GOMOS overview 2009

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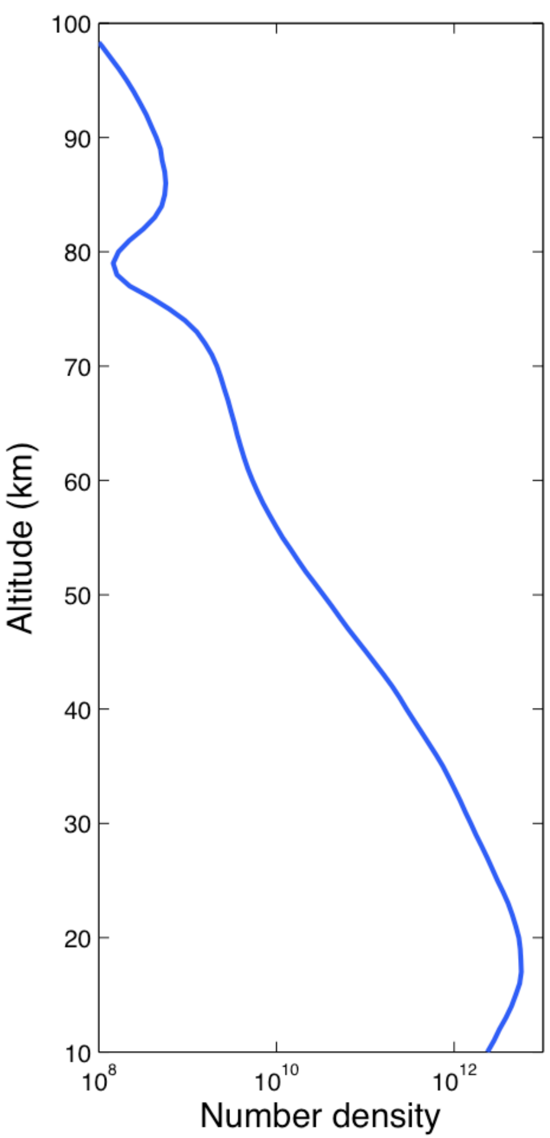
Contents

- Mission summary
- Instrument status
- Product quality
- Science highlights
- Future outlook



GOMOS mission summary

- More than 7 years of measurements
  - Tangential transmissions
  - Photometer fluxes
  - Radiances
- Number of occultations: 668 690 (August 8, 2009)
- High resolution profiles of O3, NO2, NO3, H2O, aerosols, turbulence, temperature
- Science: Climatologies, time series, third ozone peak, particle effects, turbulence, sodium layer, NLC, OClO

Ozone from 10-100 km with 2-3 km resolution esa

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Instrument status

• CCDs sensitive to proton precipitation => more frequent calibration. L2 error estimates increase, O3 profiles from cool & weak stars suffer.

• Pointing system has failed three times:

May-June, 2003: Recovery by redundancy

Jan-Aug, 2005: Recovery by the limitation of the pointing azimuth range -10...90 => -5...20 deg. At least 65% of the measurements secured.

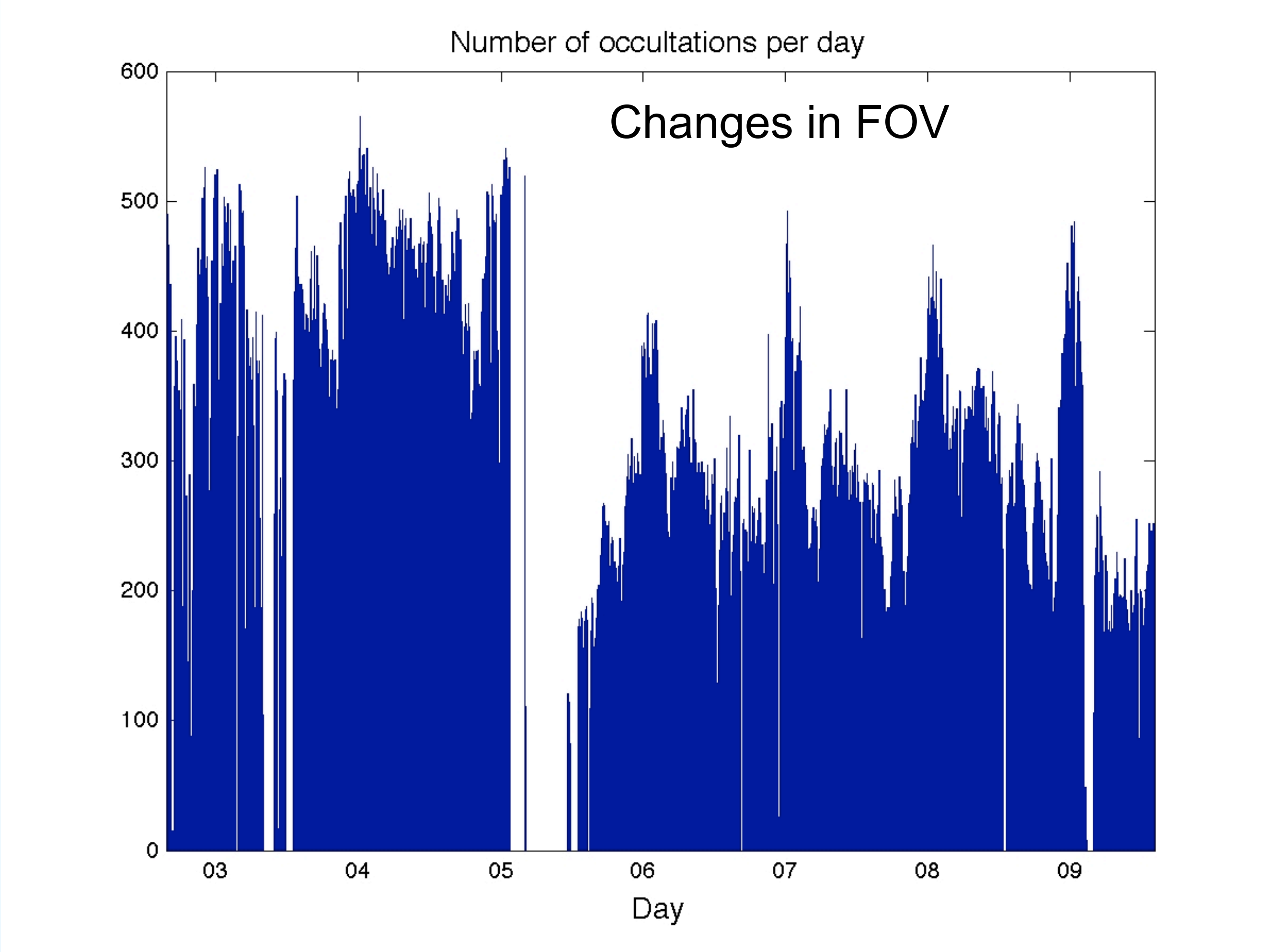
2009: Occultations interrupted prematurely

• IR2 spectrometer: PRNU calibration problem => H_2O quality:Bett

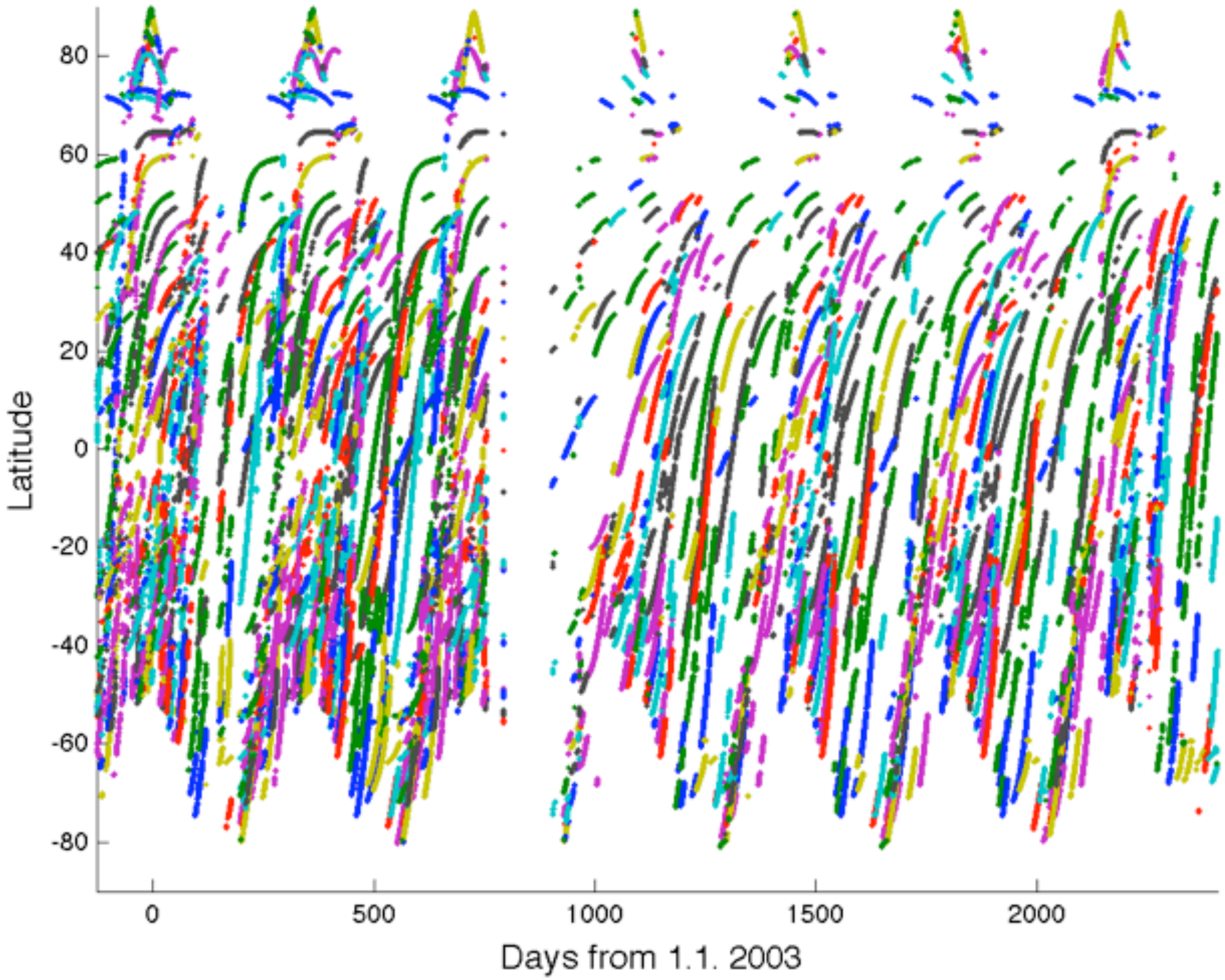
2009 ⇒ Reasonable H_2O profiles

• Bright limb spectra suffer from stray light and saturation ⇒ Day occultations have suffered: GOMOS bright limb project

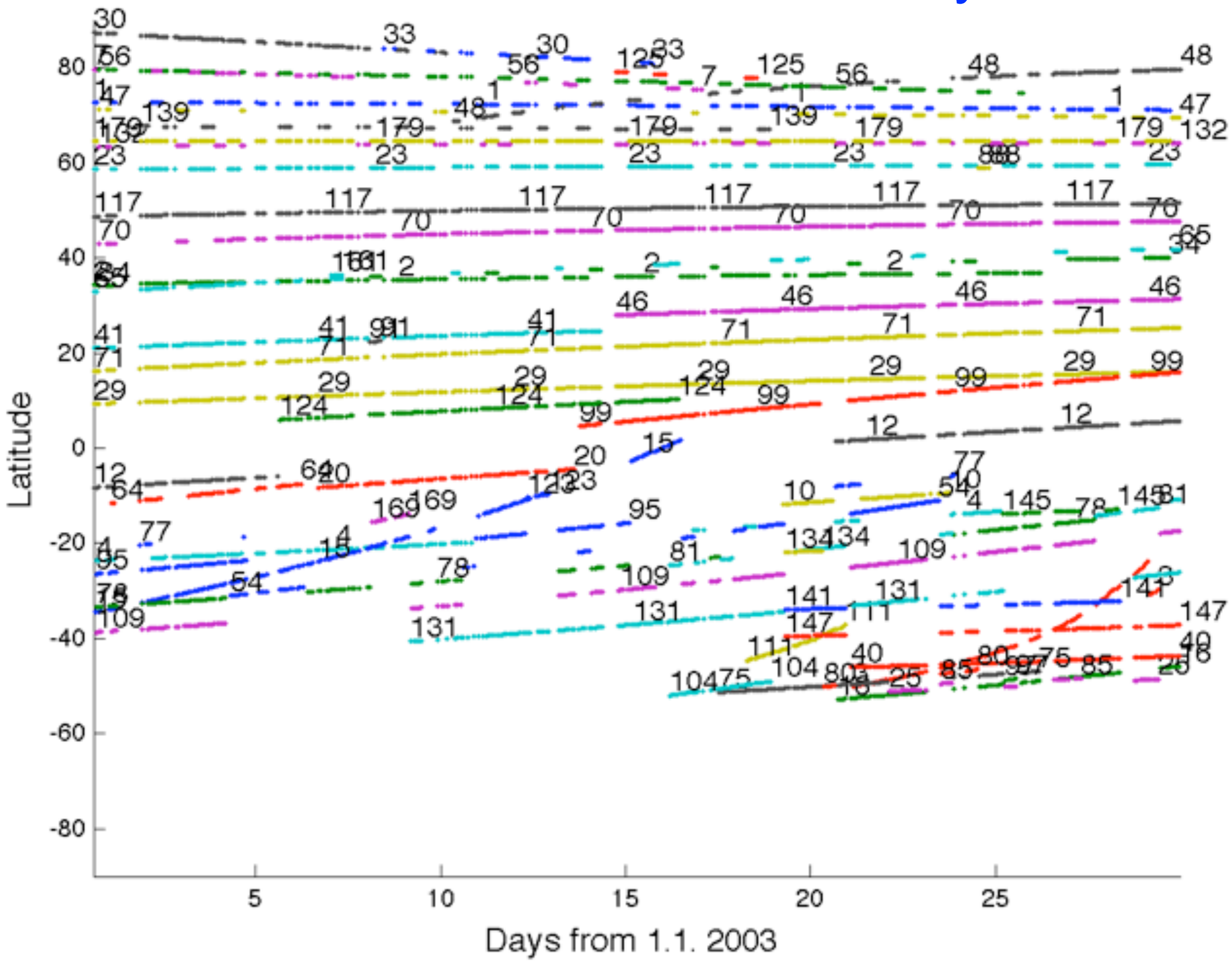
Number of occultations: 668 690 (August 8, 2009)



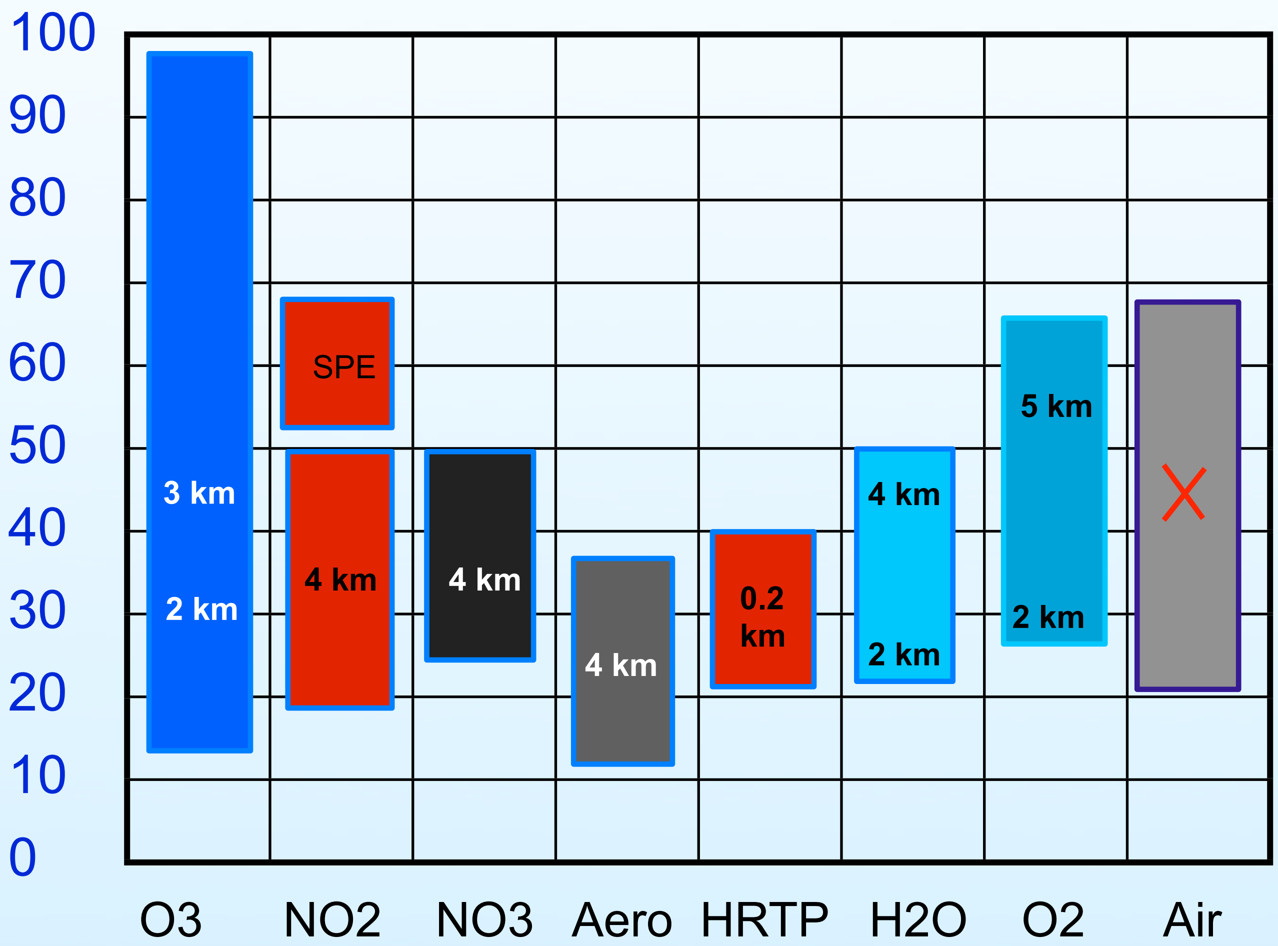
Occultation tracks



Occultation tracks January 2003



Retrieved species with altitude resolution



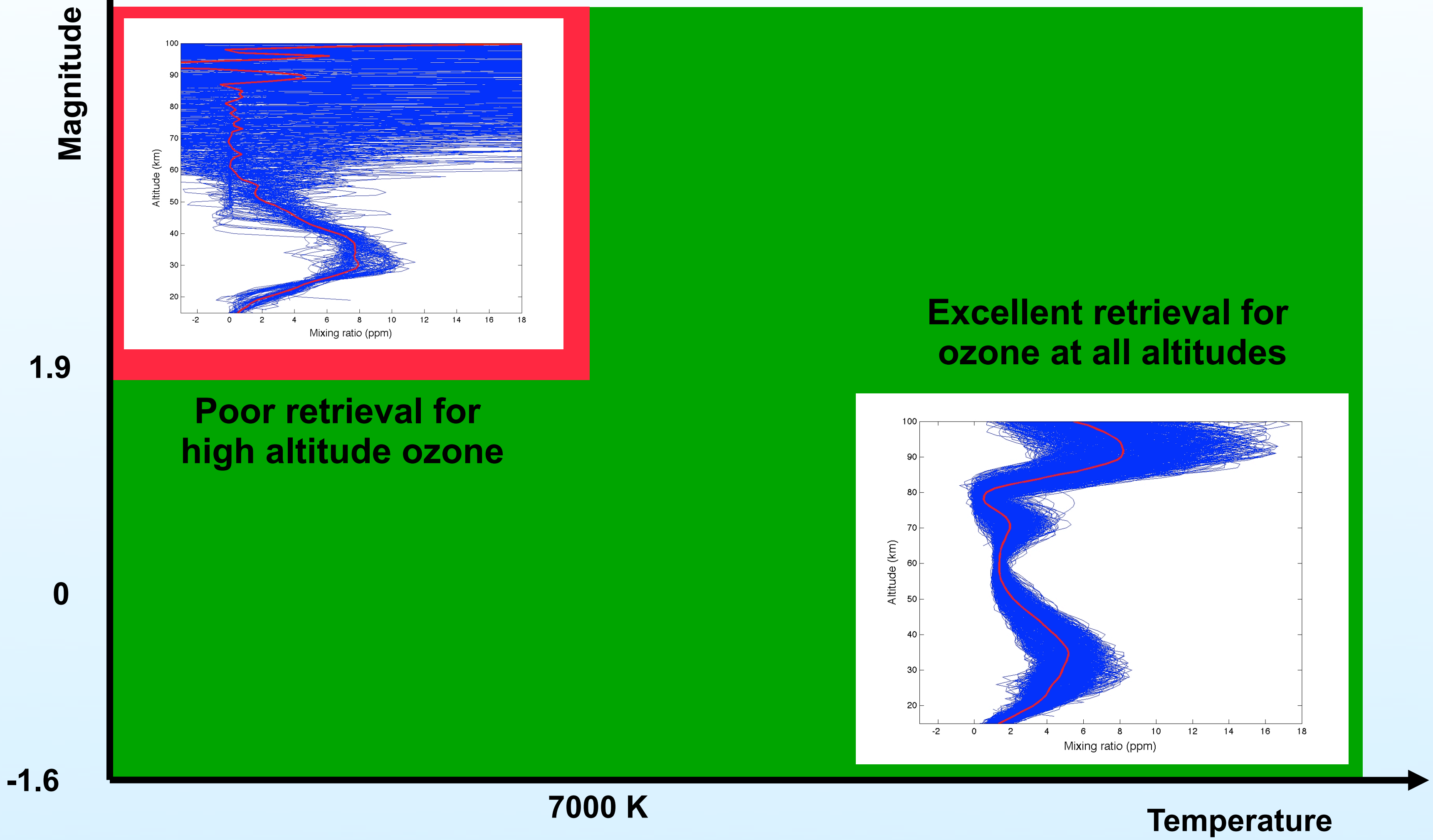
GOMOS ozone data quality

- Star visual magnitude -> overall S/N ratio

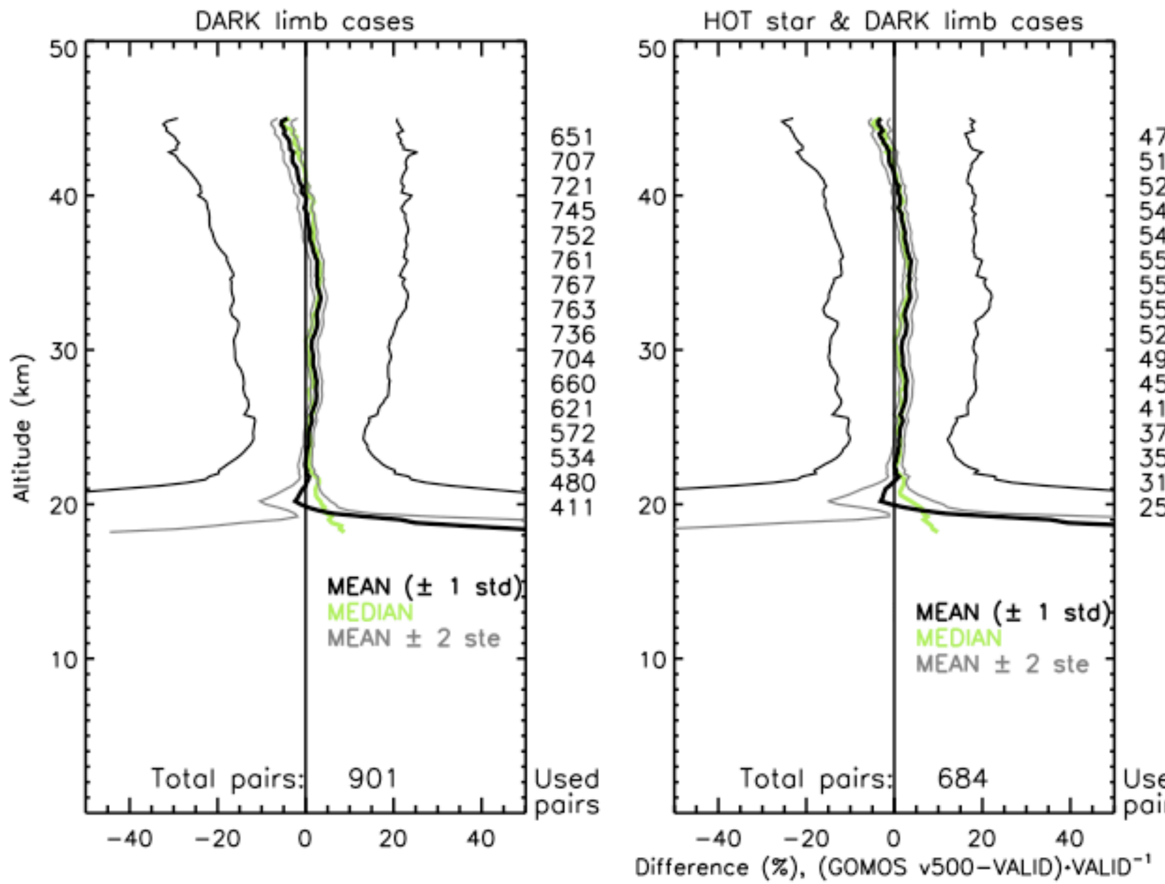
- Star effective temperature (i.e., shape of spectrum) ->
  S/N per wavelength ->ozone high altitude retrieval

- Solar illumination of the limb -> Additional signal or noise!
  1) During night: no problems
  2) For occultation retrieval solar light must be removed. Problems.
     ⇒Bright limb occultations look reasonable only above 35 km
  3) New retrievals from limb scattering signal double the number of ozone profiles from GOMOS.

Ozone retrieval vs star magnitude and temperature

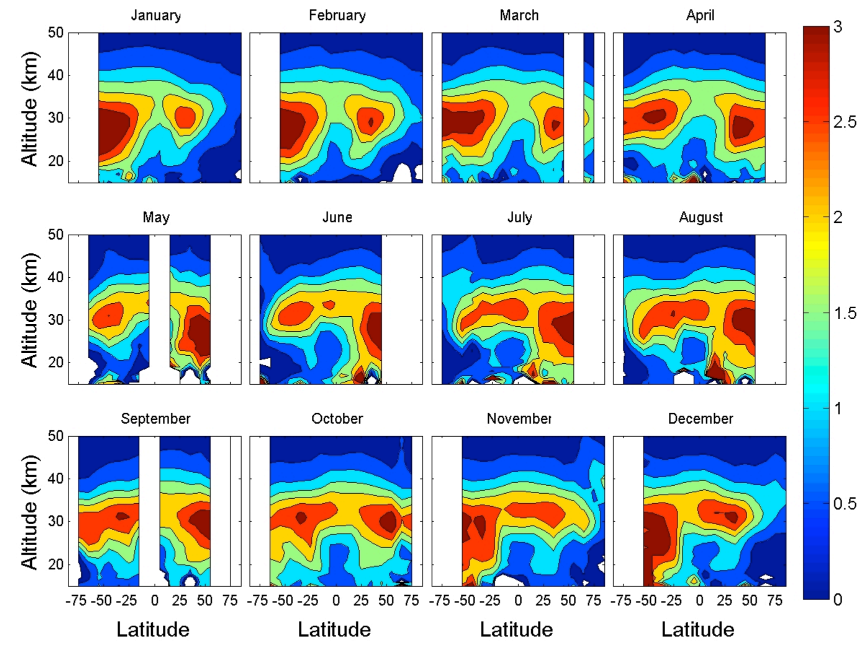


Ozone validation by lidars in 2002-2009



O_3, NO_2, NO_3

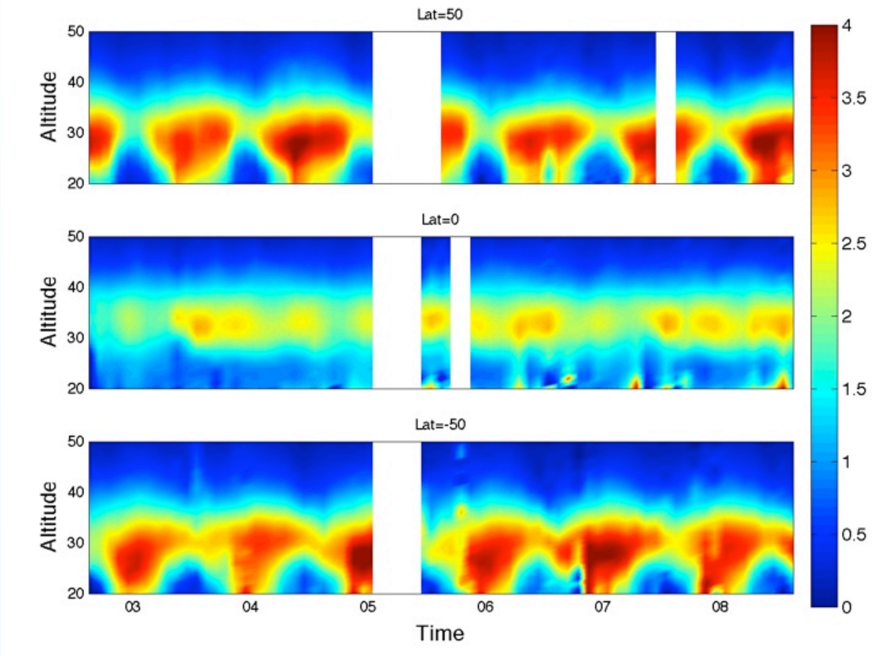
Global climatologies



http://fmilimb.fmi.fi/

Hauchecorne et al., JGR., 110, D18301, 2005.
Kyrölä, et al., JGR., 111, D24306, 2006.

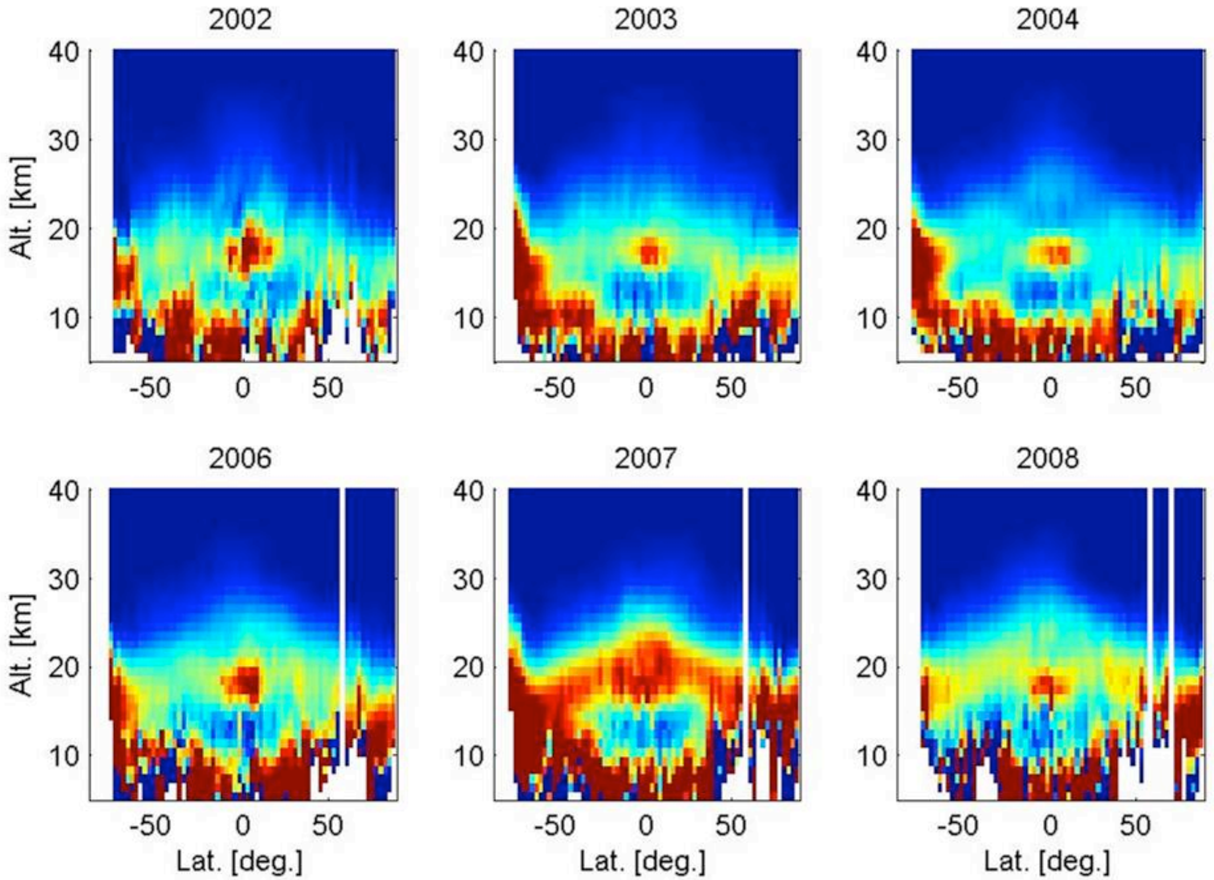
Time series analysis



Annual, semi-annual, solar, QBO

→ Time series talk by Kyrölä

PSCs, stratospheric aerosols, and cirrus clouds



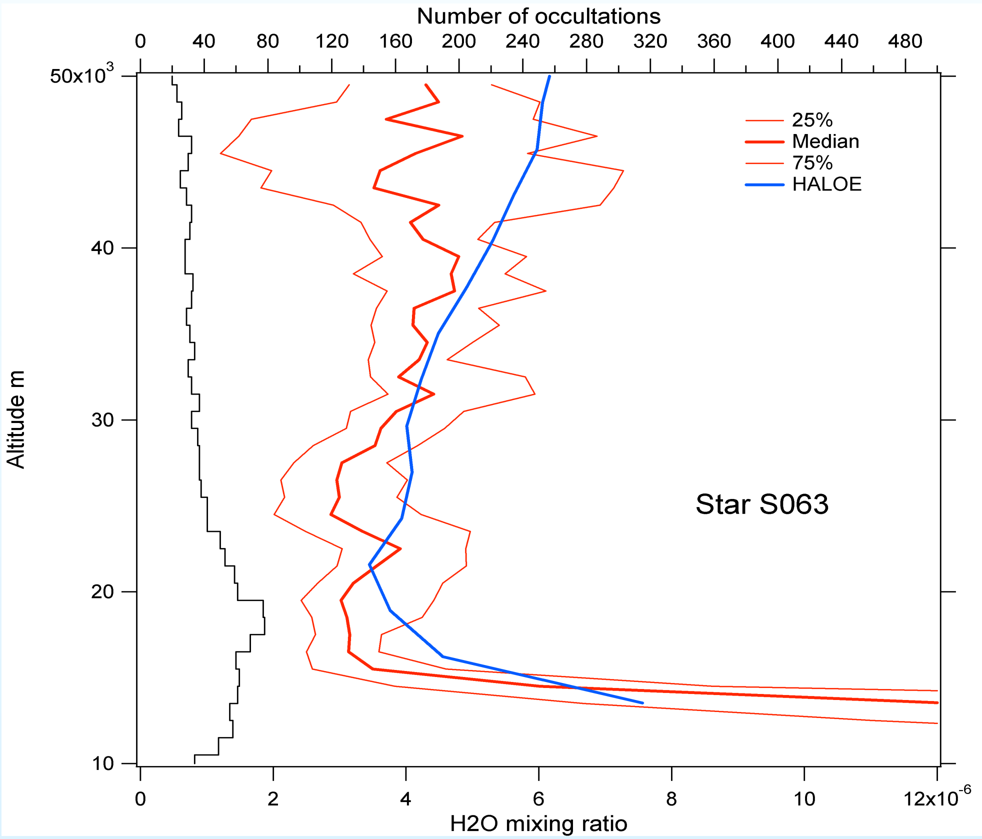
•Aerosol ext. 600 nm: yearly zonal means

- stratospheric aerosol layer
- subvisual cirrus clouds in the tropics at about 17 km
- PSCs
- increased extinction in 2007!

Color scale: 0 to 1.2 e-3 km^{-1}

Vanhellemont et al., ACP 5, 2005.

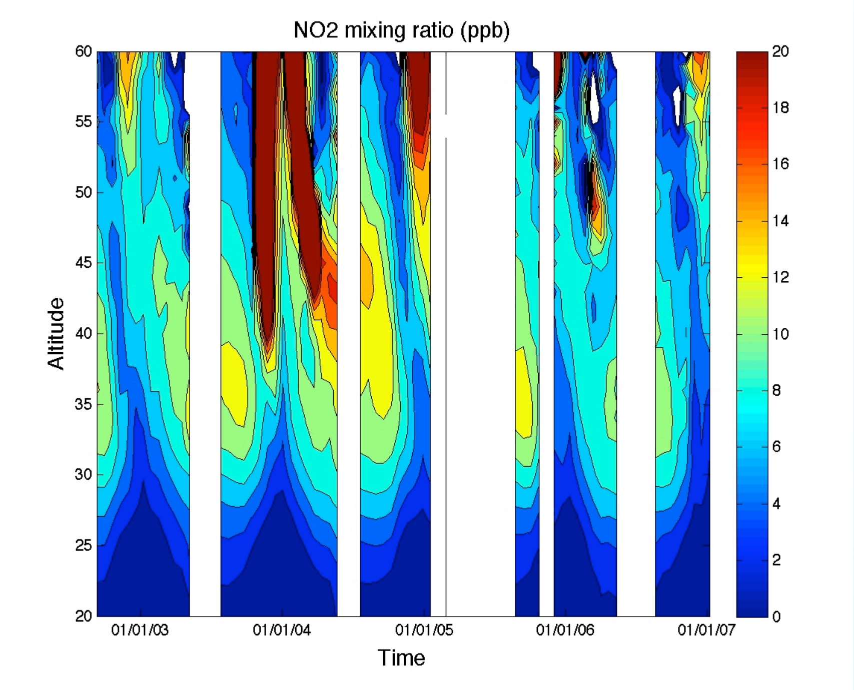
GOMOS H_2O – V7.0bb



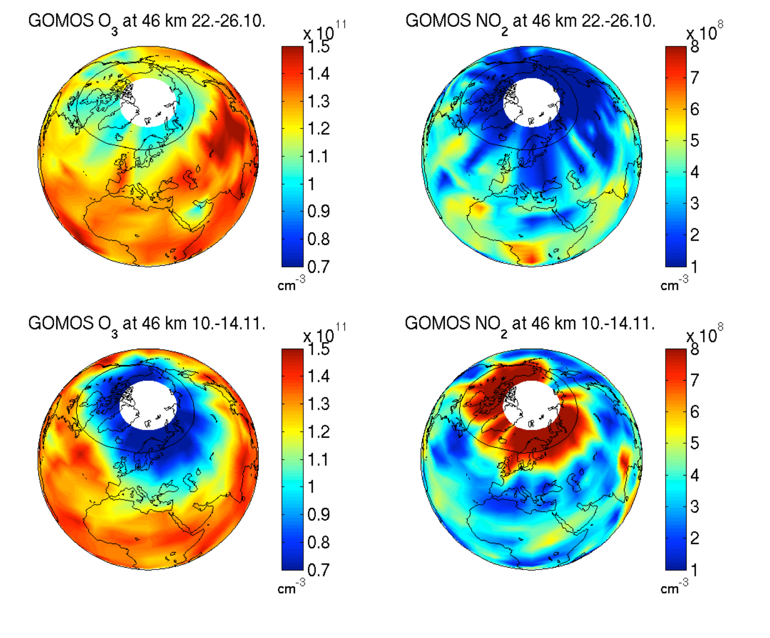
J-L Bertaux, LATMOS: ASC, Barcelona

Particle precipitation and stratospheric NO_2 and O_3

Large intrusions of NO_2 into stratosphere are common in polar atmosphere (here Arctic).



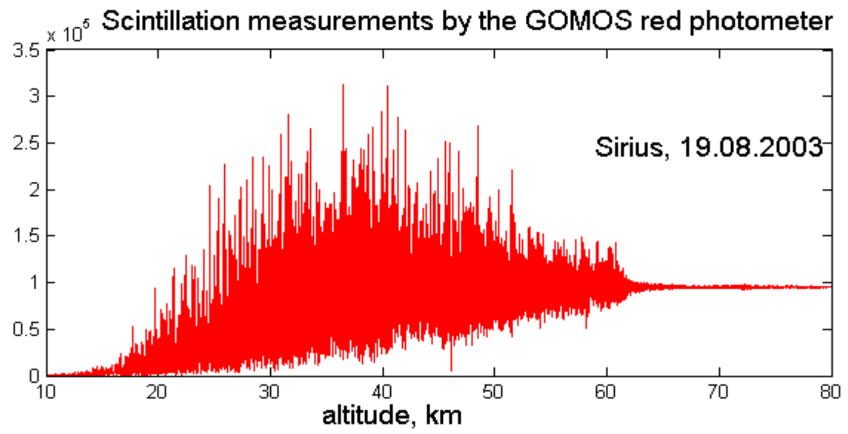
Solar protons precipitating into Earth's atmosphere create ions and modify atmospheric chemistry. Locally large ozone losses are produced via the large increases of NO and NO_2.



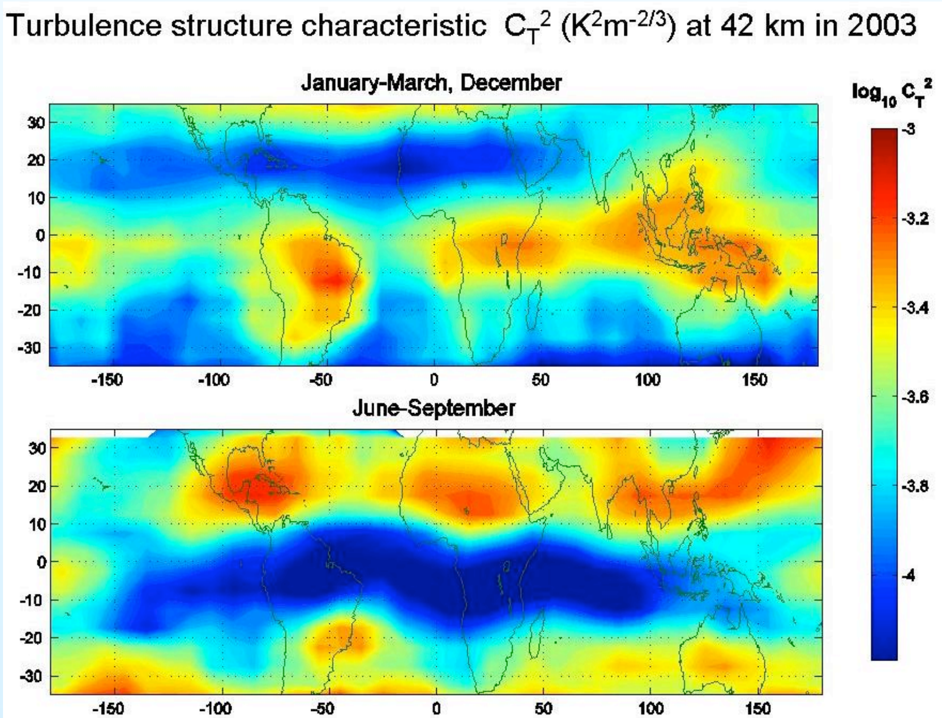
Seppälä, A., et al., GRL, 31, L19107, 2004.
Hauchecorne et al., GRL, 34, L03810, 2007.
Verronen et al., GRL, 33, 24, L24811, 2006

→ Talk by Seppälä

Scintillations: quantifying gravity waves and turbulence



Scintillations provide unique information about small-scale processes at 30-50 km

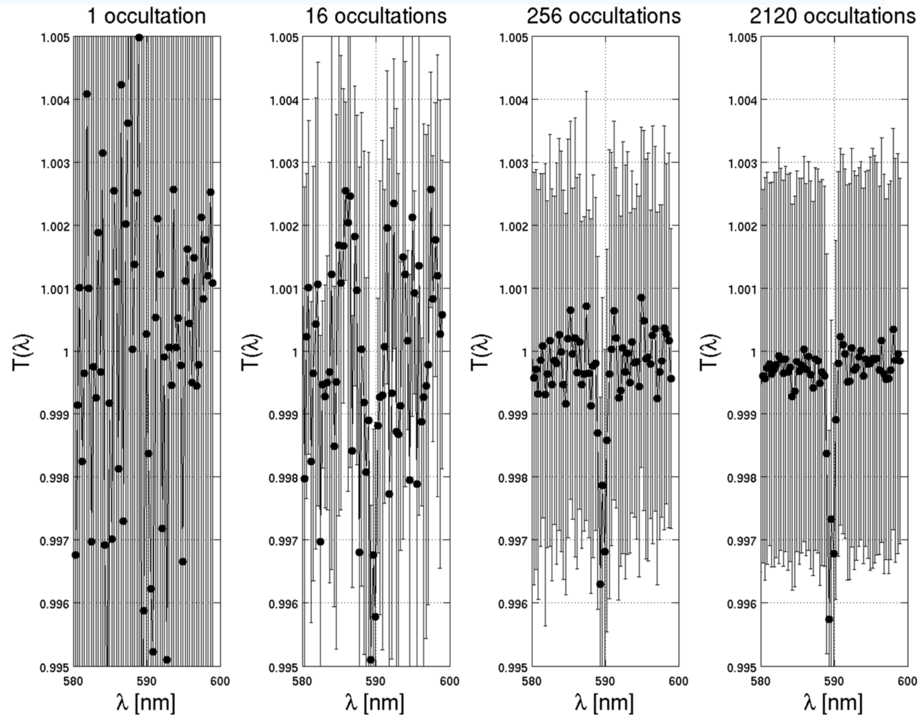


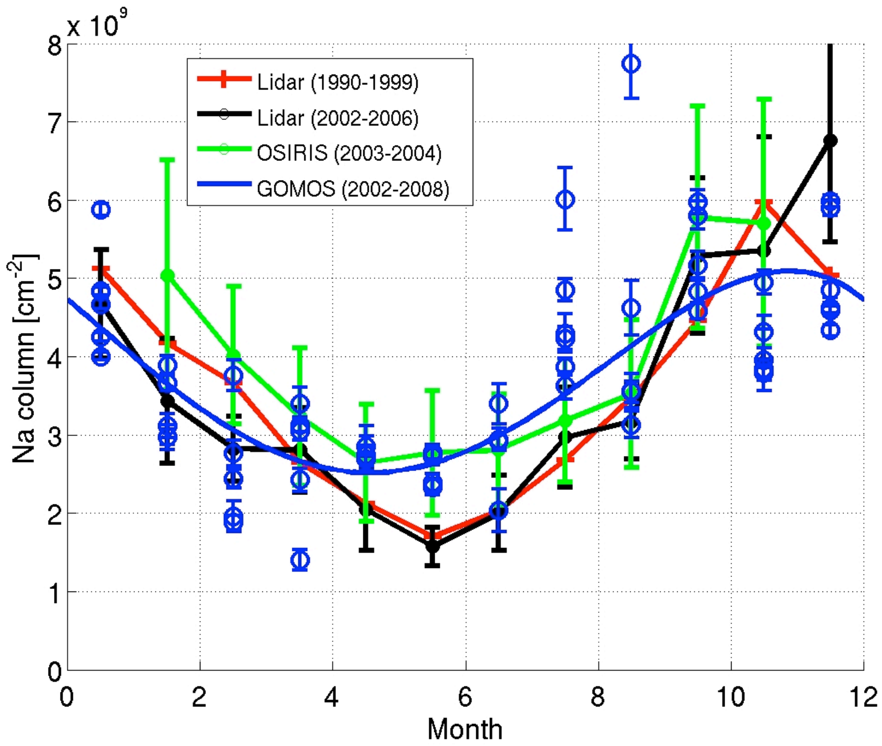
Scientific highlights

- Indication of gravity wave breaking in polar night jet [Sofieva et al., 2007, GRL & JGR]
- First global maps of turbulence in the stratosphere, at altitudes 30-50 km [Gurvich et al., 2007, GRL]
- Global distribution and seasonal variations of GW spectra parameters (structure characteristic, inner and outer scale) [Sofieva et al., 2009, GRL]

→ Talk by Sofieva
GOMOS special issue ACPD

Sodium layer





Fussen, Bira: ASC, Barcelona

Fussen et al., GRL, 31, 24, L021618, 2004.

OClO from averaging GOMOS transmissions

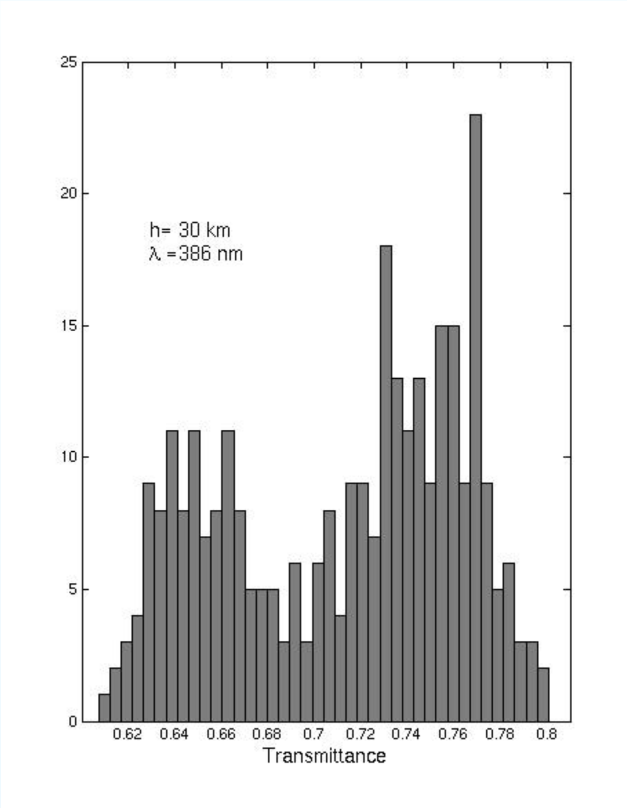


Fig. 4. Histogram of transmittances at 30 km and at 386 nm from the GOMOS Sirius occultations in January 2008 above 65°N.

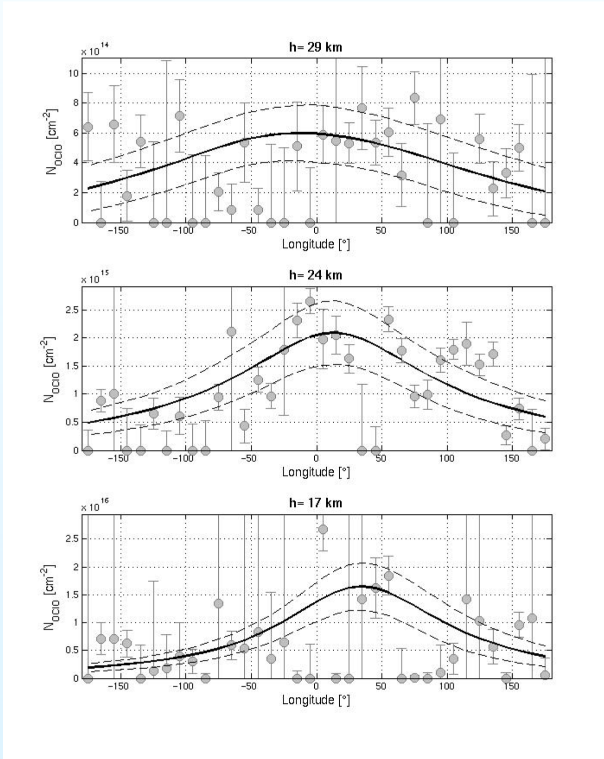
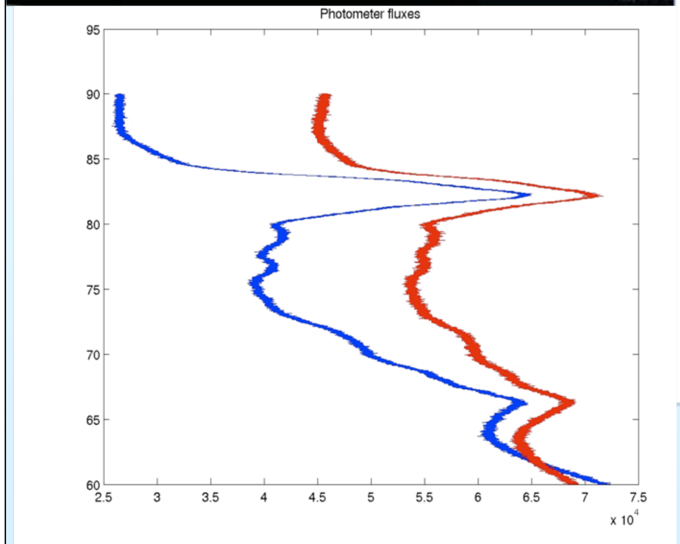
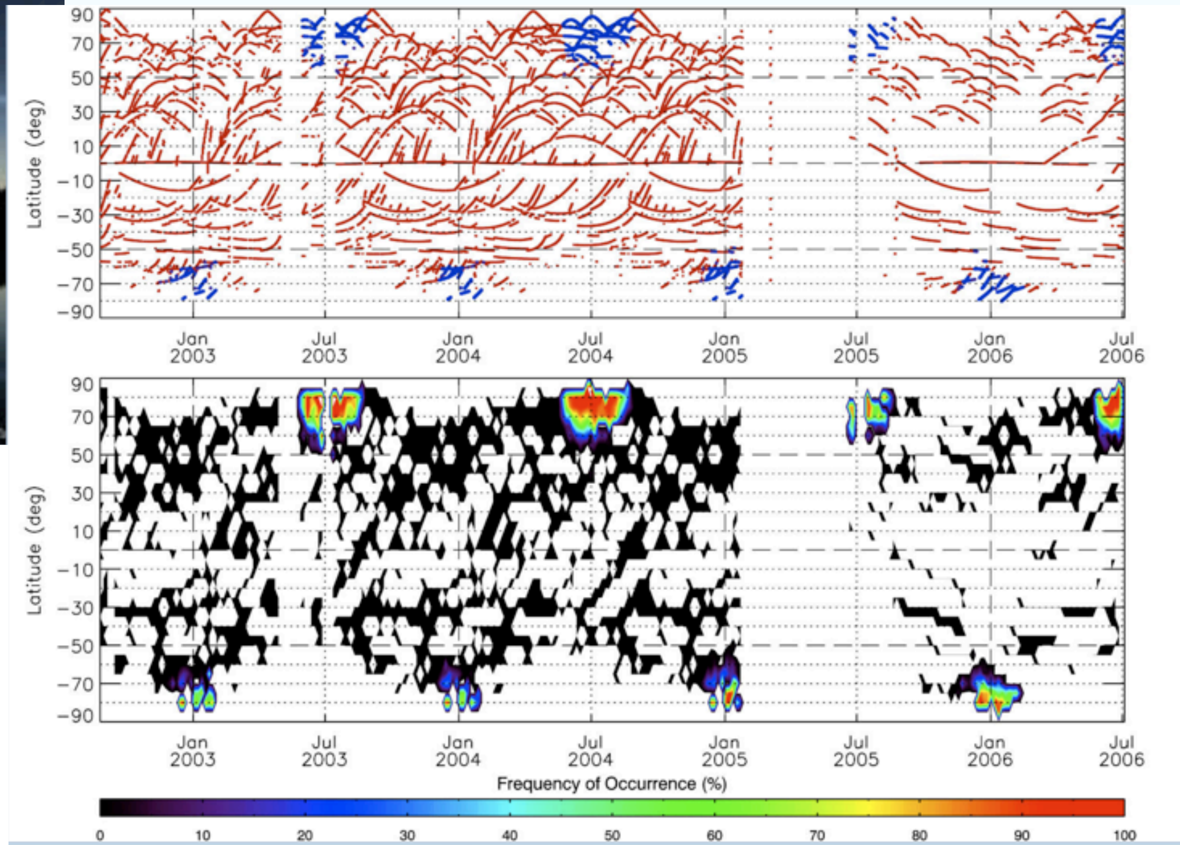


Fig. 5. OClO slant column densities as a function of longitude with the spectral inversion error bars for January 2008 in the arctic polar region. The solid line is the result of an error-weighted fit by a single lorentzian function. The dashed lines represent the associated confidence interval at 1-σ

Tetard, et al., GOMOS special issue ACPD

NLC from GOMOS photometer observations





Kristell Perot, LATMOS: ASC, Barcelona

Future outlook

The next software version 6 (Gopr 7)

- Full covariance matrix in spectral inversion -> better error estimates
- L1 calibration update -> better cool/weak star ozone and H2O retrieval
- HRTP algorithm development -> Improved HRTP

Algorithm development

- New GOMOS day product from bright limb radiances (ESA GBL project) ⇒ 300 000 day ozone profiles in addition to 300 000 night profiles

- Improved GOMOS aerosol products (ESA AERGOM project)

Open : GOMOS special issue ACPD