

IASI O₃ validation

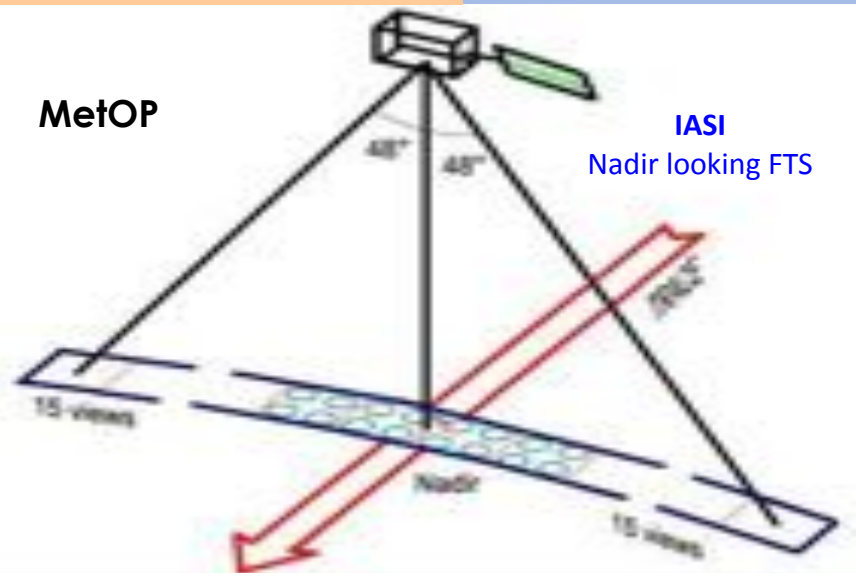
Pommier, M

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CNRS/INSU, LATMOS-IPSL, Paris, France

Pommier, M., Clerbaux, C., Law, K. S., Ancellet, G., Bernath, P., Coheur, P.-F., Hadji-Lazaro, J., Hurtmans, D., Nédélec, P., Paris, J.-D., Ravetta, F., Ryerson, T. B., Schlager, H., and Weinheimer, A. J. (2012): Analysis of IASI tropospheric O₃ data over the Arctic during POLARCAT campaigns in 2008, Atmos. Chem. Phys., 12, 7371-7389, doi:10.5194/acp-12-7371-2012.

IASI: general description - Infrared Atmospheric Sounding Interferometer

Clerbaux et al., ACP 2009



- 4 pixels (12 km at nadir)
- 120 spectra along the swath ($\pm 48.3^\circ$ Scan \rightarrow 2400 km), each 50 km along the trace

Small ground pixel size

Global coverage twice daily (morning and evening orbits) – 14 revolutions/day

MetOp: First European meteorological platform in polar orbit launched by EUMETSAT in 2006

IASI built by CNES.

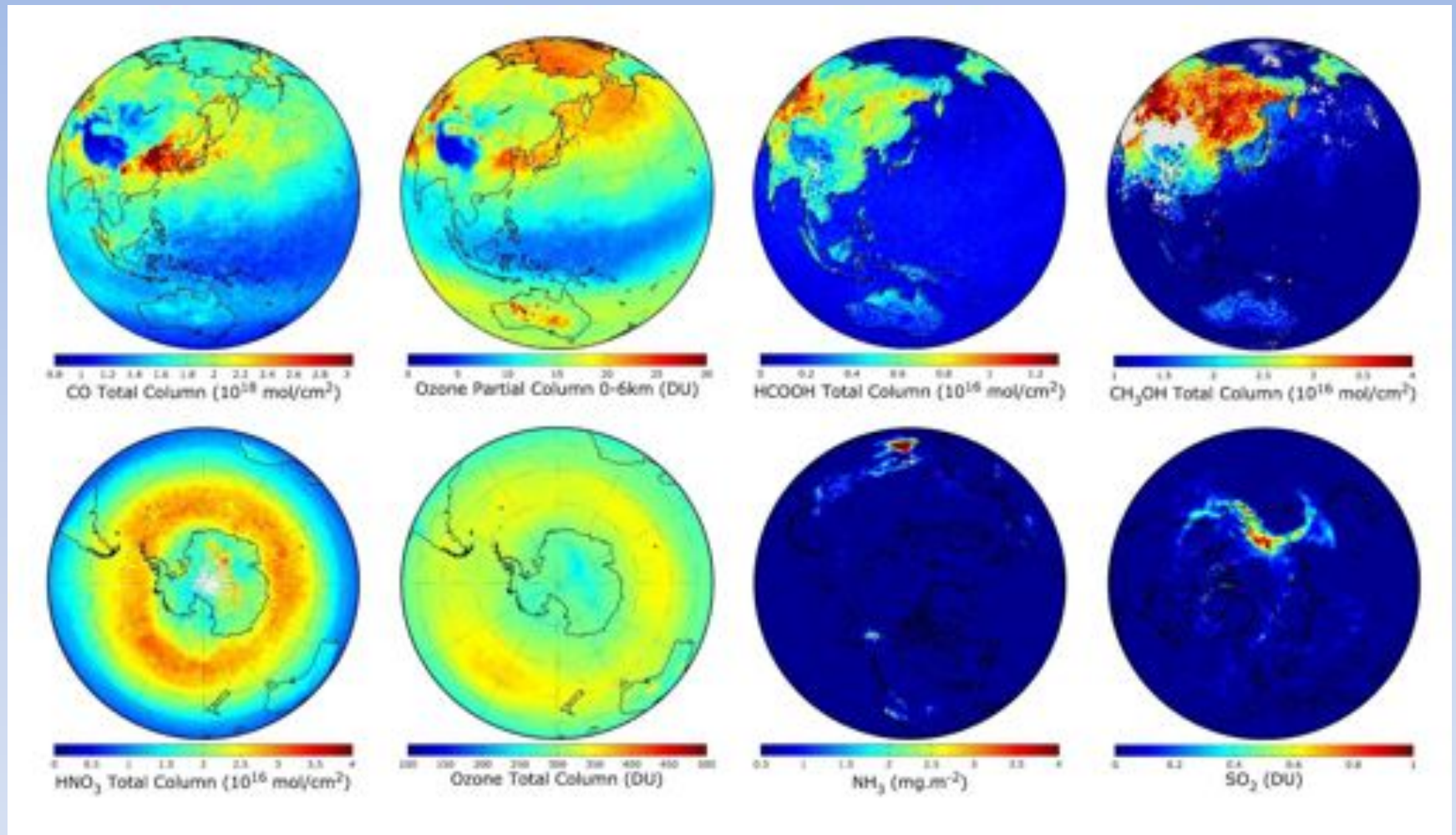
IASI :
Spectral coverage = 645-2760 cm^{-1}
Spectral resolution = 0.5 cm^{-1}
Radiometric noise $\sim <0.1-0.2$ K

Broad spectral coverage without gaps

Medium spectral resolution

High radiometric performances

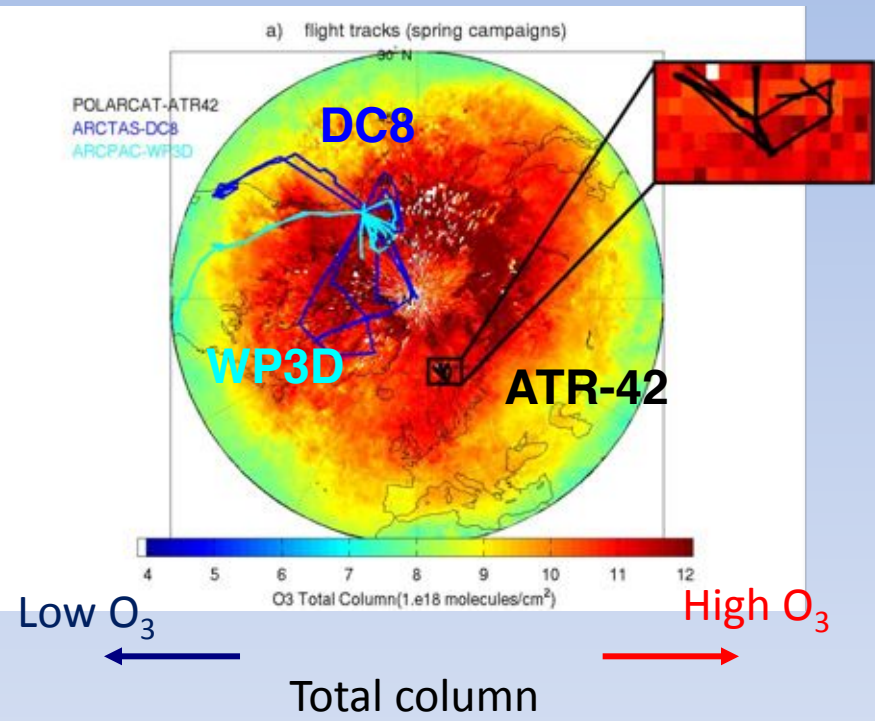
IASI: trace gases distribution, average $1^\circ \times 1^\circ$, 10 days (18-28 August 2008)



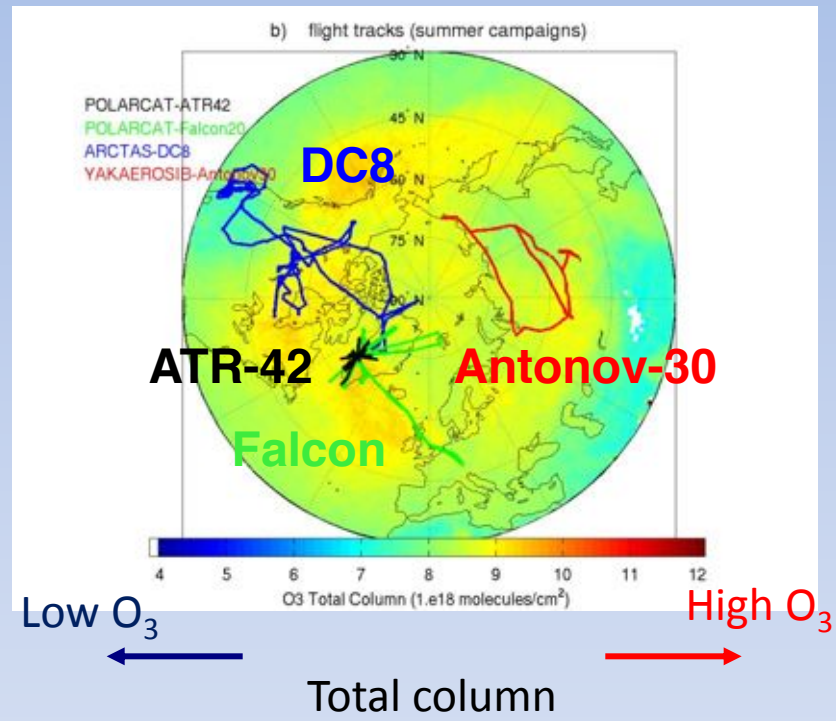
Clerbaux et al., ACP, 2009

Flight-tracks during both campaigns

spring

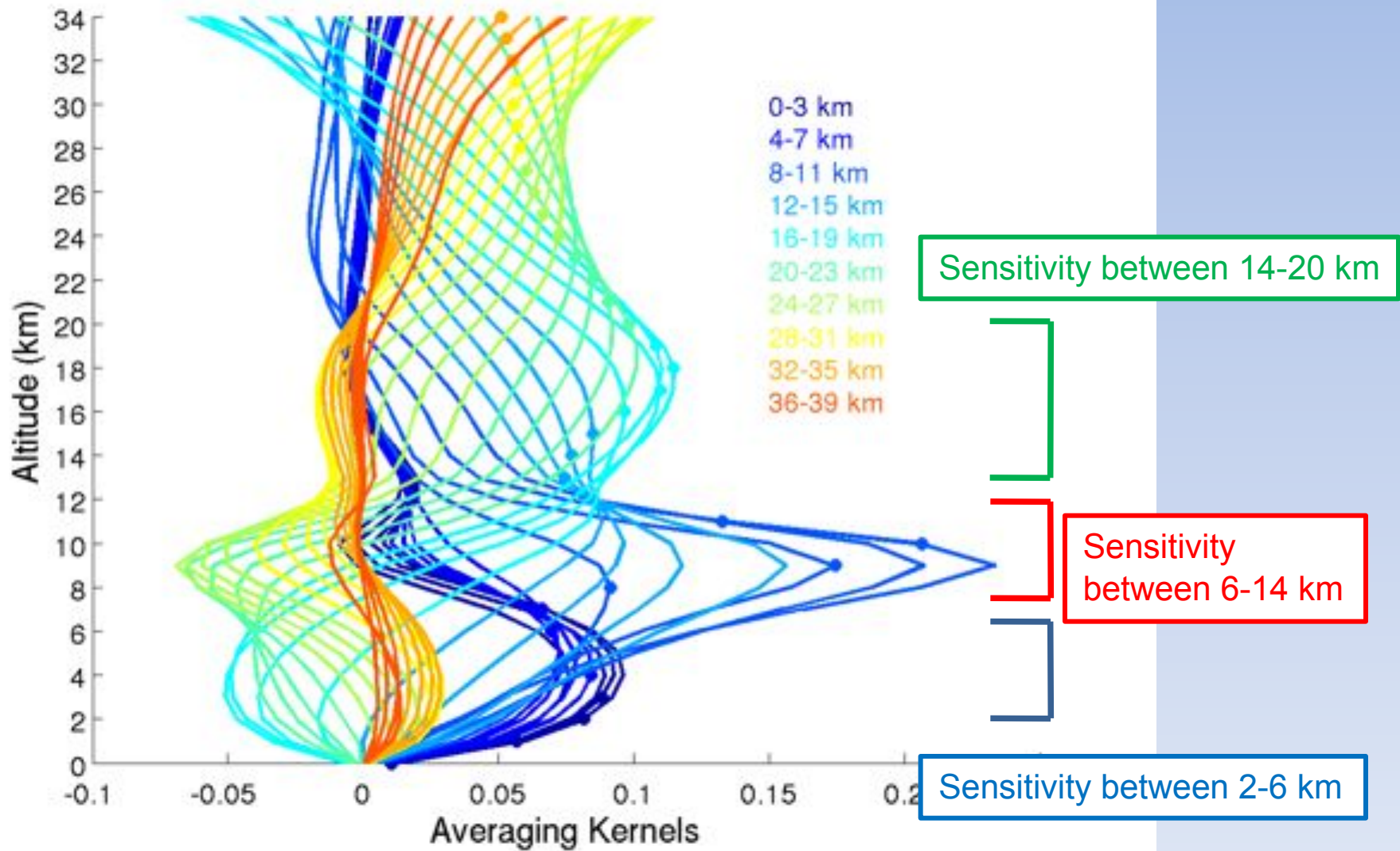


summer



IASI sensitivity over the Arctic

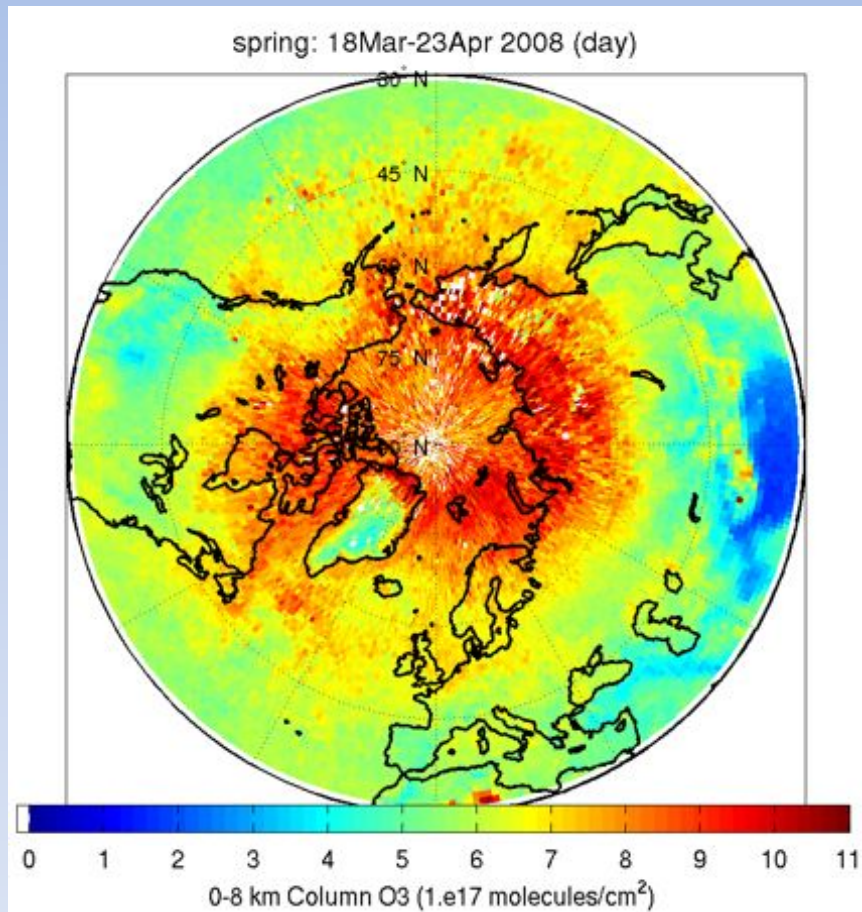
DOFS=3.3 at 63.7°N, 20.4°W, on 17 July 2008



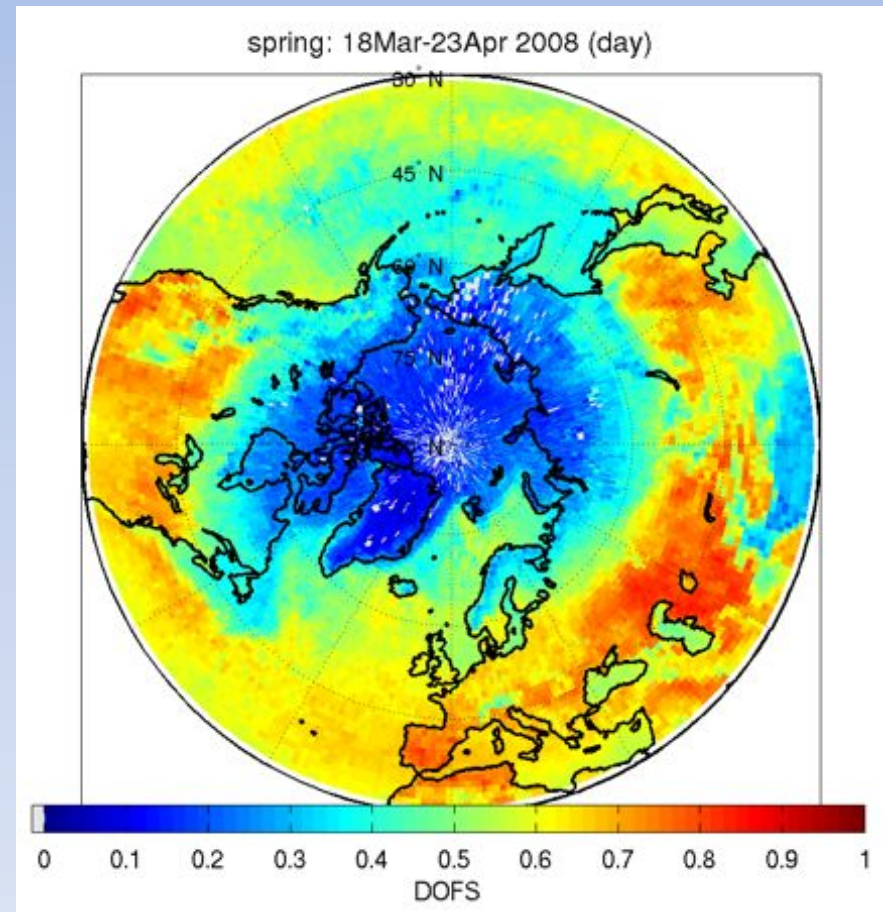
IASI sensitivity over the Arctic

Example during day-time in spring

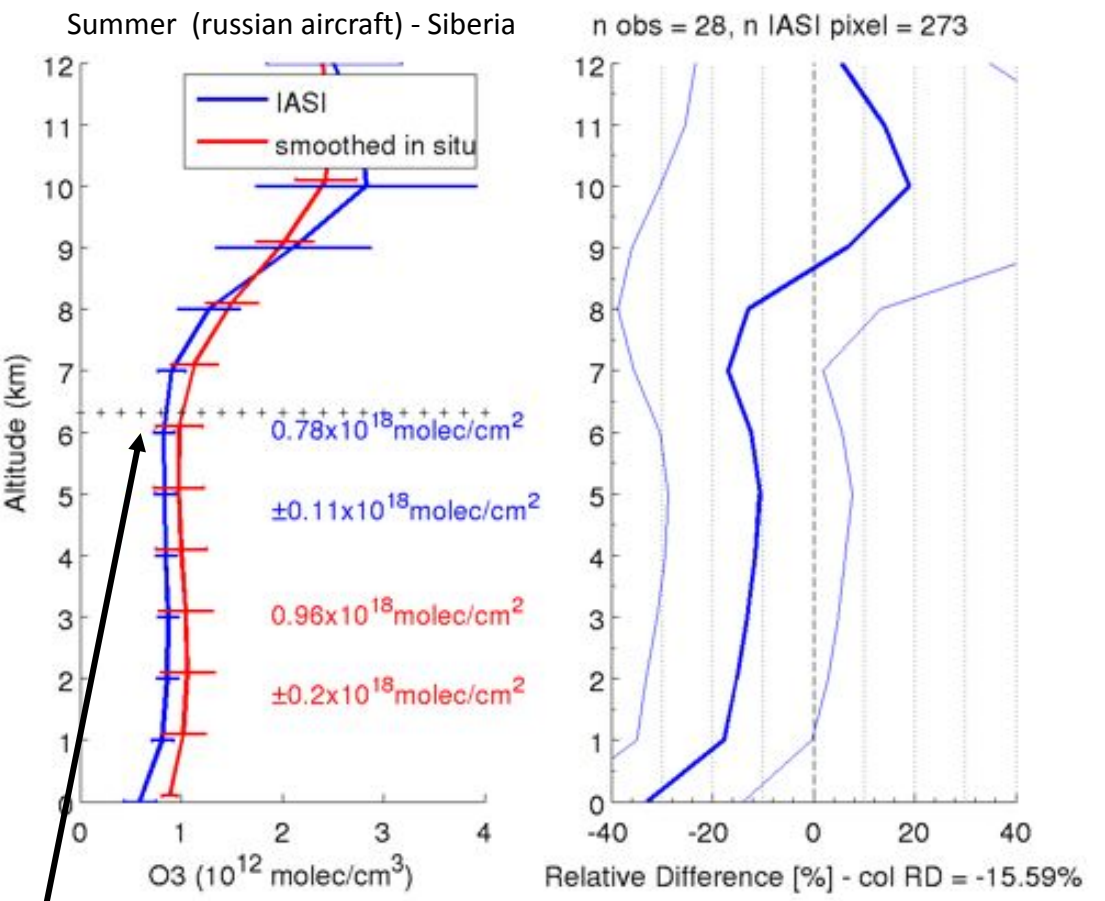
O₃ [0-8 km]



DOFS



Co-location criteria: $\pm 0.5^\circ \pm 2$ h



Mean limit between climatology and *in situ* measurements

Overview of this comparison:

Profiles:

136 profiles compared

- in the in situ part of smoothed in situ profiles :

- *relative difference < 40%*
- *smoothed in situ concentrations > IASI in both seasons.*
- *According to surface: relative difference < 25% over sea; <33% in spring and < 20% in summer over land (40% close to the surface) .*

[0-8 km] Columns :

bias < 26%

IASI > (<) smoothed in situ – summer (spring)

Correlation less obvious... max in spring with American aircraft (DC8) =0.68

Results of validation in the UTLS (only summer data)

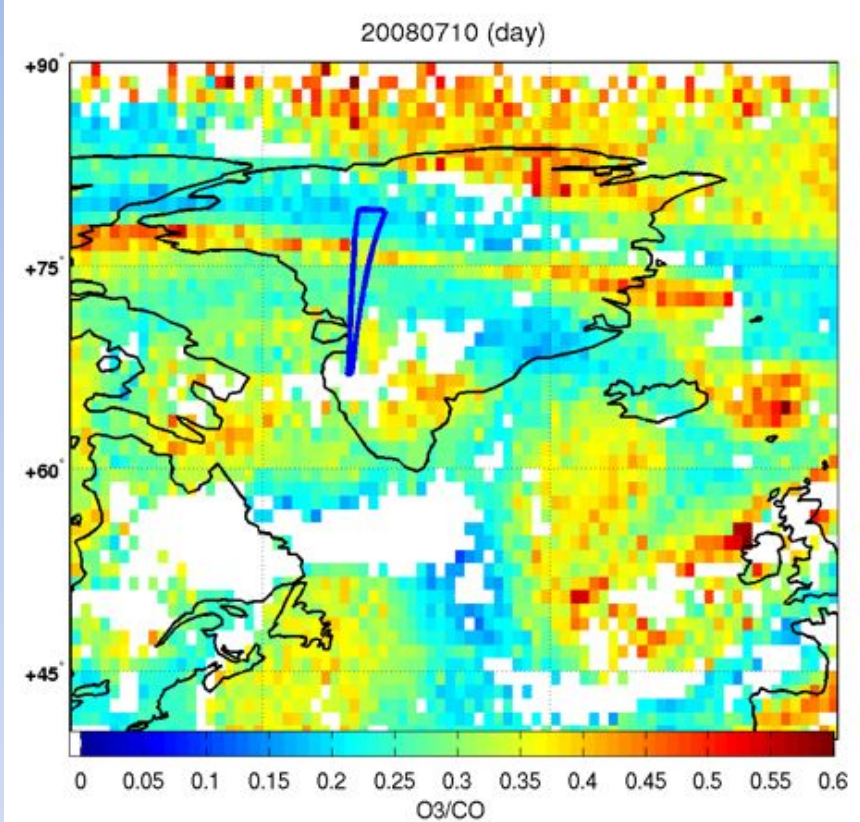


*O₃ lidar data: G. Ancellet
+ F. Ravetta*

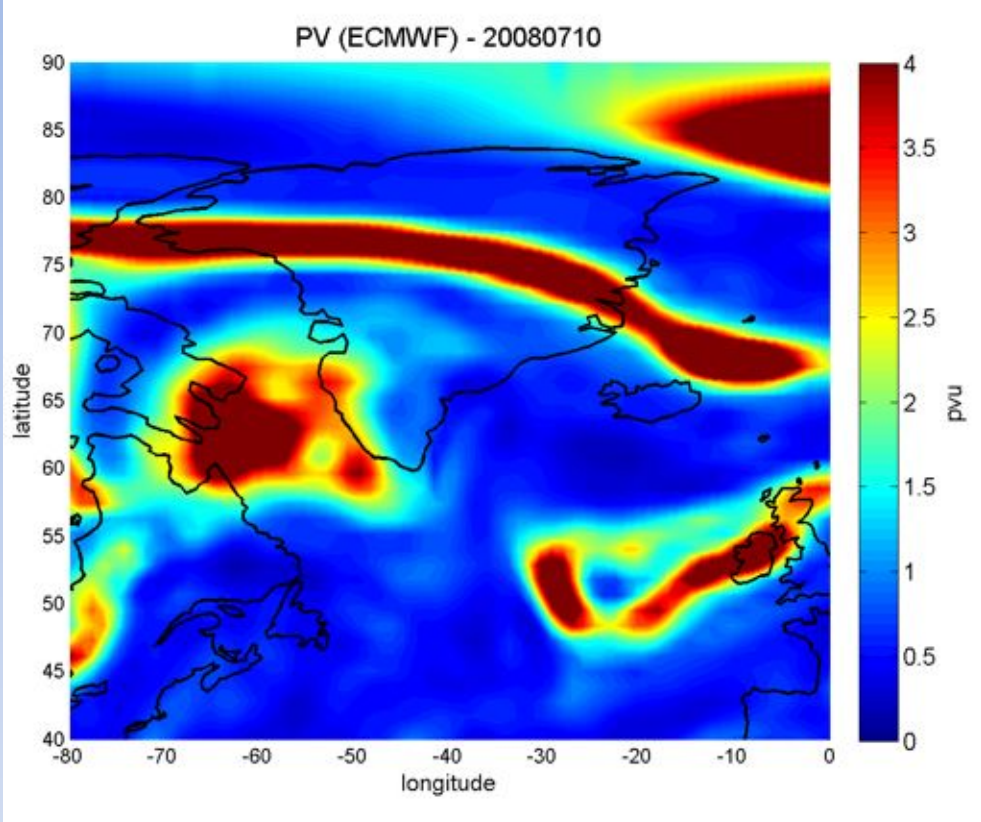
- use of lidar → RD=10% in the free troposphere
- **BUT** high positive bias in the UTLS (above 9-10 km) (**>100%**)
- Impact comparison with [0-12 km] columns and profiles

e.g. : IASI > smoothed lidar columns

Example of stratospheric intrusion over Greenland observed by IASI



O₃ [0-8km] column / CO total column



PV at 8 km

- **RD < 30% except on the surface (40%) with in situ measurements**
- **RD < 10% with lidar measurements in the free troposphere BUT > 100% between 9-10 km**
- **IASI > (<) smoothed in situ – summer (spring)**
- **IASI > smoothed lidar columns (summer)**
- **O₃ [0-8km] column / CO total column : observation of stratospheric intrusion**