

Comparative studies of trace gases and PSCs from limb scatter and occultation satellite sensors

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Outline of talk

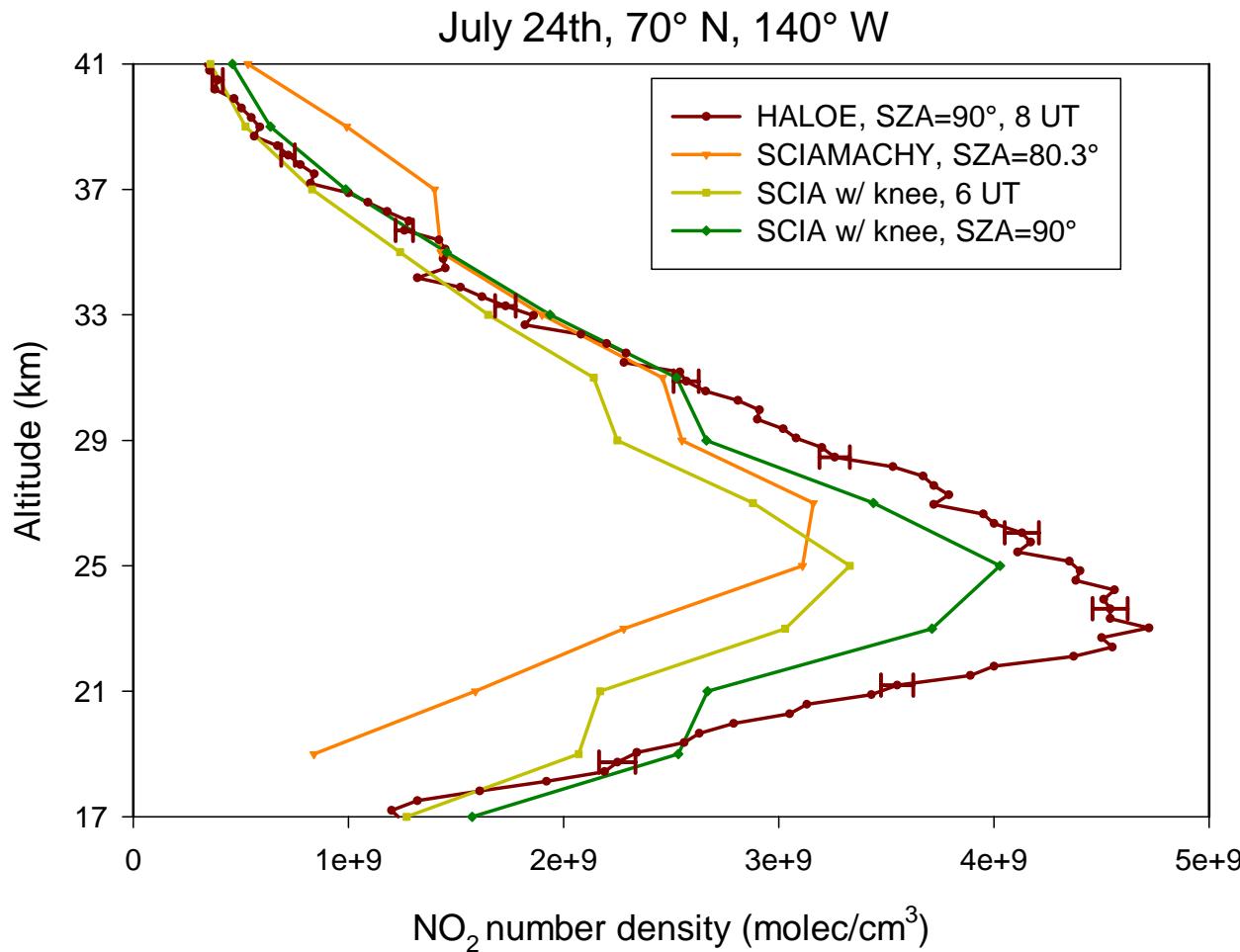
Present research topics as a SOSST member

Illustrate with previous findings from other instruments

Research topic:

Retrieval of trace gas profiles (e.g. NO₂ and O₃) from SAGE III limb scatter

Experience: SCIAMACHY (Mar 2002-), OSIRIS (2001-)



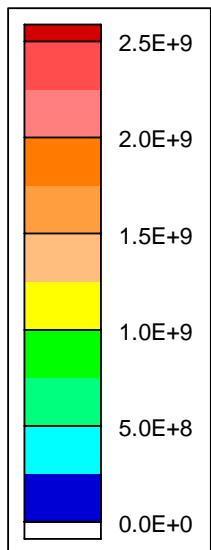
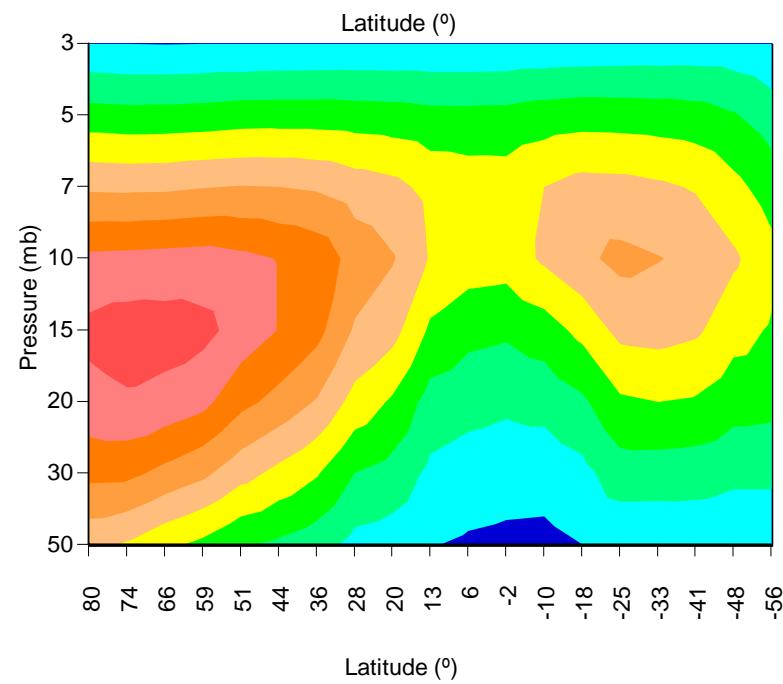
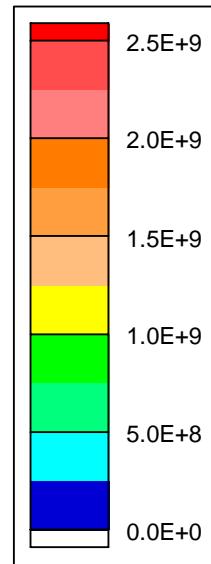
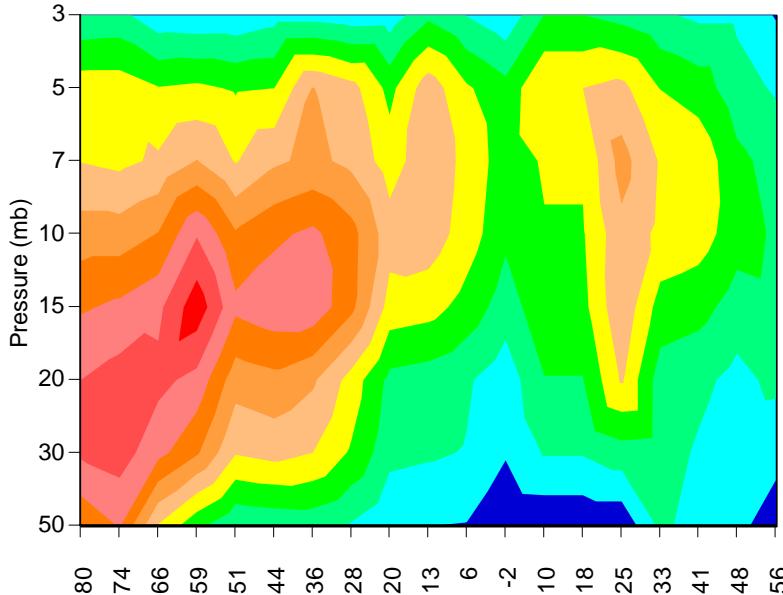
(from Sioris *et al.*, submitted to *Adv. Space Res.*)



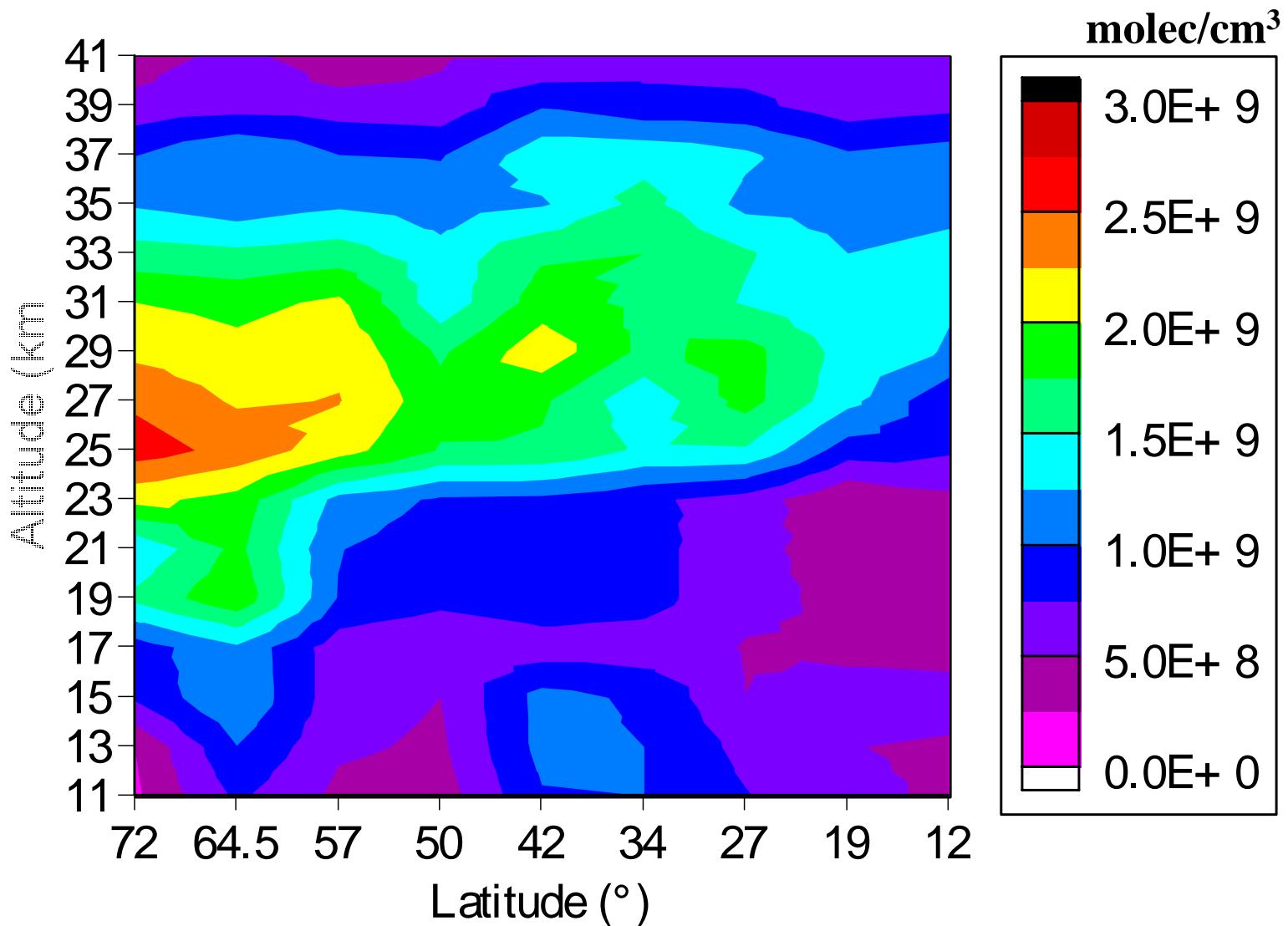
Sample orbit of stratospheric NO₂

Top: SCIAMACHY NO₂ number density, cm⁻³, on August 5, 2002;

Bottom: Canadian Middle Atmosphere Model NO₂ [de Grandpre *et al.*, 1997].

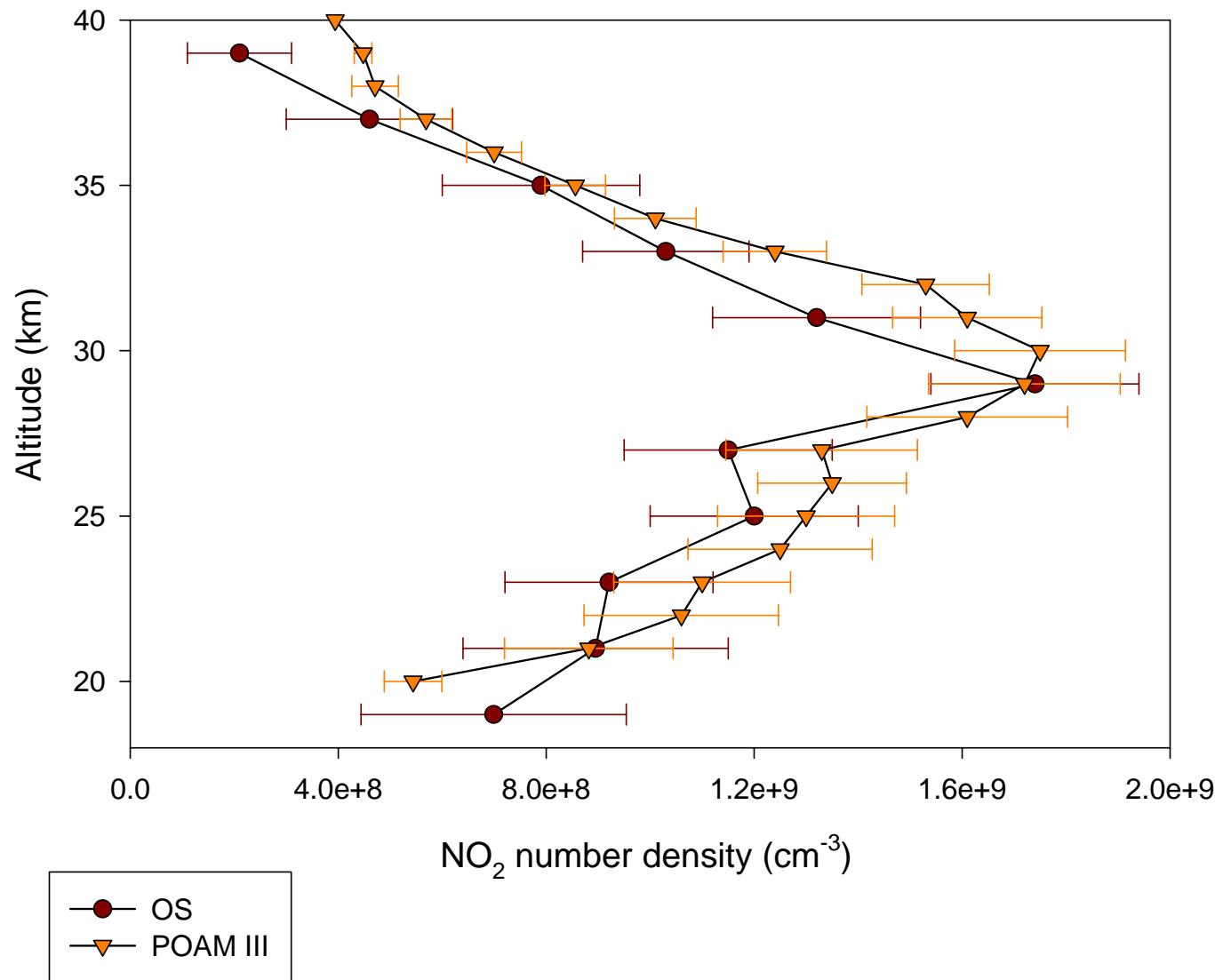


SCIAMACHY NO₂ - August 10, 2002

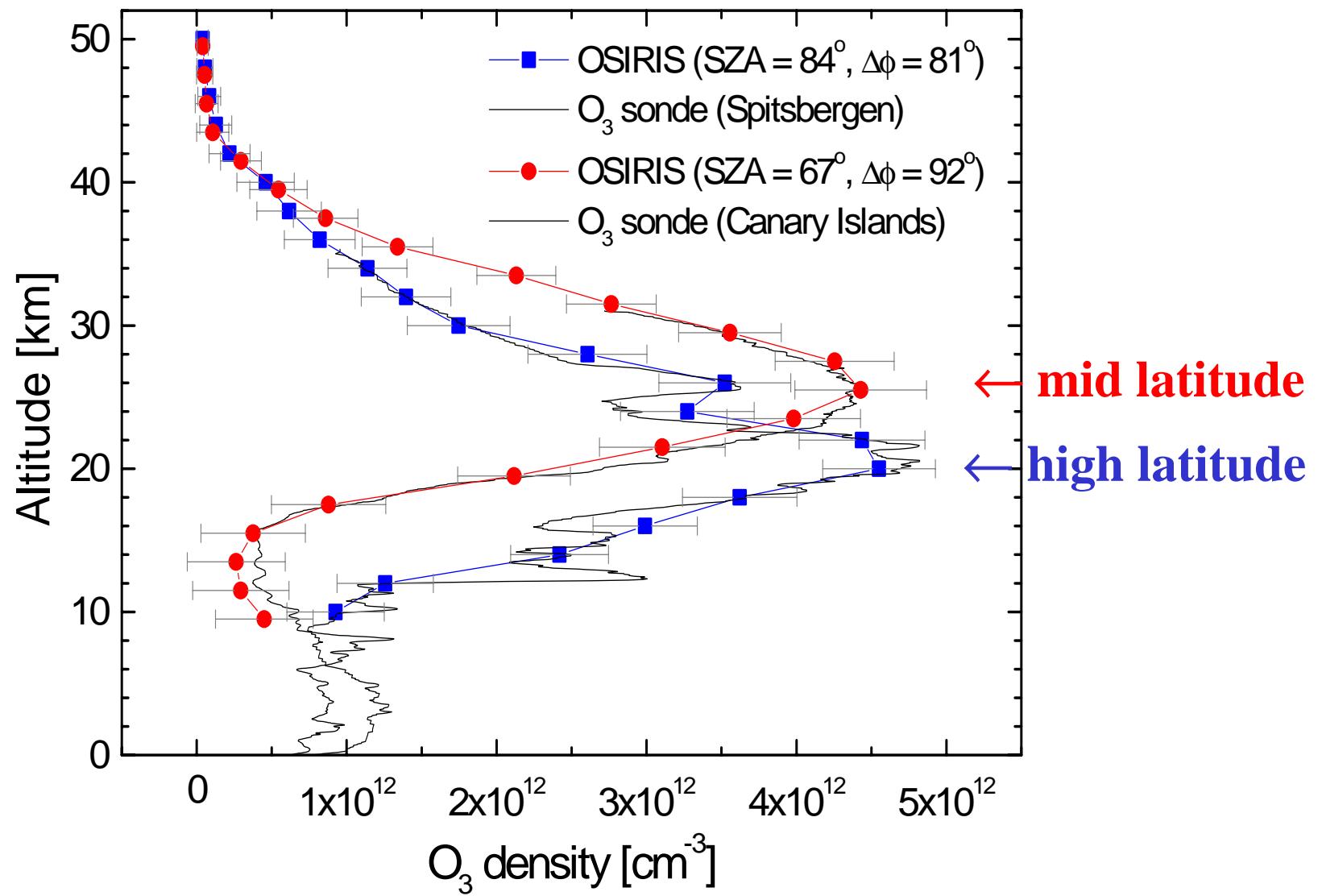


~enhancement of 130 pptv of NO₂ (likely due to air traffic, **Chicago-New York** corridor, ~40° N, 10 am LT)

OSIRIS sunset coincidence with POAM3 , Oct. 10th, 2001, 71° N



(from Sioris *et al.*, JGR, 2003)



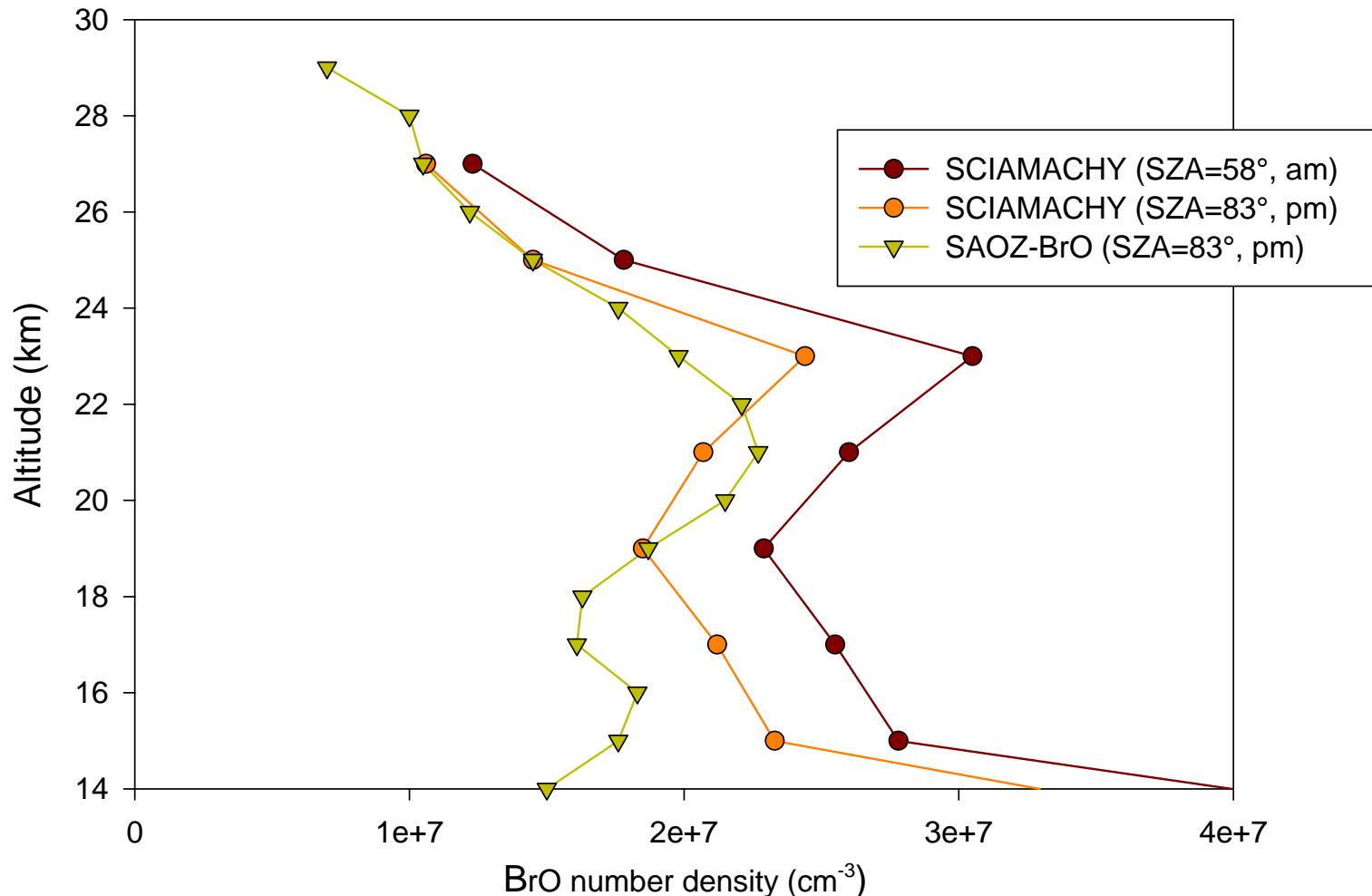
Sample O_3 retrievals from OSIRIS validated with sonde measurements at high and mid-latitudes [Savigny *et al.*, submitted].

Research topic:

Retrieval of BrO and OCIO profiles from SAGE III solar occultation

Experience: SCIAMACHY limb scatter

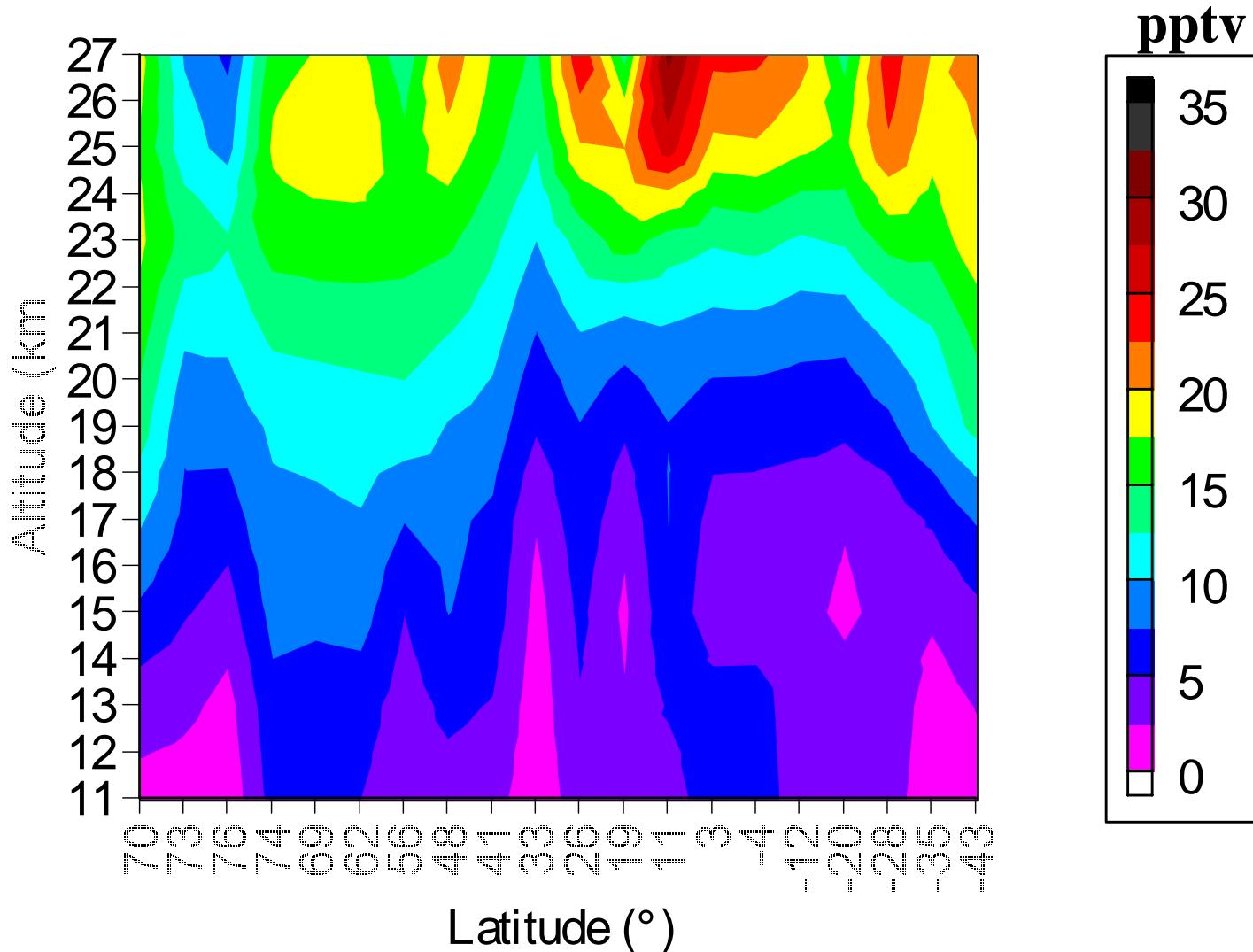
Aire sur l'Adour (43.7° N 0.3° E), Oct 1st, 2002



At ~ 23 km, BrO: 26 pptv (10 am LT)

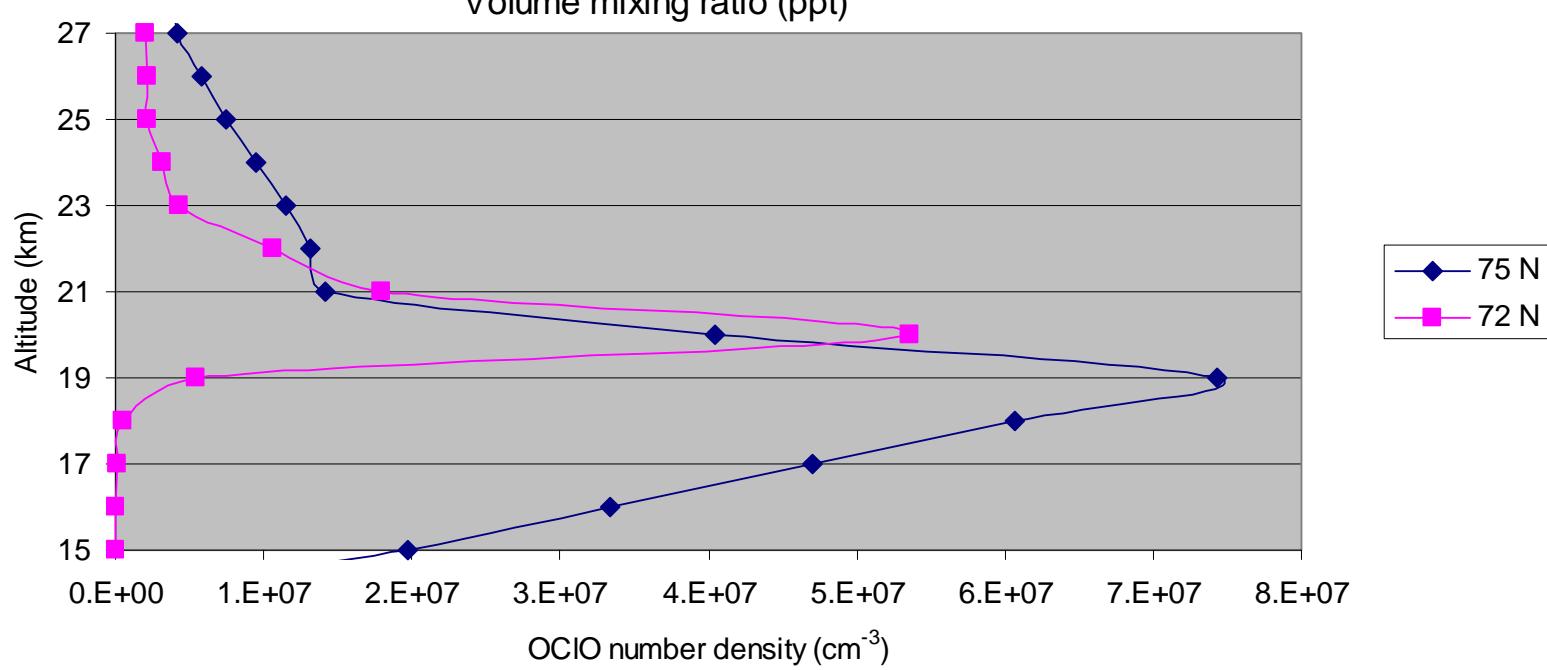
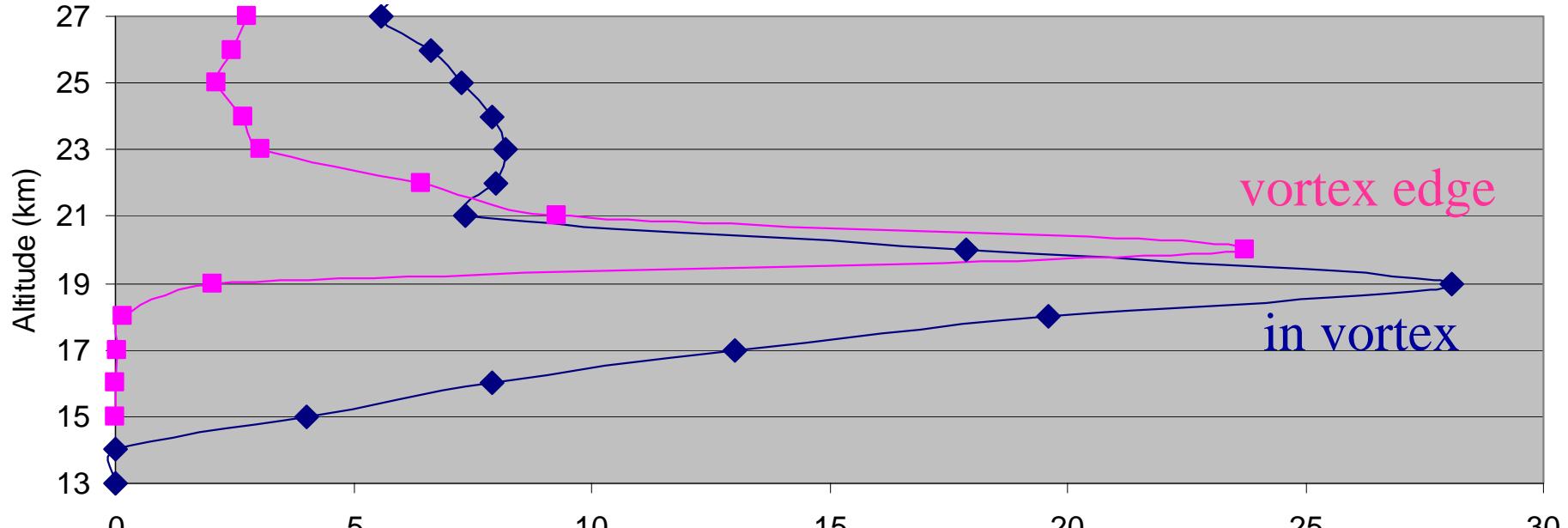


Sample orbit of BrO- July 24th



- Tropical upper tropospheric BrO at 4° S, associated with cirrus
- Latitudinal distribution as expected
- [BrO] ~18 pptv in the middle stratosphere

Arctic
sunrise
OCIO,
Feb. 10th,
2003



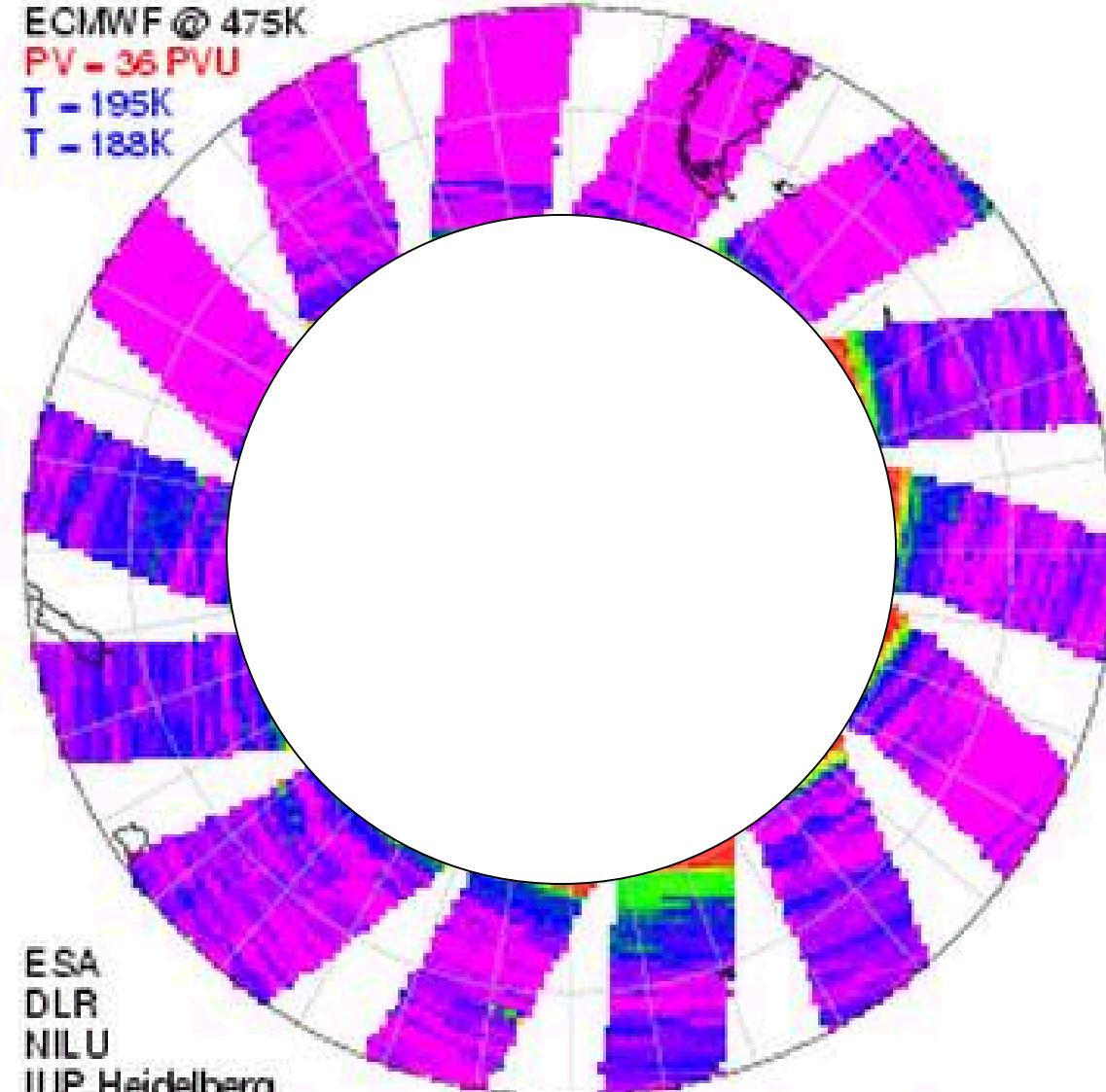
GOME NRT OCIO, 2002/06/21

ECMWF @ 475K

PV = 36 PVU

T = 195K

T = 188K



SC OCIO
[molec cm⁻²]



ESA

DLR

NILU

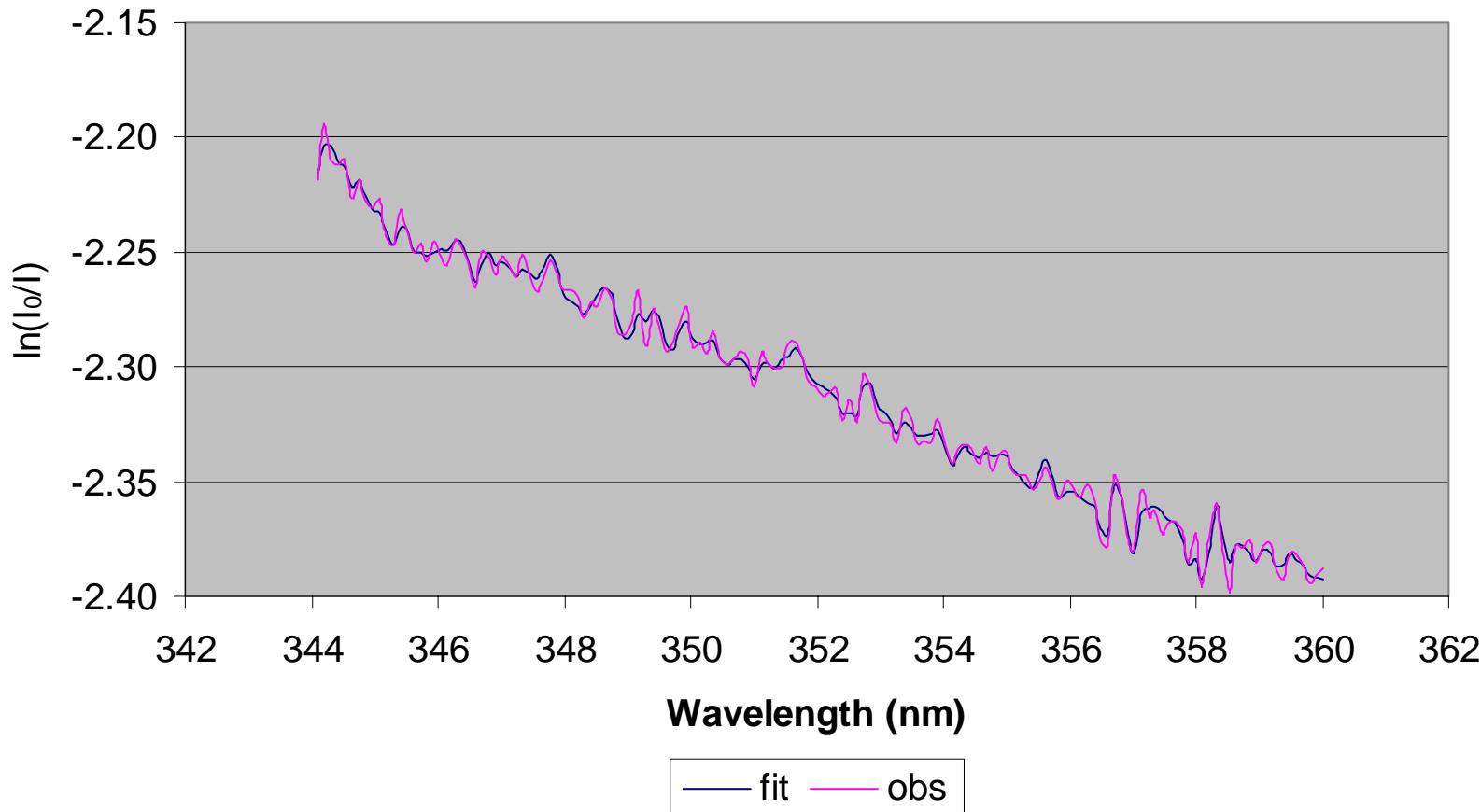
IUP Heidelberg

IUP Bremen Folkard.Wittrock@iup.physik.uni-bremen.de

Opportunity for OClO measurements at sunrise in June with SAGE III

Retrieval of NO_2 from limb scatter and BrO and OCIO require fitting for recently-discovered ‘*tilt*’ pseudo-absorber (Sioris *et al.*, *JGR* 2003)

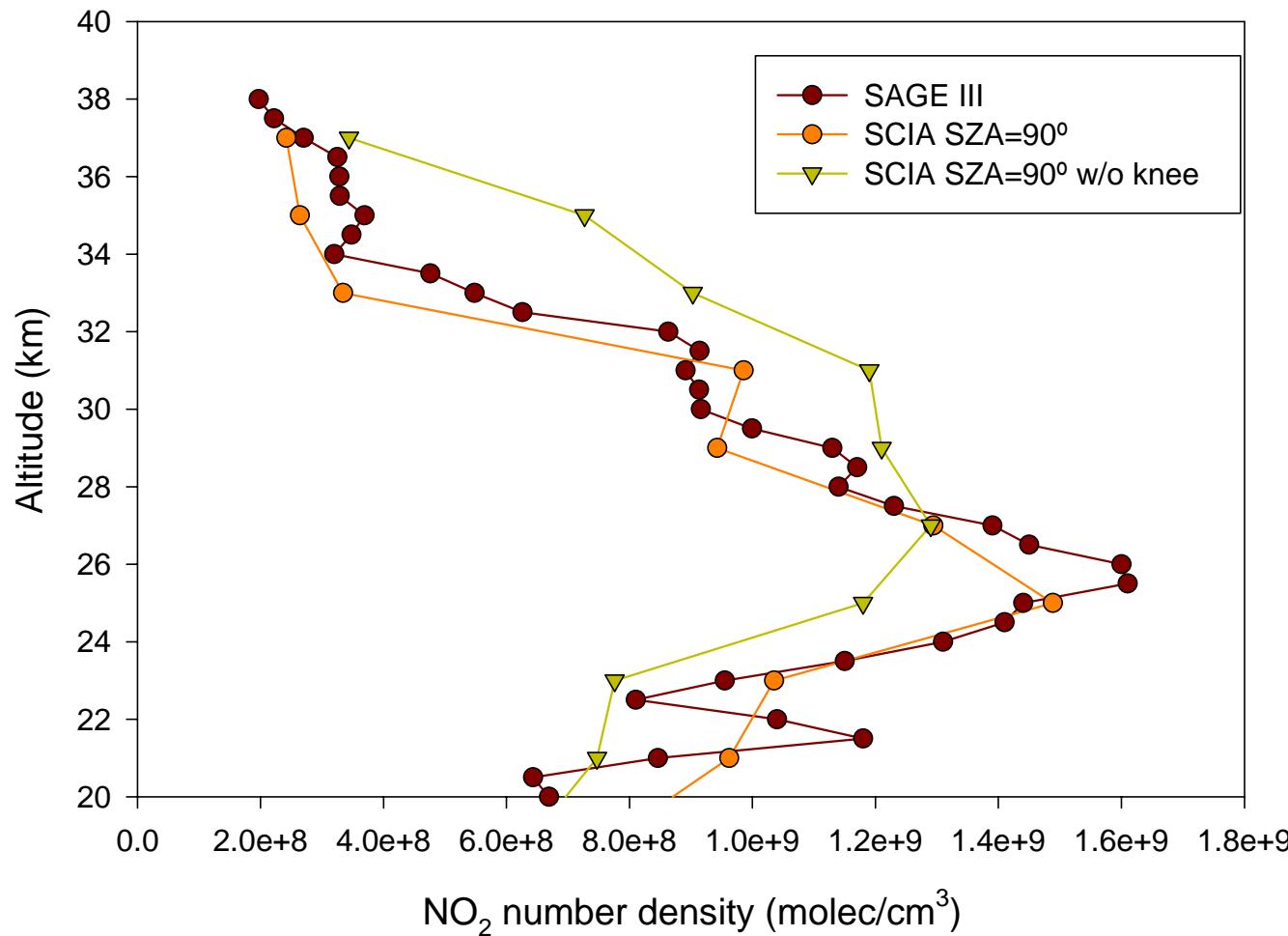
- effect occurs due to combination of undersampling, Fraunhofer structure, and different spectral slopes of I and I_0
- pseudo-absorber is modelled and included in spectral fit
- expected for all spectrometers with pixelated detectors (e.g. SAGE III)



Attitude determination for limb scatter

-use ~305 nm ‘knee’: compare with RTM for “same” case (SZA, p , O₃)

75 N, Oct. 26th, 2002



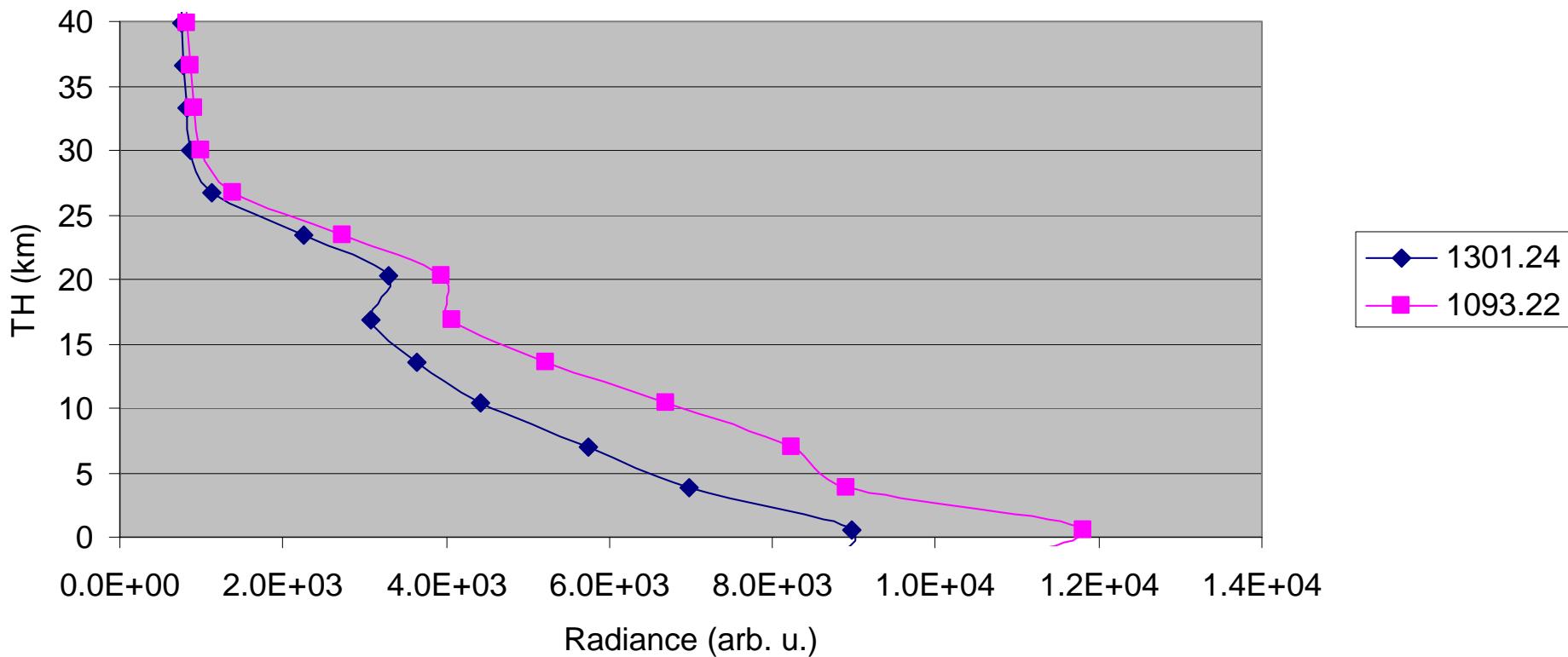
Advantages: -insensitive to surface, and lower atmosphere
-O₃ governed by photochemistry (except for high lat winter)

Research topic:

PSC detection from SAGE III and SCIAMACHY (solar occult. and limb) and ILAS-II data

Experience: SCIAMACHY limb scatter, ILAS solar occultation

Limb radiance profiles at 2 NIR λ s



SCIAMACHY data from Antarctic winter '02

PSC observation, 65° S in early August (orbit 2293)

Summary of planned research

- Retrieve NO_2 and O_3 from SAGE III limb scatter
- Compare SAGE III limb and solar occultation NO_2 and O_3 with OSIRIS
- Retrieve BrO (and OCIO) from SAGE III when full CCD is downlinked
- Detect PSCs from SAGE III solar occultation and limb scatter data
- Look at correlations between O_3 , NO_2 , BrO, and OCIO and PSCs

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A Recent History of the Total Organic (Br_y^{org}) and Inorganic (Br_y^{in}) Stratospheric Bromine Inventory

