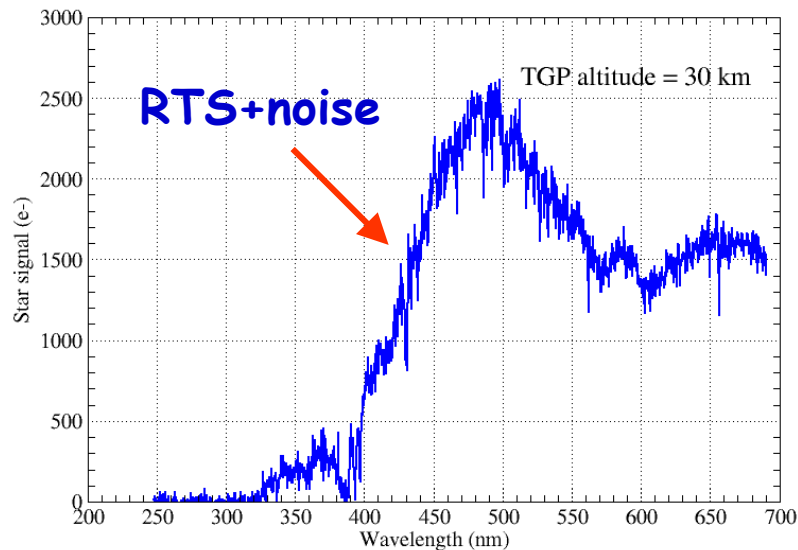
Level 0 data



Dark charge + RTS

Star 106
mv=2.65

Clean spectrum



GOMOS level 1b processing status

Current version is defined by level 1b **DPM 6.1**

Products format defined by **IODD 6.0**

Prototype **GOPR 6.0a**
IPF processor **5.00** (prev. July)

Level 1b processing improvements

Three sources of improvements

1. Processor improvements (algorithms/parameters)
2. Instrument knowledge improvement (calibration)
3. New data in the output products

No important modification since
previous issue (DPM 5.4 - GOPR 5.4d - IPF 4.x)

- ☆☆☆ **Background correction** (parameters only)
exponential interpolation between bands
no background correction in full dark limb
- ☆☆ **PRNU correction** (algorithm+calibration)
star spectrum location on CCD defined by LUT
- ☆ **Reference star spectrum validity** (algo+parameters)
no possible negative values
- Atmosphere thickness** (parameters only)
atmosphere width set to 160 km
- Ray tracing** (parameters)
convergence of ray tracing set to 0.1 μ rad
- Cosmic rays** (algorithm+parameters)
thresholds function of gain setting

- ★★ **Spectrometer B PRNU**
for a better flat-field correction
- ★★ **Star spectrum location on the CCD array**
also for a better flat-field correction
- ★ **Reflectivity LUT upgrade**
for a better transmission computation

☆☆☆ **Illumination conditions**

sun zenith angles at satellite and tangent point

sun azimuth angle at the tangent point

sun coordinates

illumination condition (PCD_{illum})

classification dark, twilight/straylight, daylight

☆☆ **Geometrical information**

occultation obliquity

☆ **Limb signal in the central band**

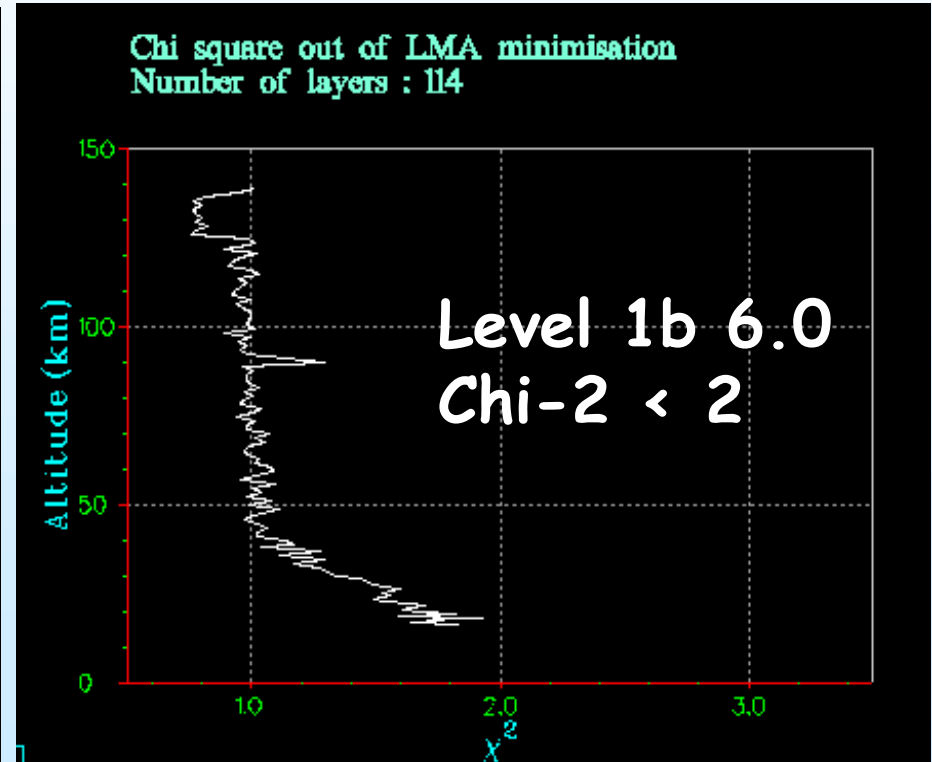
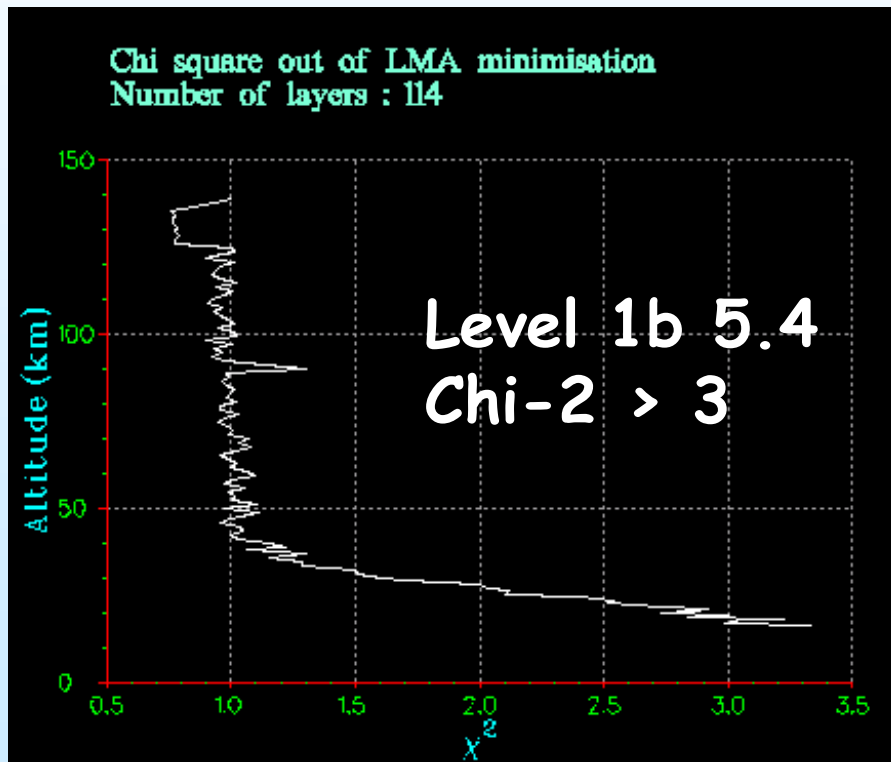
ratio U/C indicates the percentage of limb light mixed to the star signal

New output data

Level 1b processing improvements

Impact on LMA minimisation (level 2) below 50 km

T_{measured} versus T_{model}

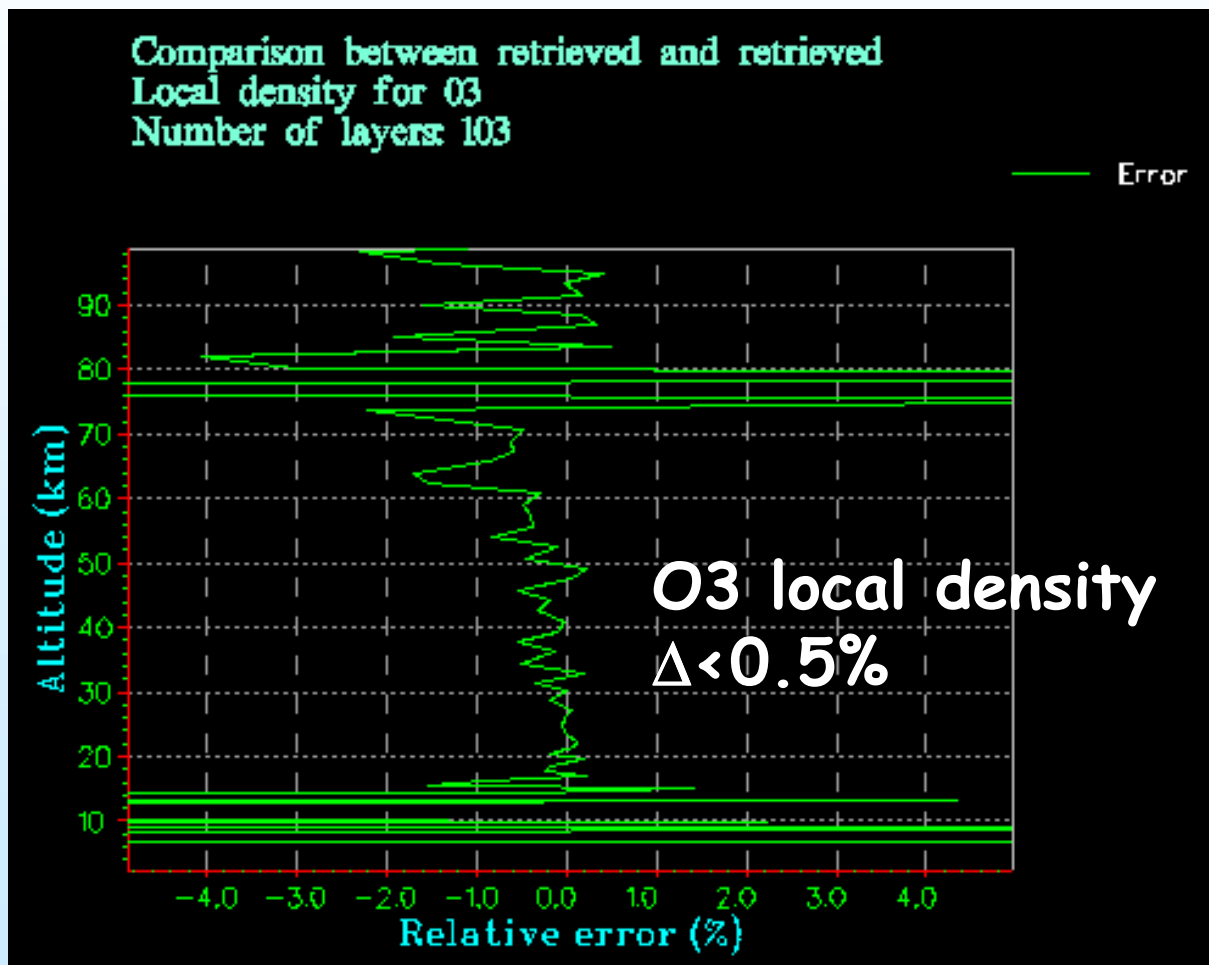


Level 1b processing improvements

Impact on Ozone

*small impact
between 20
and 40 km*

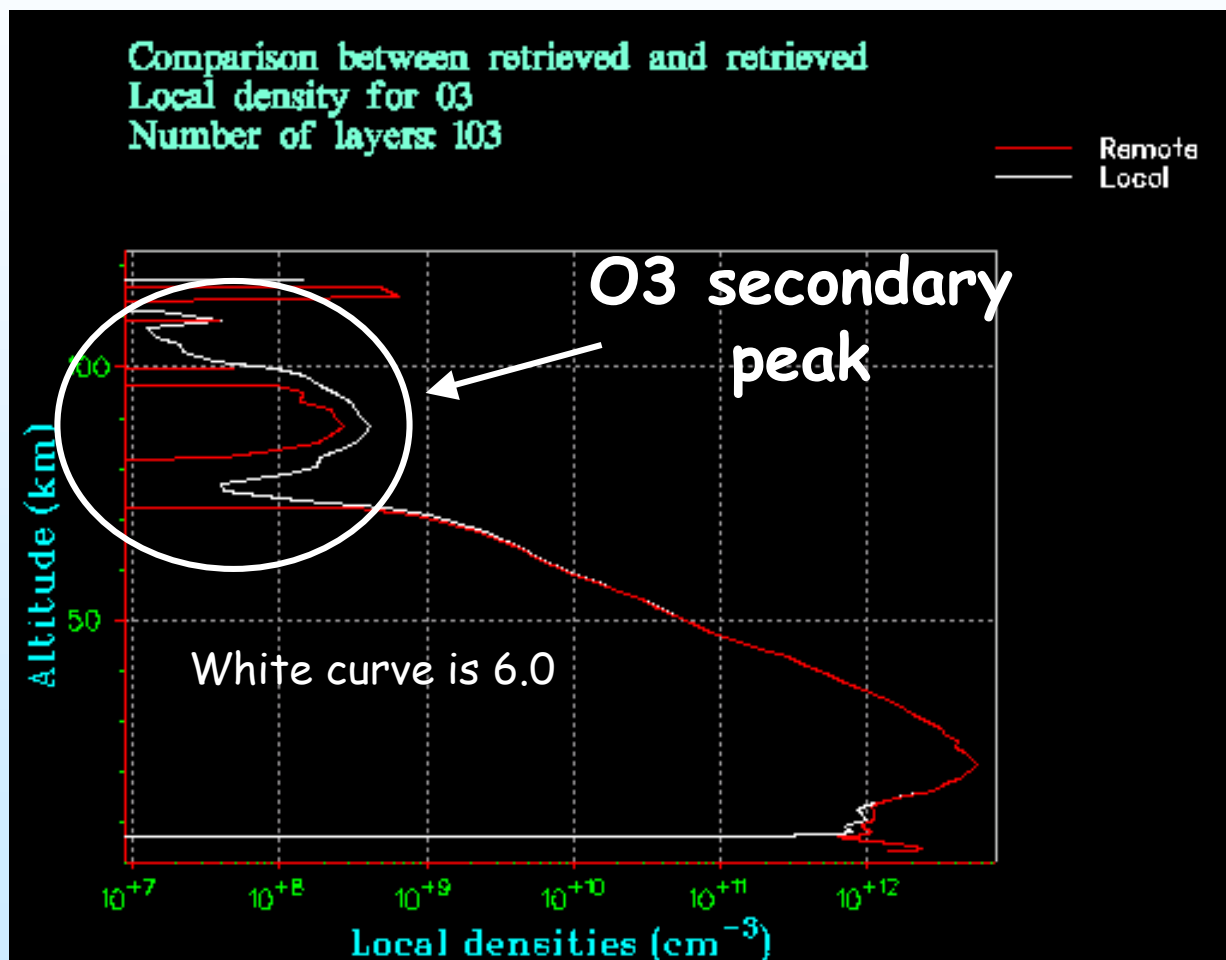
*noisy below
20 km because
still use level 2
issue 5.4d for
comparison*



Level 1b processing improvements

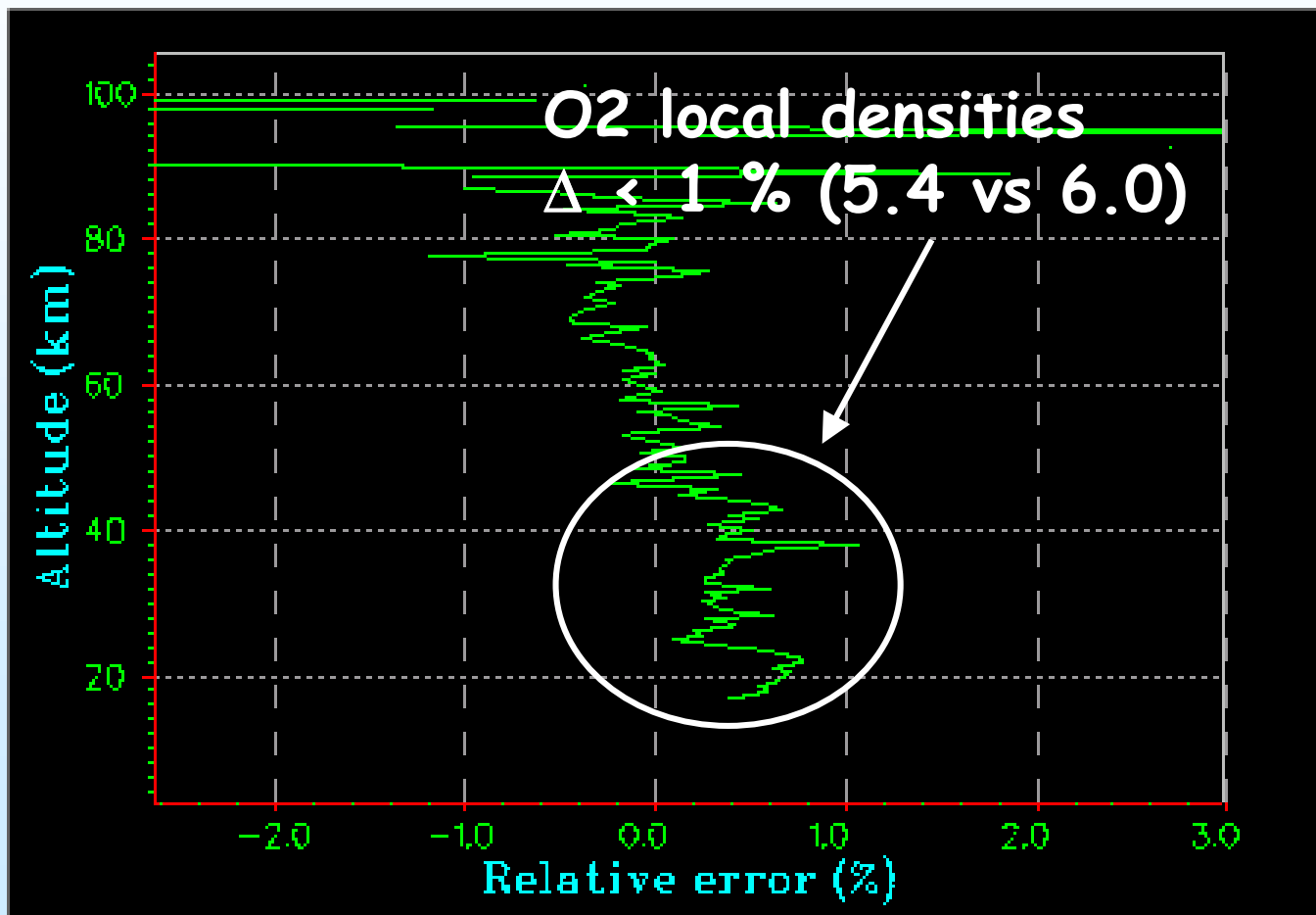
Impact on Ozone

better catch of the O3 secondary peak at altitude 80 to 100 km



Level 1b processing improvements

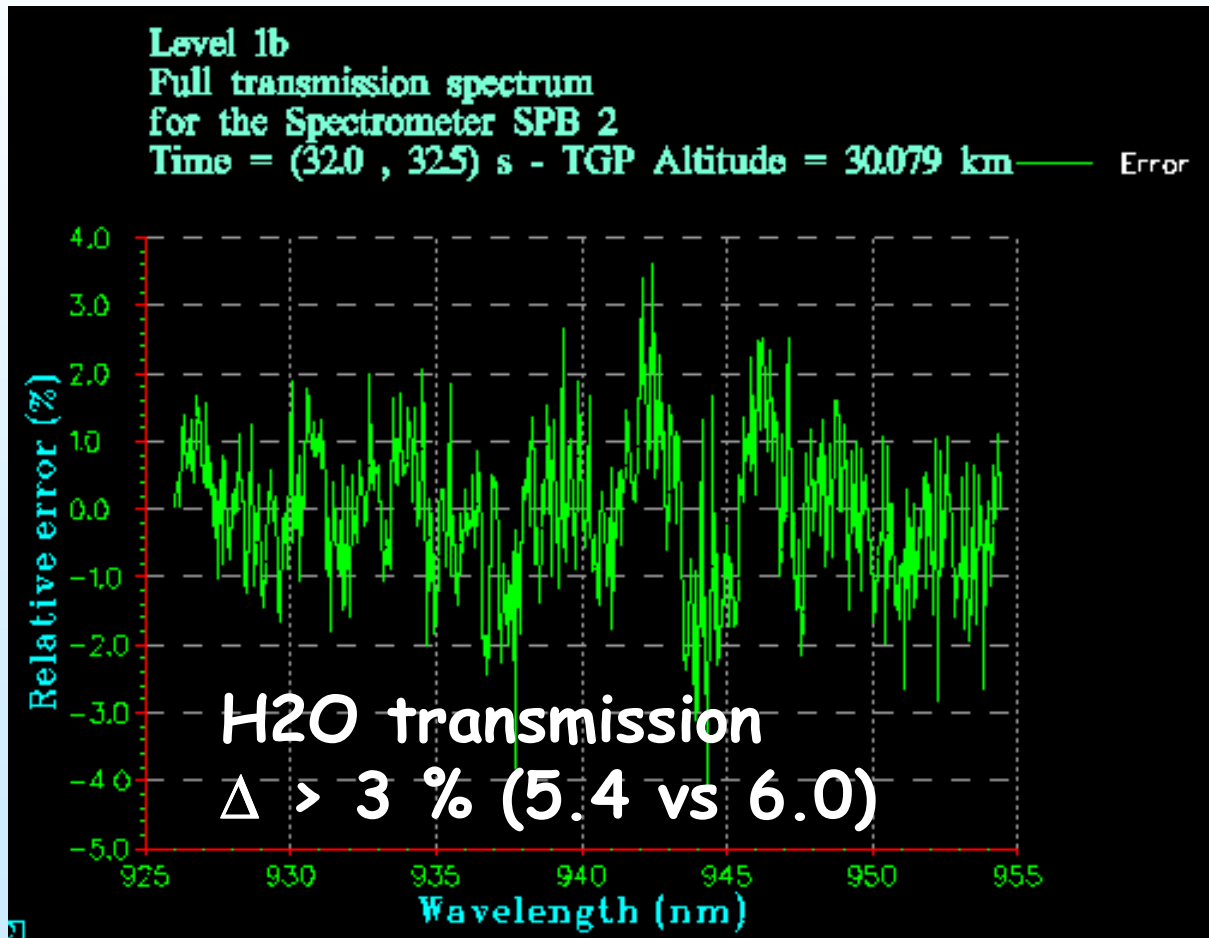
Impact on O₂
(SPB1)



Level 1b processing improvements

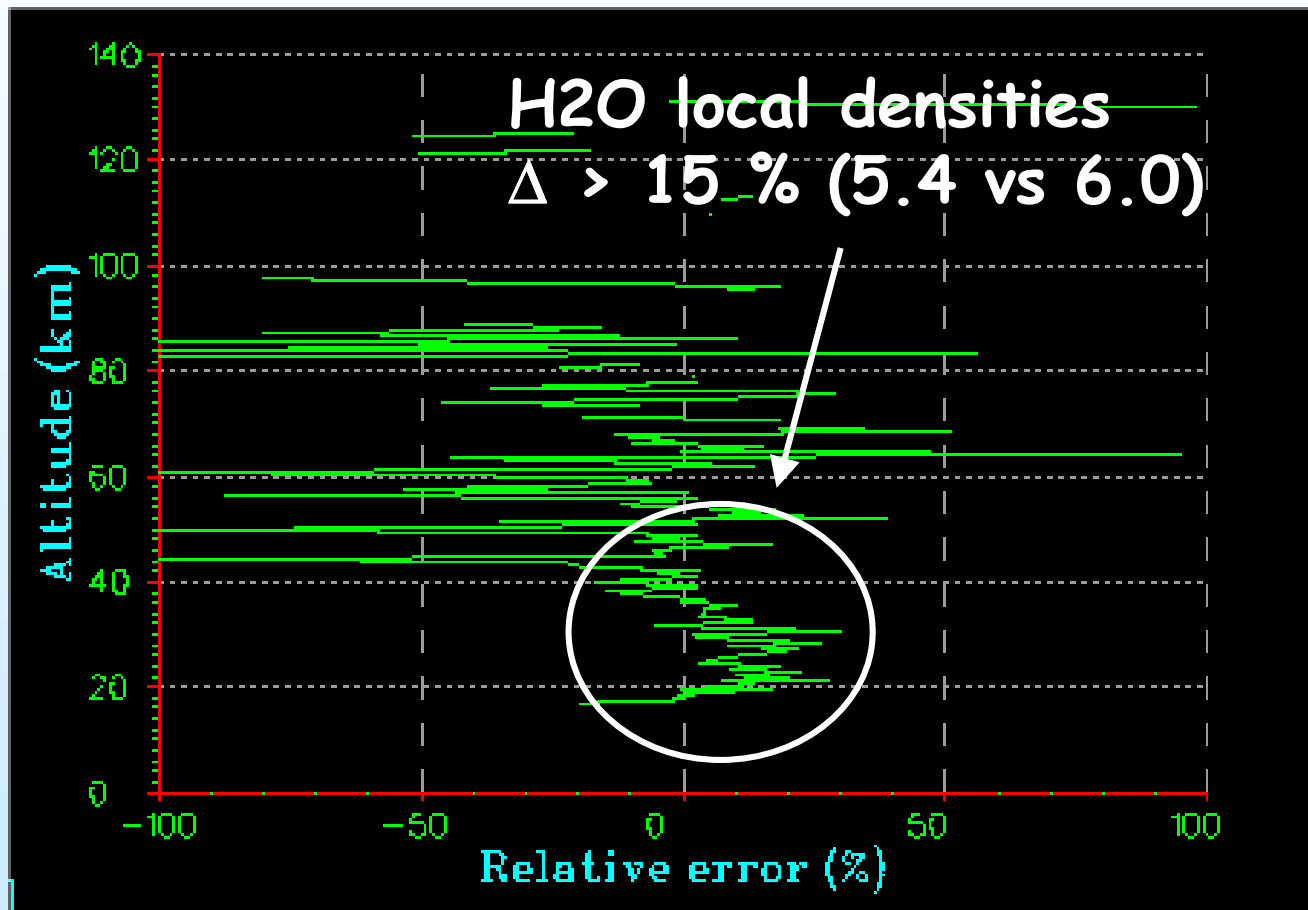
Impact on H₂O

better flat-field correction



Level 1b processing improvements

Impact on H₂O

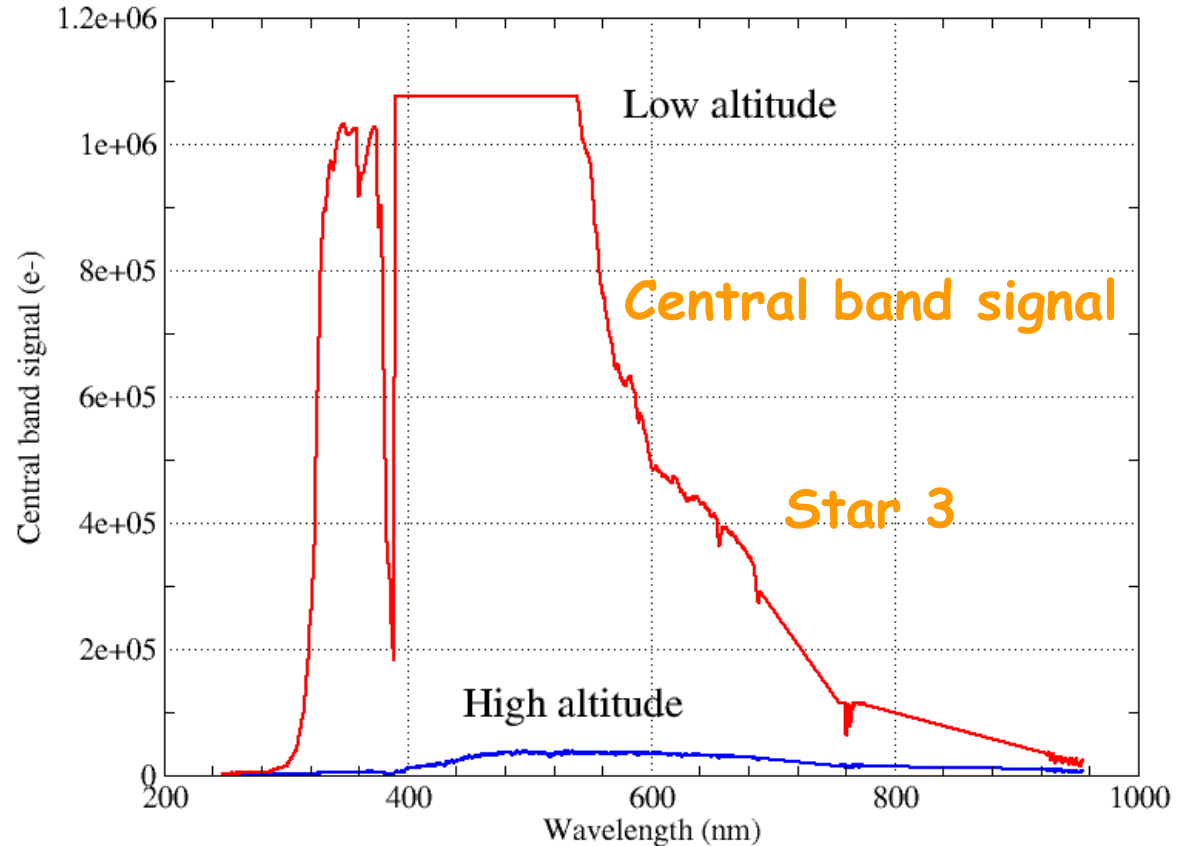


Still some work to do...

Bright limb mission
cleaning the star signal from limb light

Shot-noise error of limb band $\approx 10\%$ of the star signal at 30 km
For Star 3 ($mv = -0.05$)

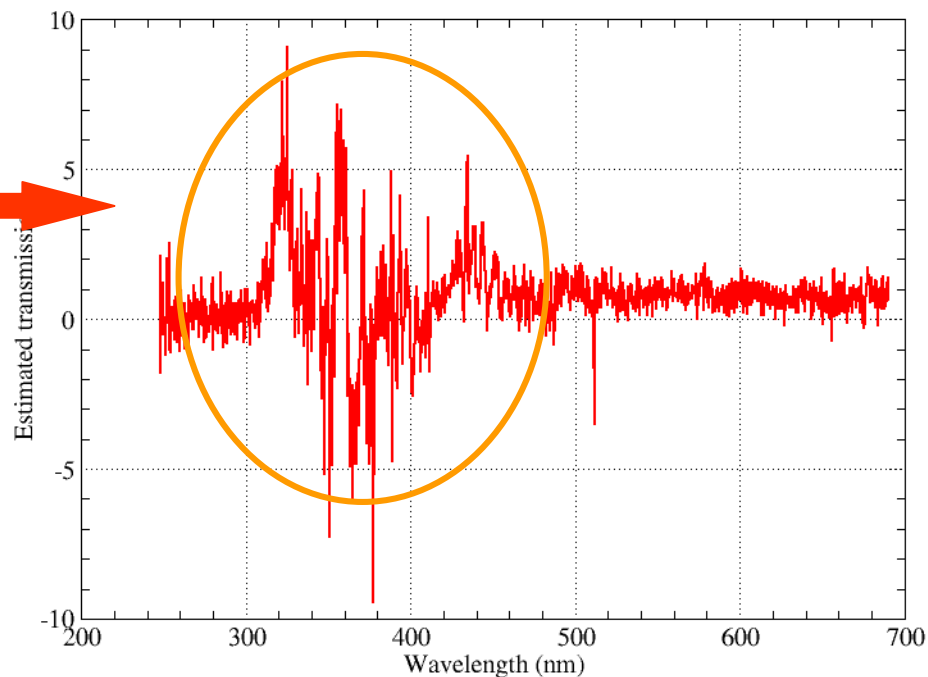
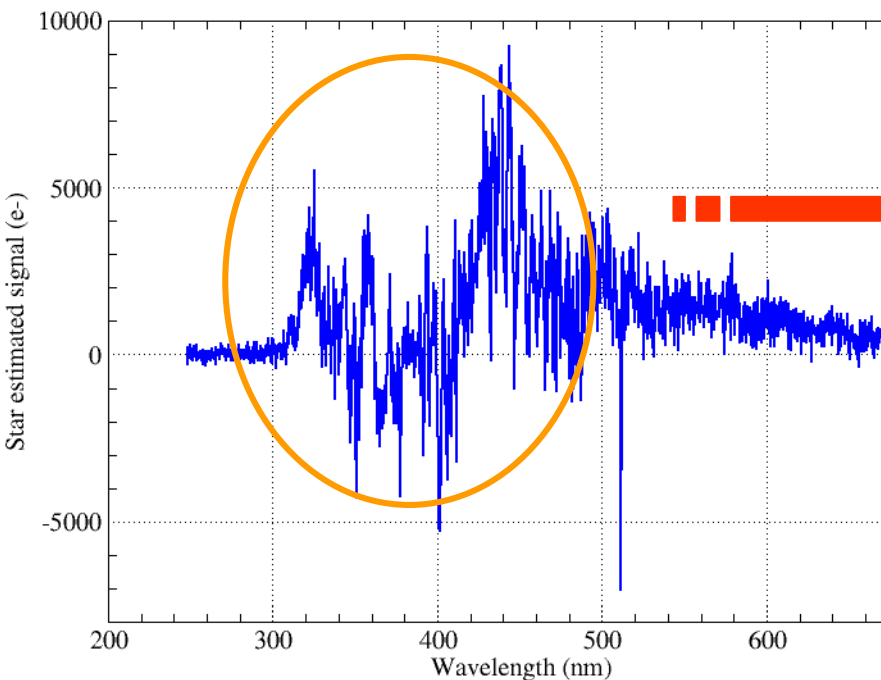
Shot noise error $>100\%$ at 30 km for Star 105 ($mv = 2.64$)



Still some work to do...

Bright limb mission

Star signal is not properly correctly... transmission is unrealistic



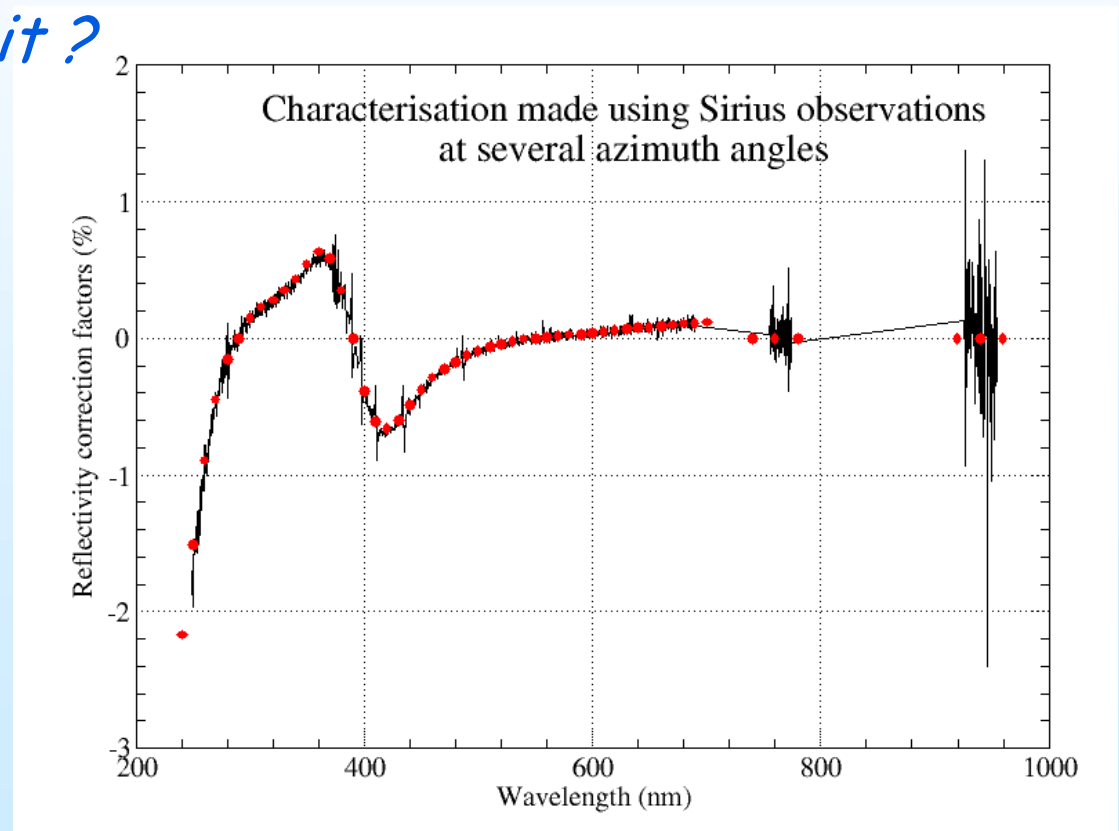
Star signal after limb correction

Estimated transmission

Still some work to do...

Reflectivity correction in elevation

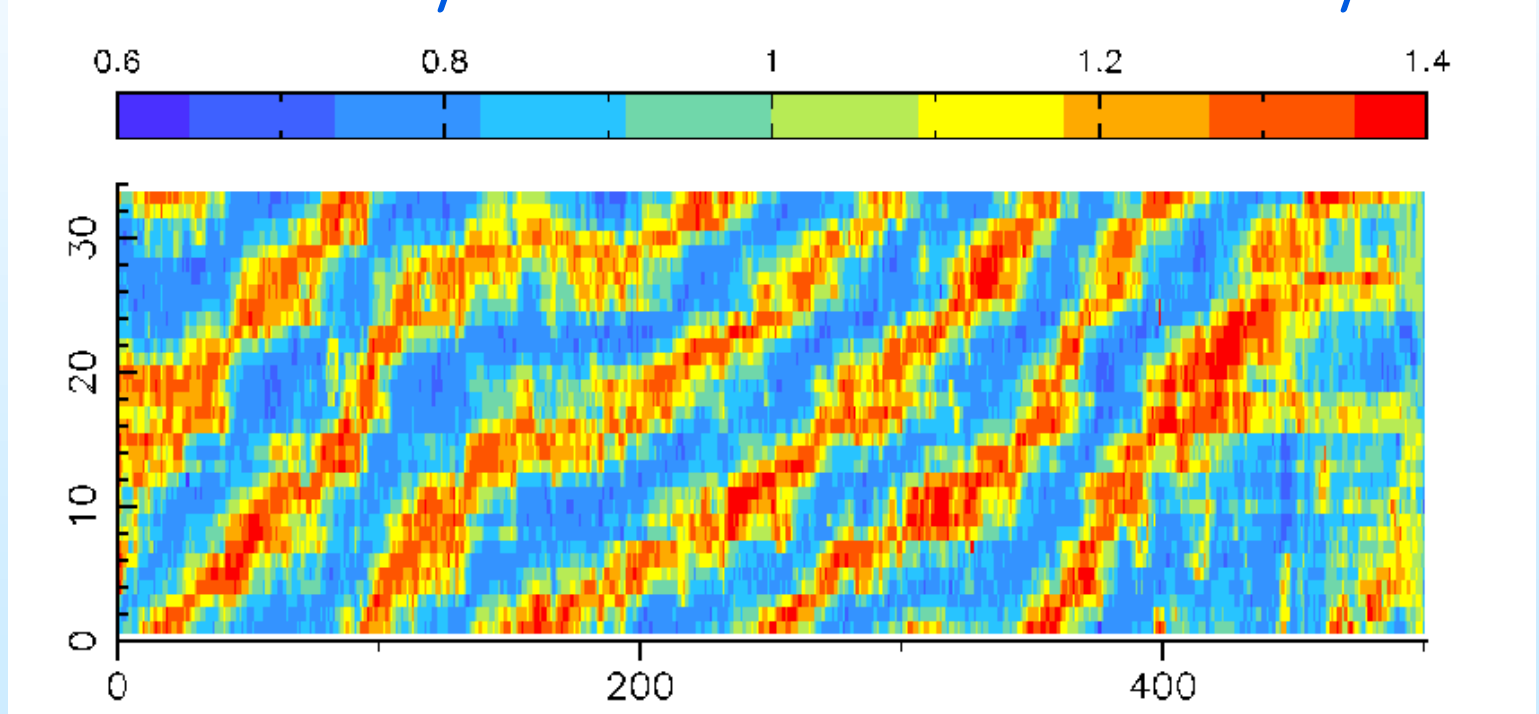
How to characterise it?



Still some work to do...

Spectrometer B PRNU (H₂O species)

PRNU characterised a posteriori from transmission spectra ?



Still some work to do...

SP-FP discrepancy

differences between SP spectral average and FP temporal average in the same spectral band

Correction of the residual RTS signal

use the transmission model as a « reference » in the level 2 processing

LSF larger than target band

*will imply a modification of the band setting
re-calibration needed*

and for more details... read the GOMOS data disclaimer

Level 1b processing and calibration status

Conclusion

- Dark limb cases (algorithms+parameters+calibration) are correctly handled by *GOMOS* level 1b processing (6.0a)
- Bright limb mission must be improved