

# tropospheric Ozone Column S5P-Satellite comparison

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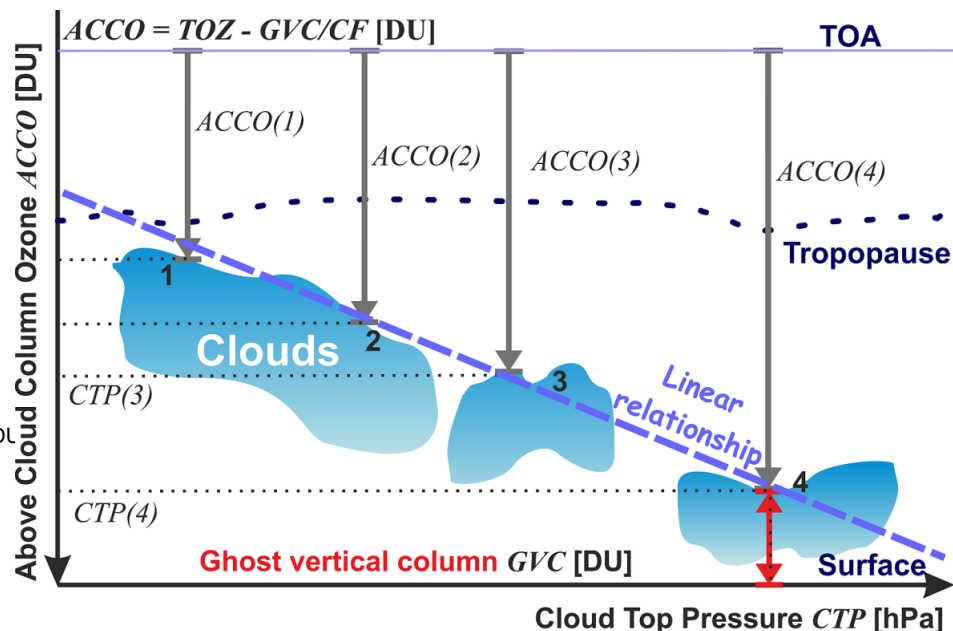
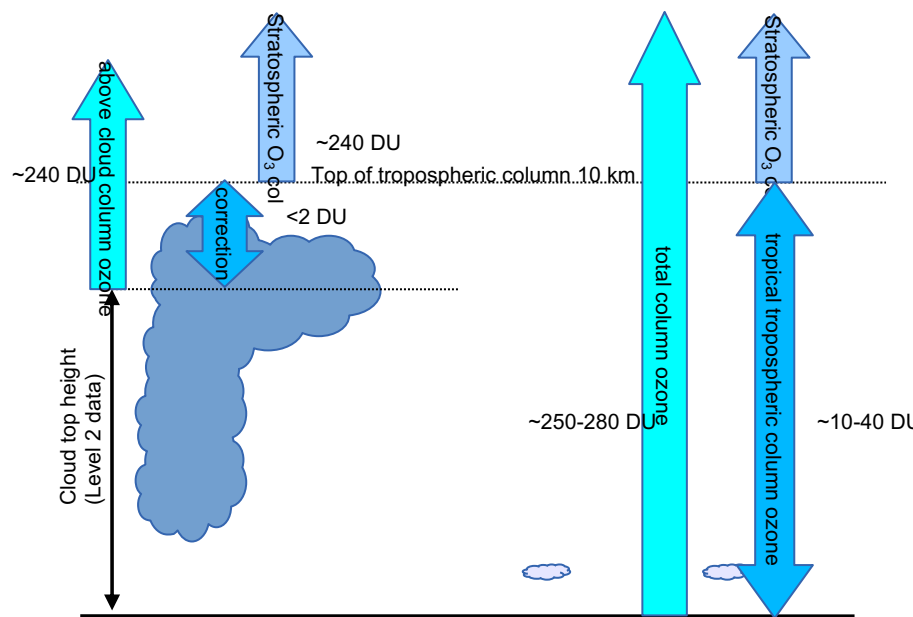
3) Institut für Umweltphysik, Universität Bremen, Bremen, Germany



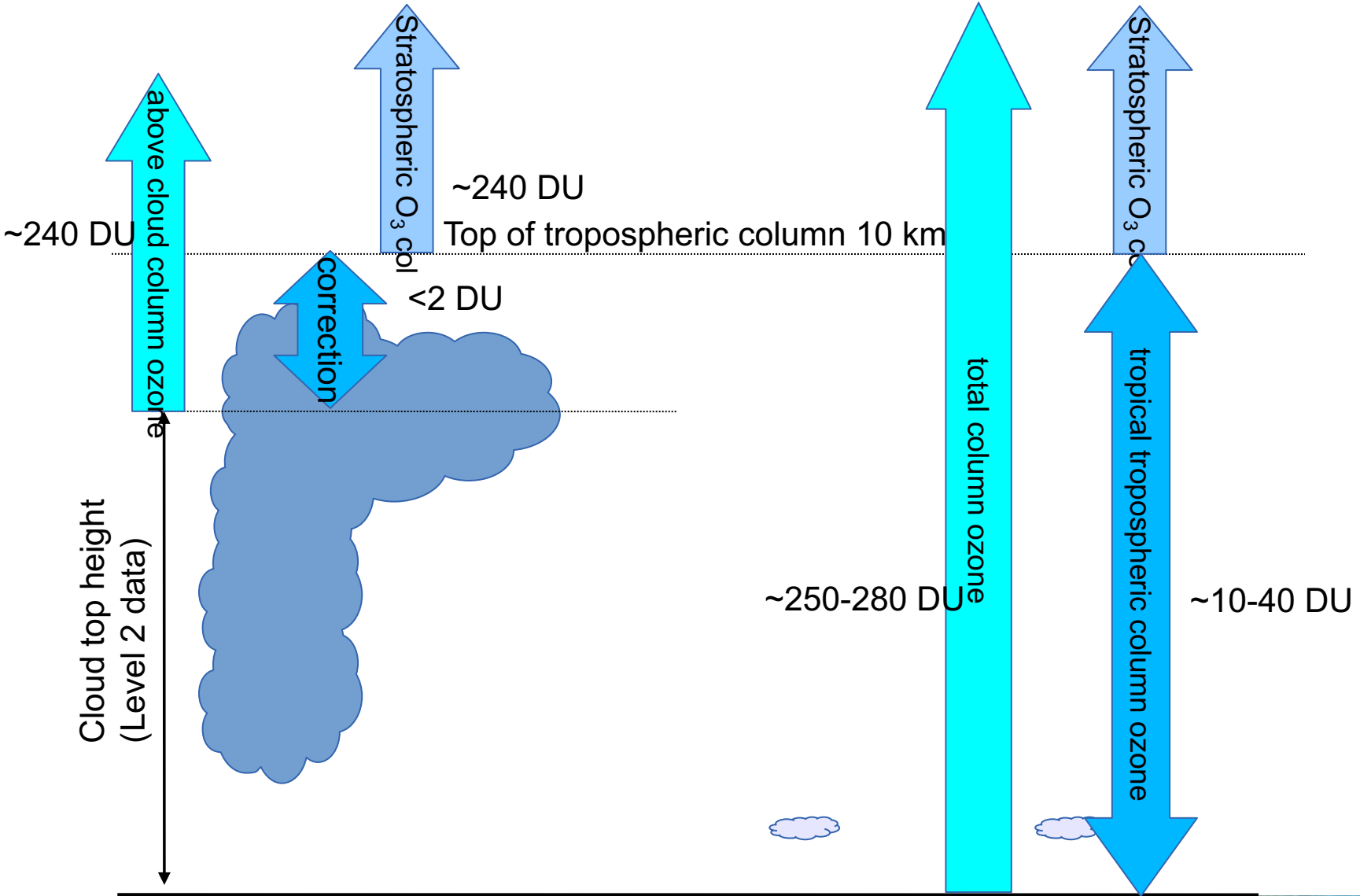
Knowledge for Tomorrow

# Overview of tropospheric data files

CCD	CSA
Resolution (0.5° x 1° 3/5 Days)	Resolution (5° x 20° 5 Days)
Tropospheric column below 270 hPa ozone_tropospheric_vertical_column	Tropospheric mixing ratio between 5 and 15 km ozone_upper_tropospheric_mixing_ratio
qa_value	qa_flags



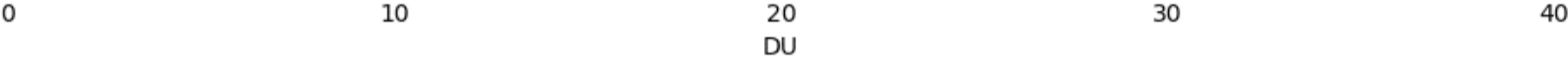
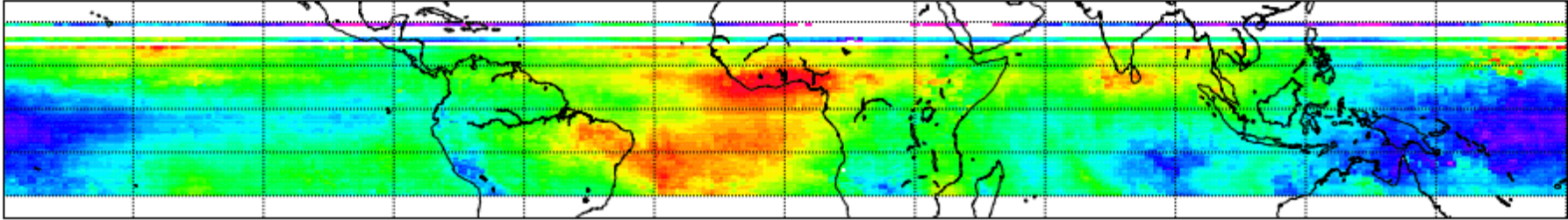
# CCD method



# Example Result

Sentinel 5 Precursor, tropospheric ozone, DLR

2018-03-15



# CCD Comparison to OMI

Comparison for tropospheric ozone between OMI and S5P

S5P: PDGS\_OFFL total column data set, internally reprocessed until 2018-09-13

- 5 Days / 3 Days, started every day
- $0.5^\circ \times 1^\circ$  (averaged to  $1^\circ \times 2^\circ$ )
- Up to 270 hPa (scaled by pressure difference to 200 hPa)

OMI:CCI GODFIT\_v4 total column modified CCI product until 2018-09-14:

- 5 Days instead of 1 month, started every day
- $1^\circ \times 2^\circ$  instead of  $1.25^\circ \times 2.5^\circ$
- Up to 200 hPa

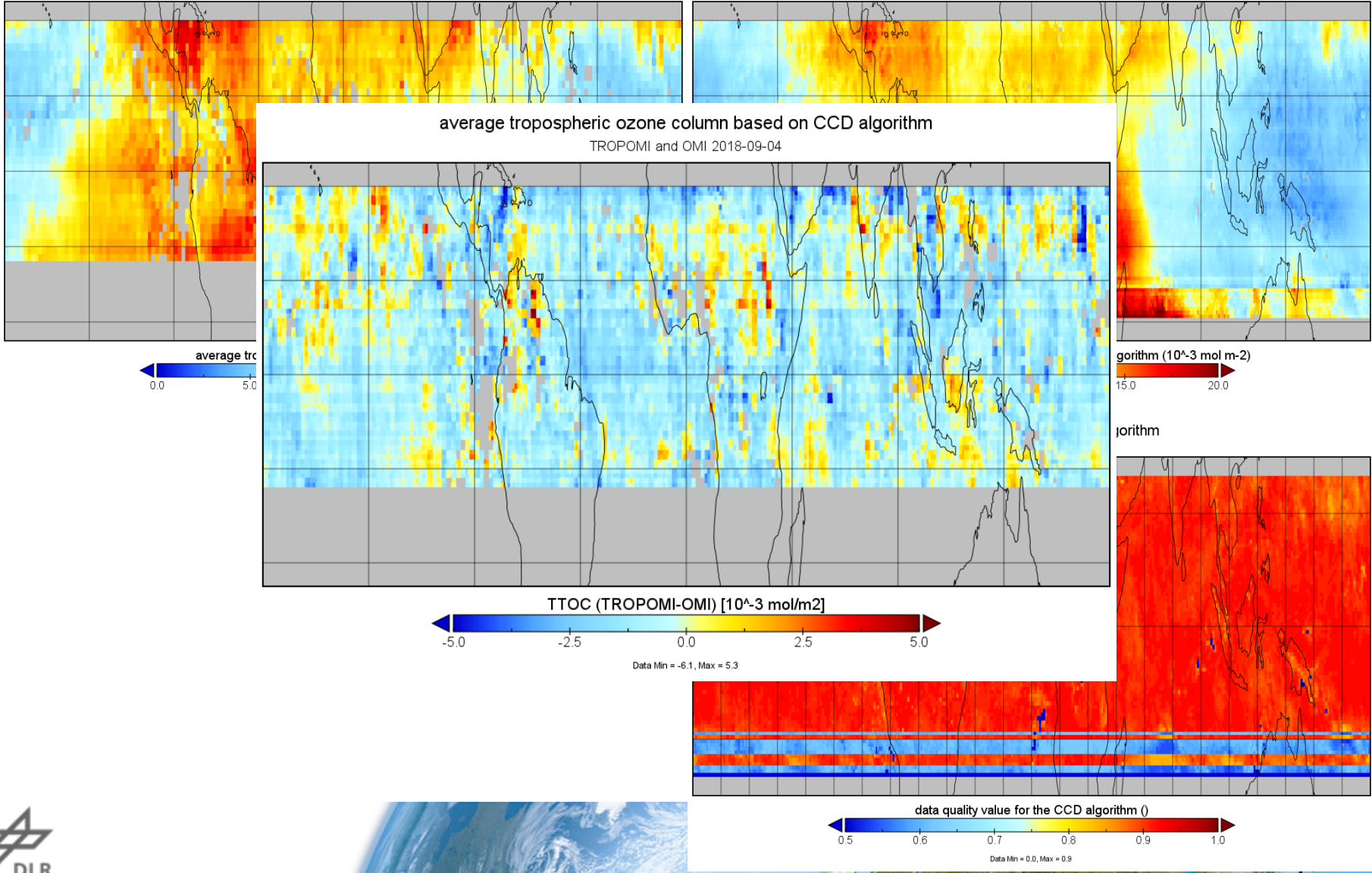


# Example comparison



average tropospheric ozone column based on CCD algorithm  
OMI\_2018-09-04

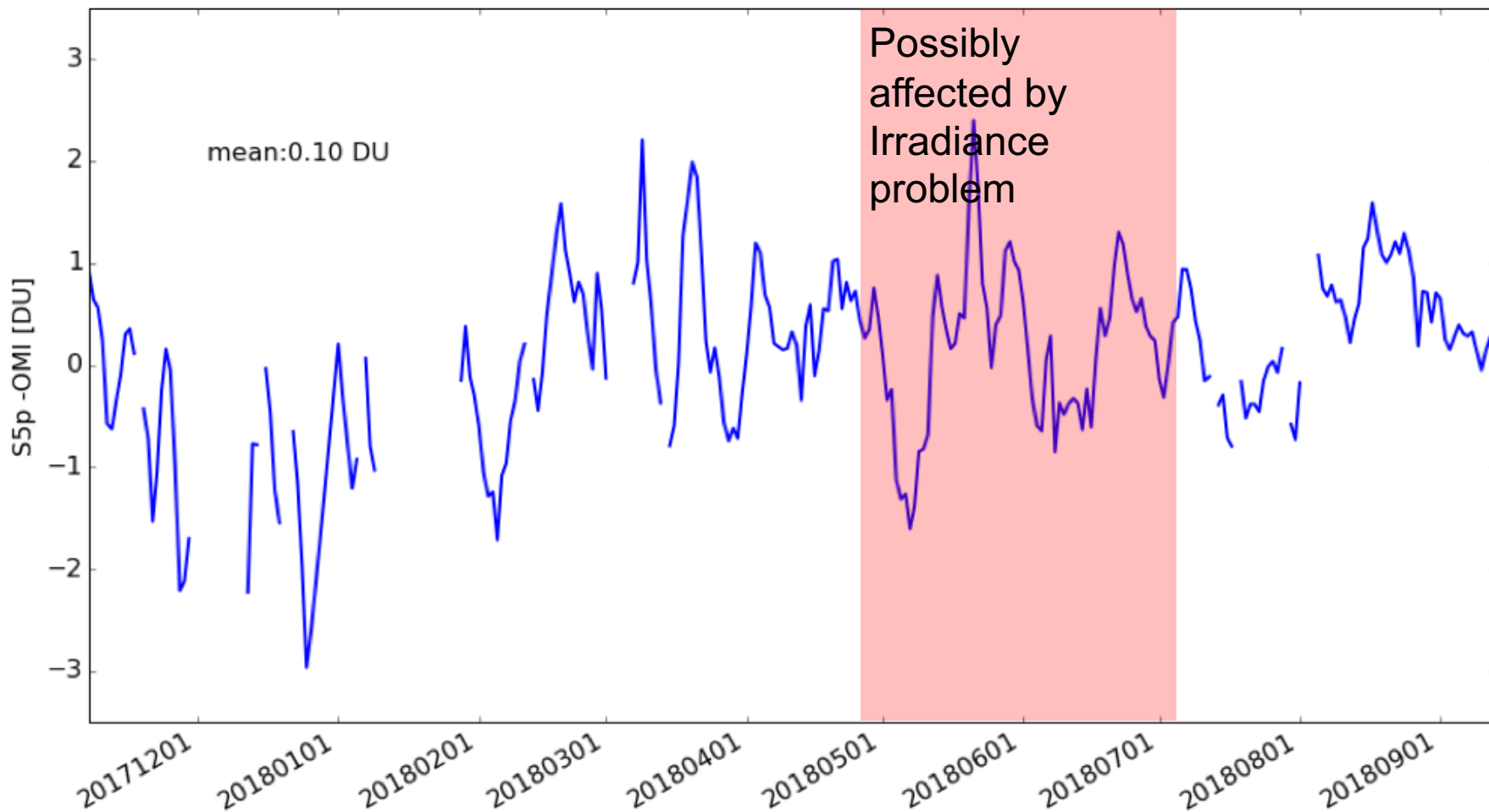
average tropospheric ozone column based on CCD algorithm  
TROPOMI\_2018-09-04



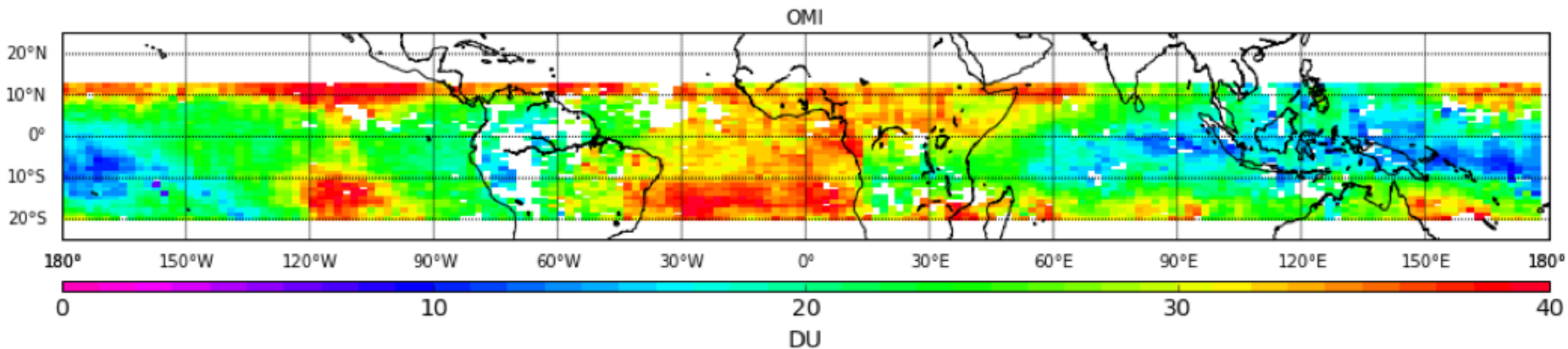
# Mean difference to OMI



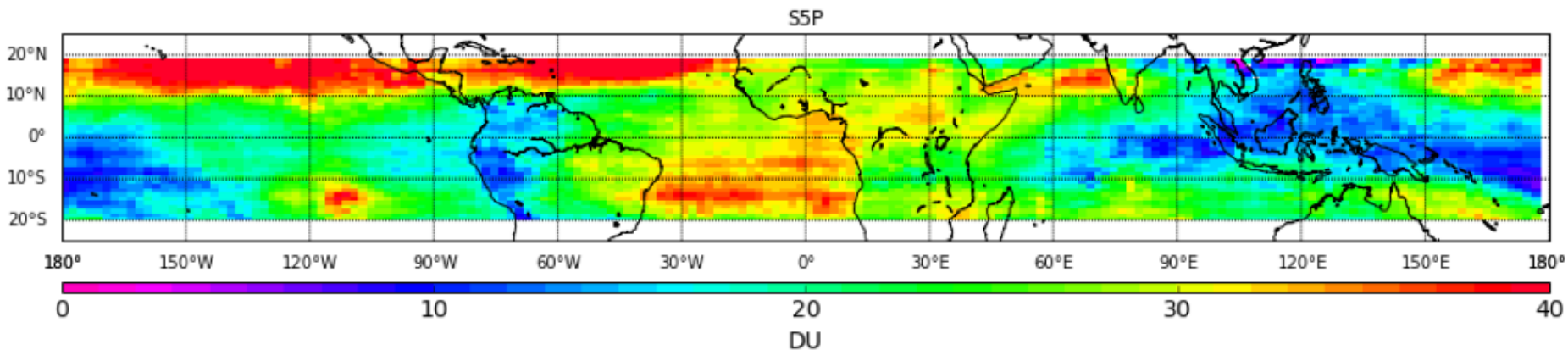
Tropospheric ozone



# Worst case maps 2017-12-25



Mean difference S5p-OMI:  $\sim -3 \pm 3$  DU



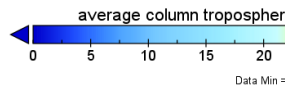
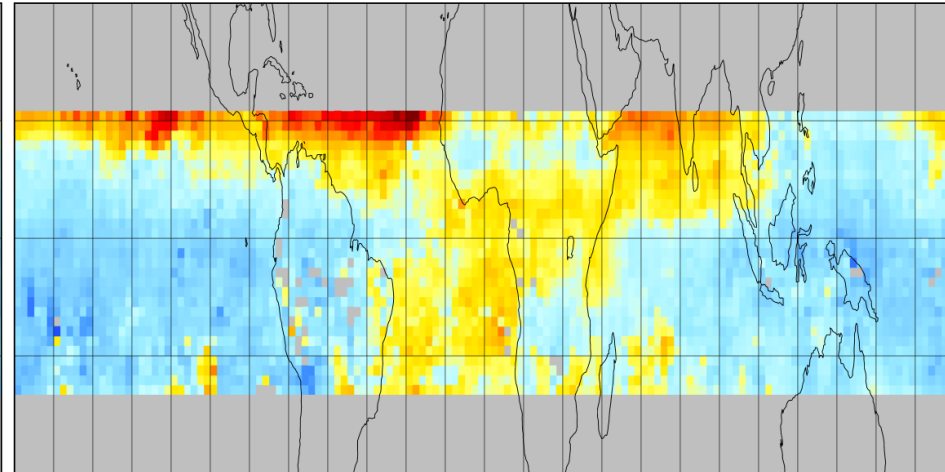
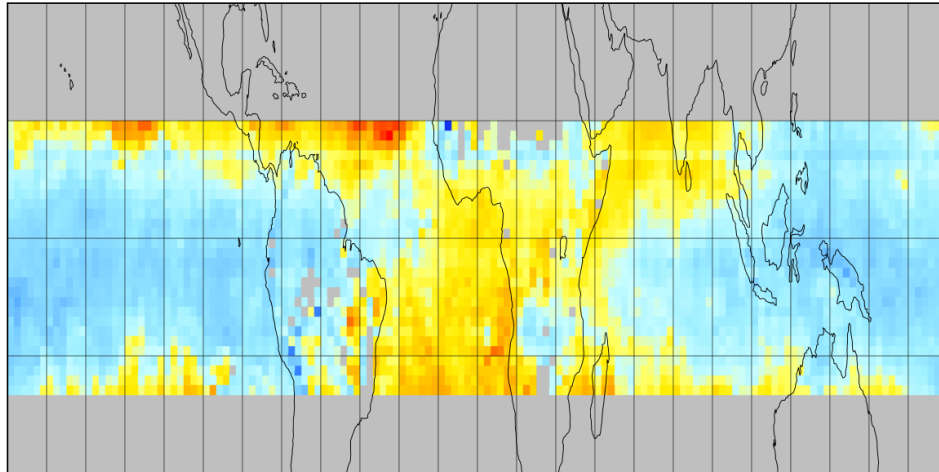


# Comparison TROPOMI NRTI to GOME-2A and B

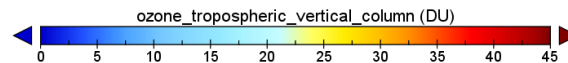
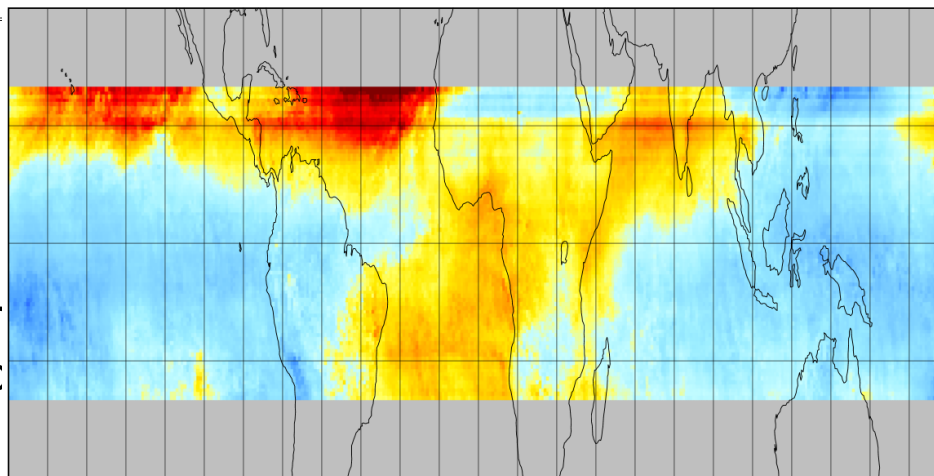
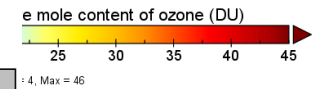


average column troposphere mole content of ozone  
GOME-2 / MetOp-A, Feb 2018

average column troposphere mole content of ozone  
GOME-2 / MetOp-B, Feb 2018



ozone\_tropospheric\_vertical\_column  
TROPOMI, S5P, February 2018, DLR



- Total column
- Different
- Different
- MetOp orbit r
- Reverence to

n except for

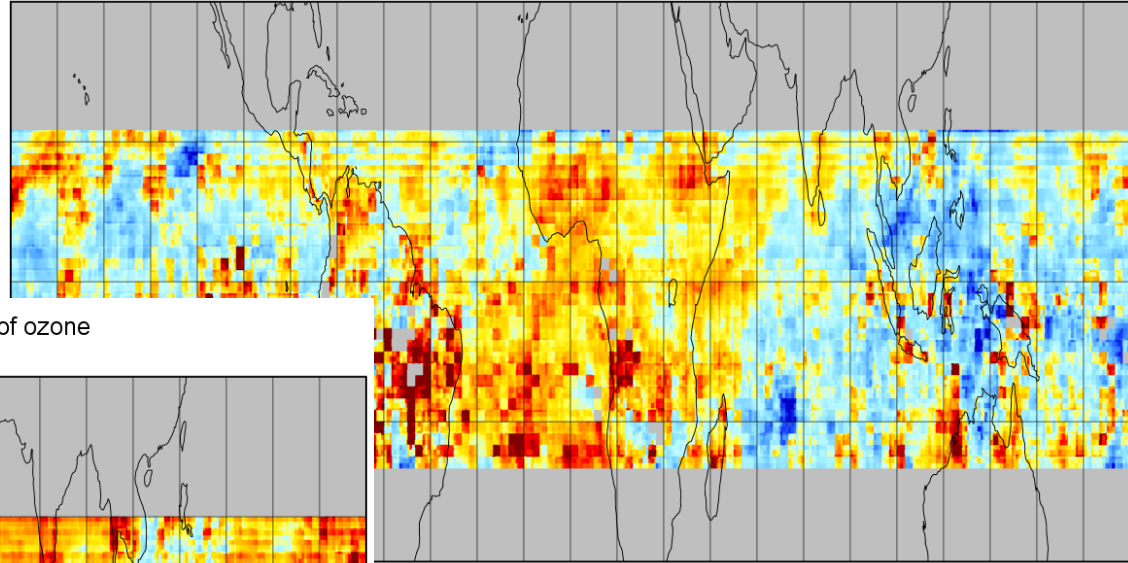
S5P.



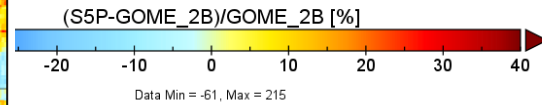
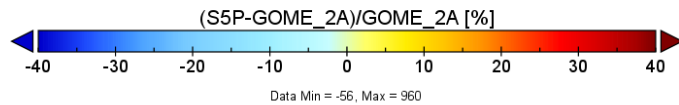
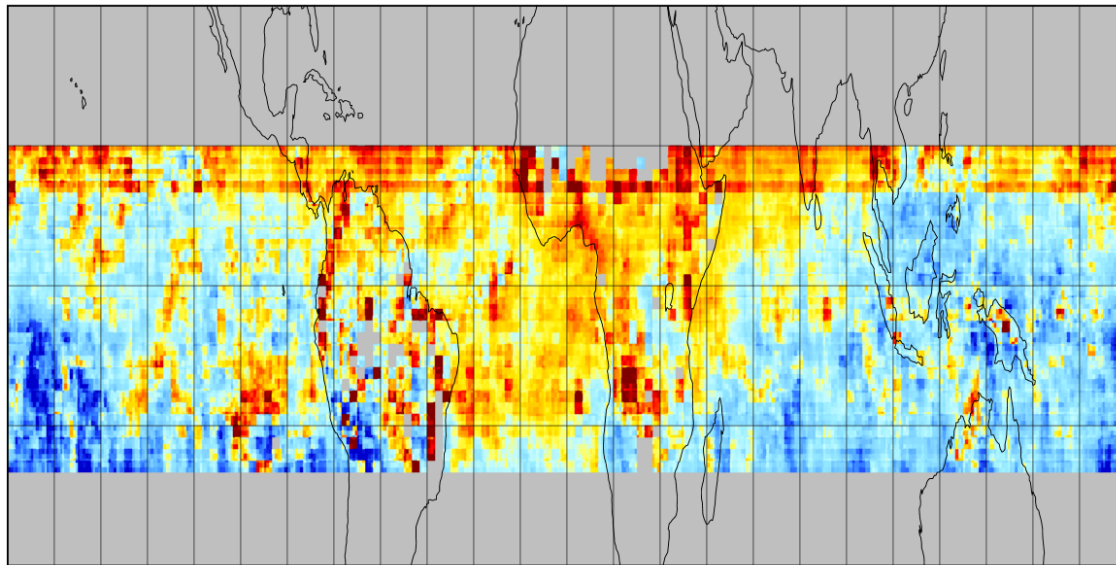
# Comparison NRTI

- Overestimation over Africa and Atlantic
- Underestimation over Pacific

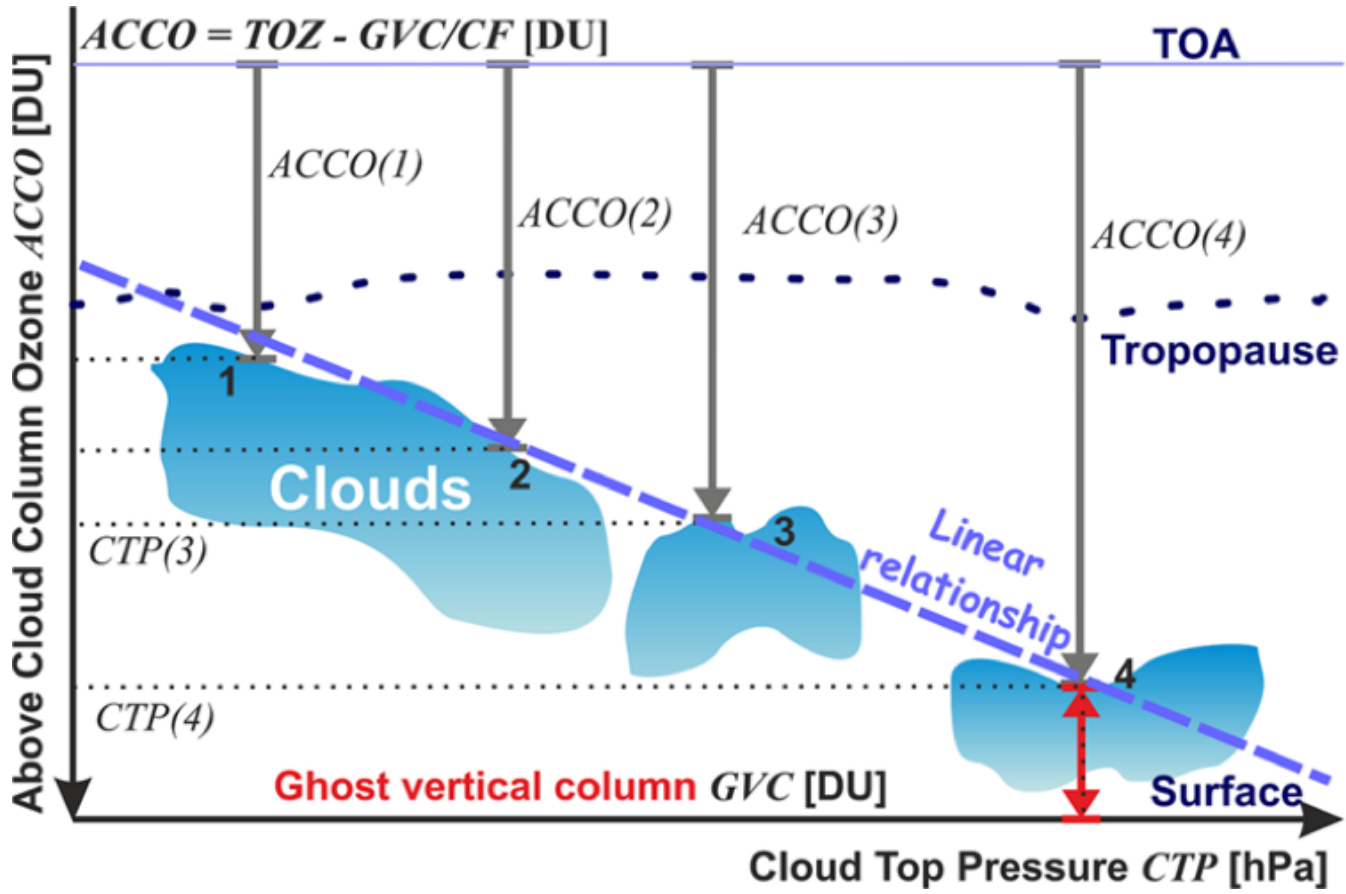
average column troposphere mole content of ozone  
TROPOMI vs GOME\_2B Feb 2018



average column troposphere mole content of ozone  
TROPOMI vs GOME\_2A Feb 2018



# Cloud Slicing Algorithm (CSA)

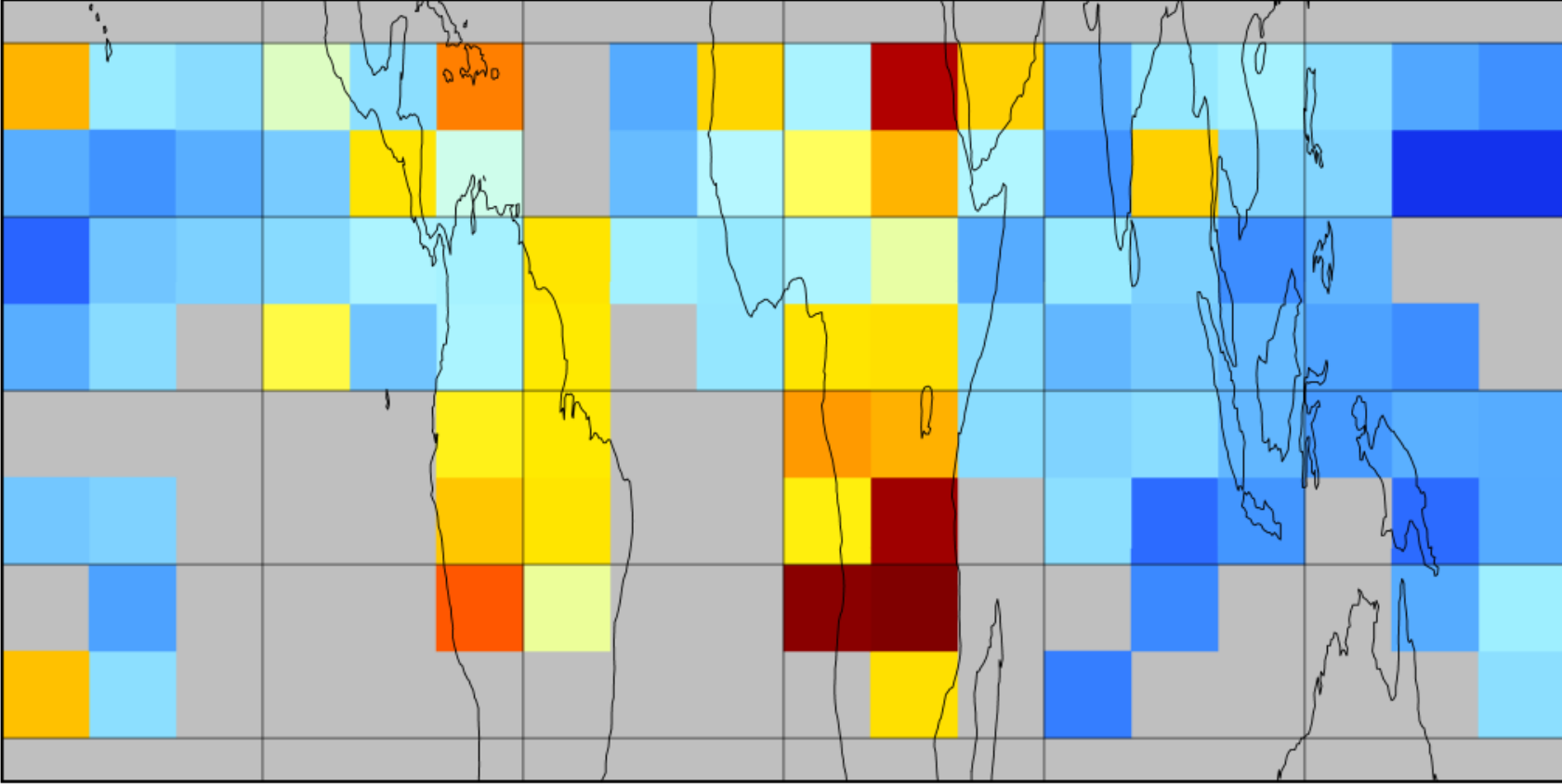


# Example result

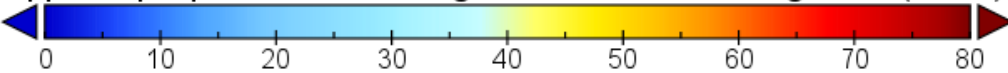


upper tropospheric ozone mixing ratio based on CSA algorithm

TROPOMI OFFL 2018-09-04 -09-10



upper tropospheric ozone mixing ratio based on CSA algorithm ( $10^{-9}$ )



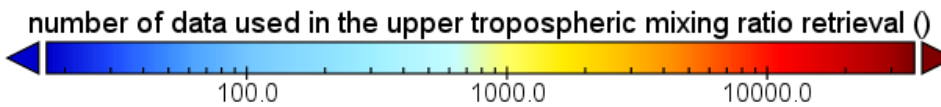
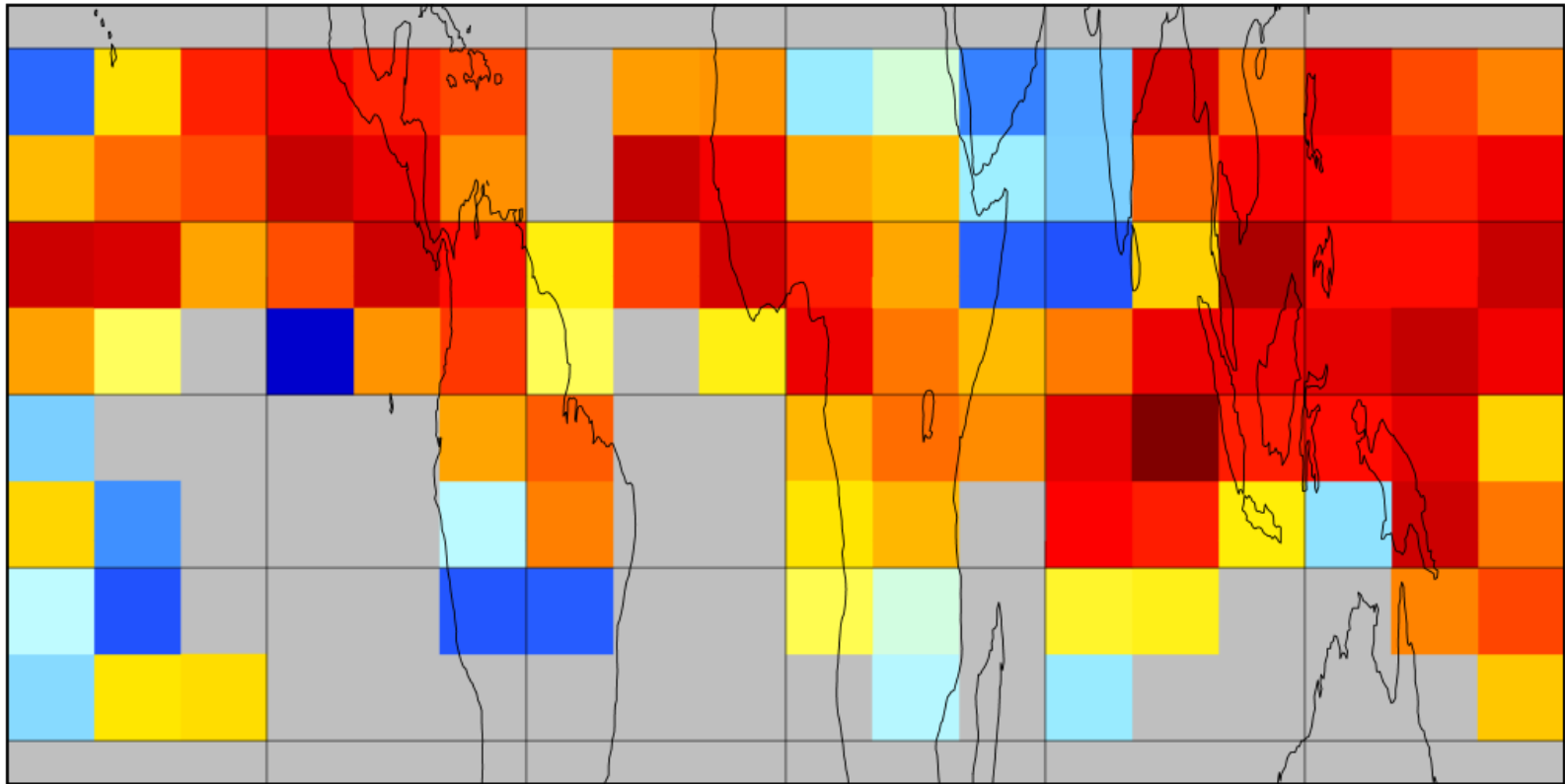
Data Min = 4, Max = 80



# Number of data in the correlation

number of data used in the upper tropospheric mixing ratio retrieval

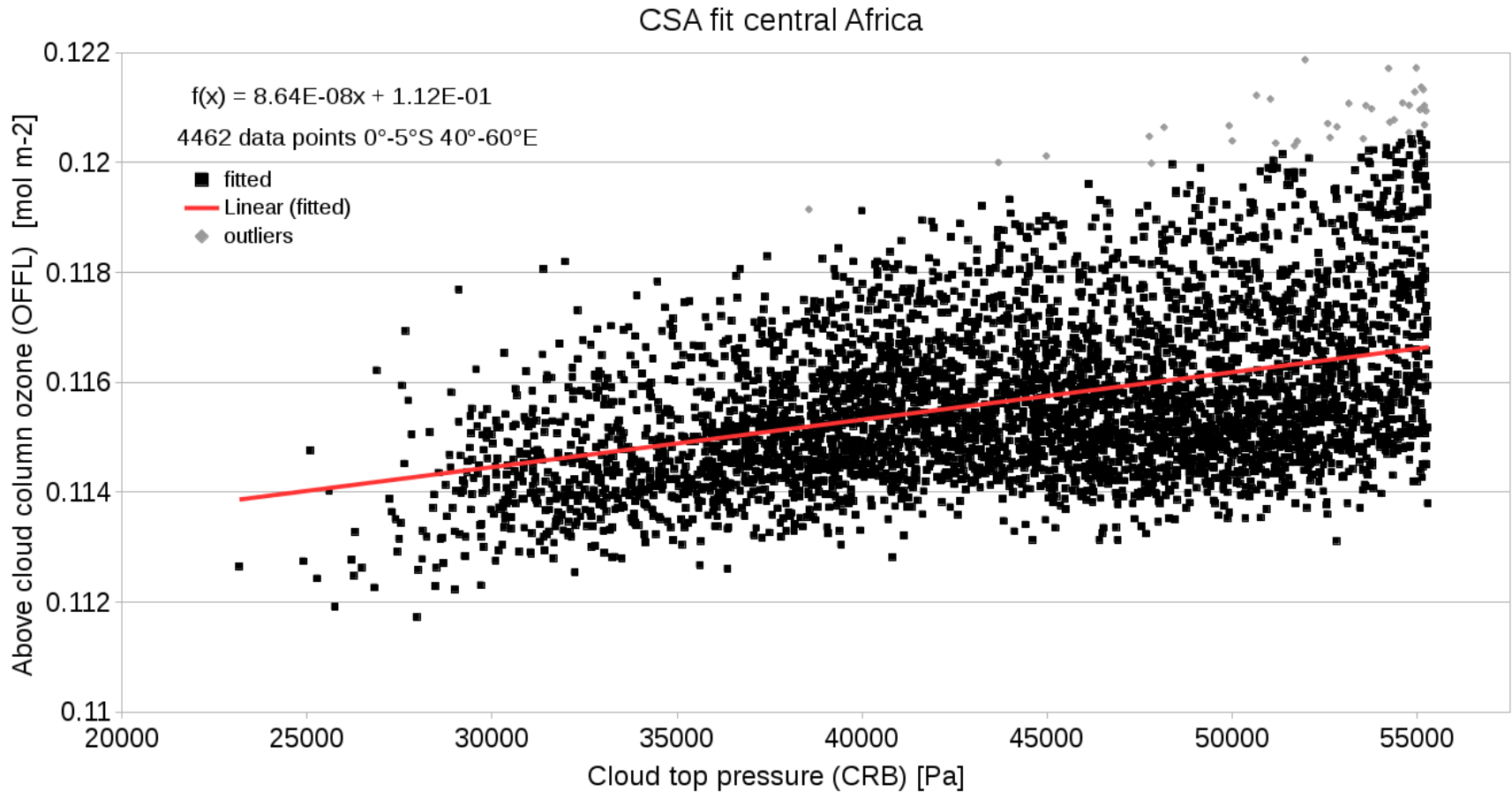
TROPOMI OFFL 2018-09-04 - 09-10



Data Min = 17.0, Max = 36759.0



# Example fit for cloud slicing



Slope =  $8.64 \text{ e-}8 \text{ mol}/(\text{m}^2 \cdot \text{pa}) \Rightarrow \text{VMR} = 24.5 \text{ ppb}$



# Conclusion

**Tropospheric ozone** retrieval is running fine

- Compared to OMI much higher spatial and temporal resolution is achieved for the tropospheric column (CCD)
- Very good agreement between TROPOMI OFFL tropospheric column and OMI tropospheric column
- 25% uncertainty (bias) requirement is met
  - compared to OMI CCI for most of the data
- Ozone upper tropospheric mixing ratios results in reasonable values for the OFFI data.
- Algorithm requires some optimisation
  - Increase resolution (temporal or regional)
- Larger deviations in NRTI data (not yet to be released)

