

# Tropospheric ozone (cloud slicing algorithm): Update on input data

Kai-Uwe Eichmann, Klaus-Peter Heue

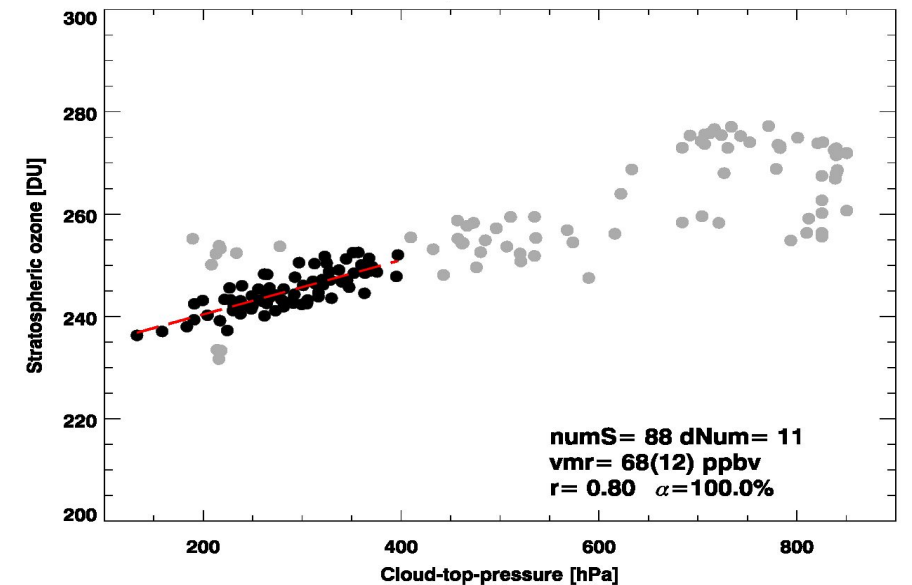
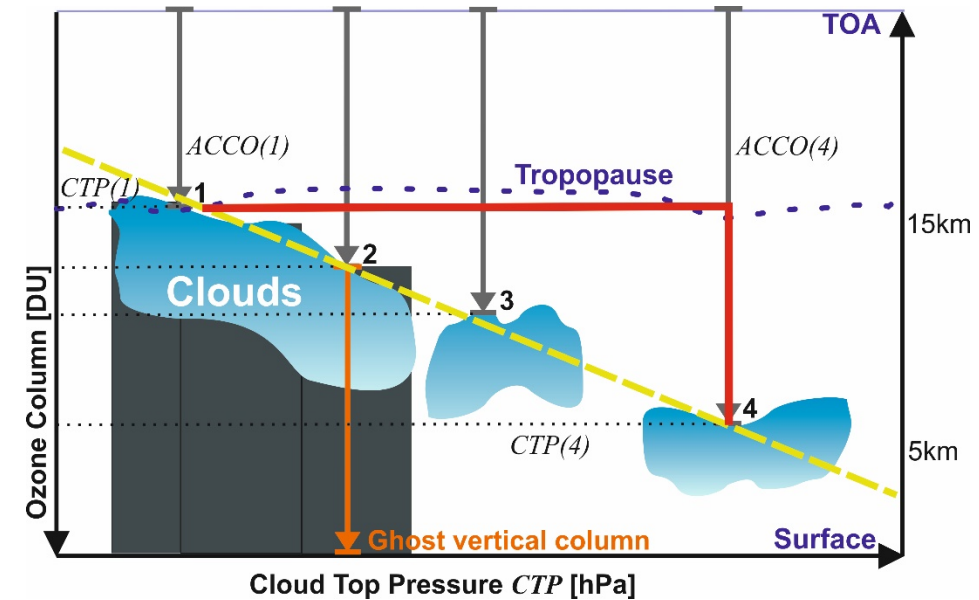


S5p Second Products Release Workshop  
September 28, 2018



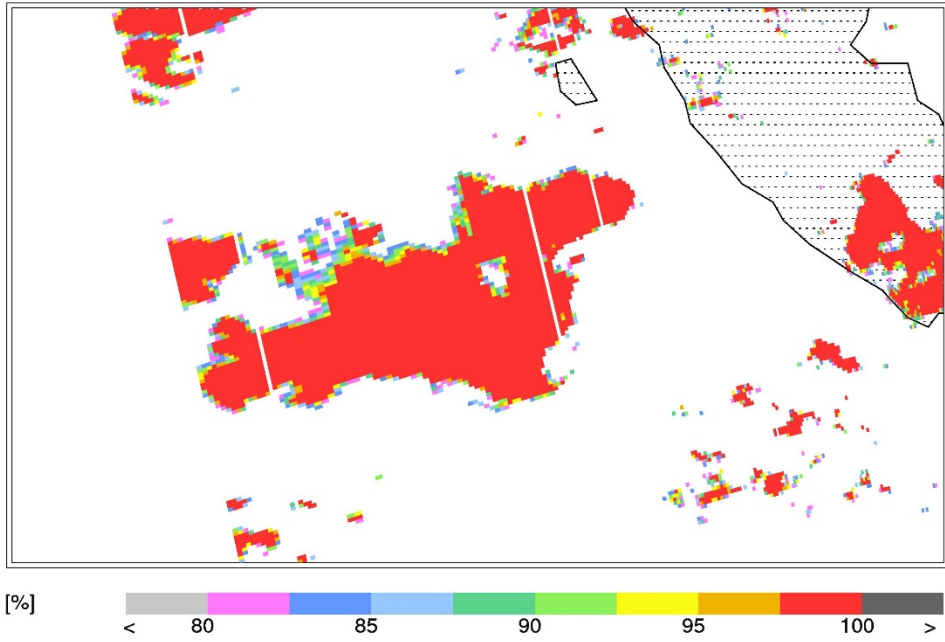
# Tropospheric Ozone: Cloud slicing algorithm

- S5P OFFL/NRTI version 1.00/1.01 ozone is tested for the IUP CSA and CCD algorithms.
- NRTI V1.00/1.01(2018-07-18): DOAS ozone + OCRA/ROCINN CAL clouds.
  - ACCO from averaging kernels and Apriori ozone profile
- OFFL V1.01: GODFIT ozone + OCRA/ROCINN CRB clouds
  - ACCO from total ozone and ghost column
- First check: Pacific, tropical area (Lat:  $-10^{\circ}$ - $0^{\circ}$  / Lon:  $90^{\circ}$ - $105^{\circ}$ ) on 2018-06-21 (orbit 3559). Filtering: QA > 50, CF > 0.8, CTH > 0km.

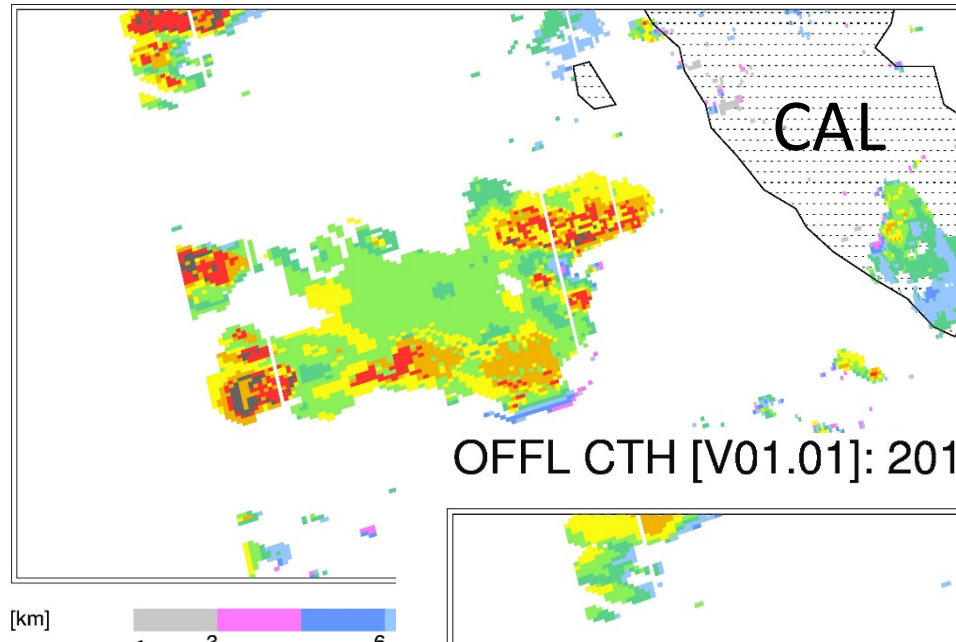


# Input: Cloud parameters (from ozone NRTI/OFFL dataset)

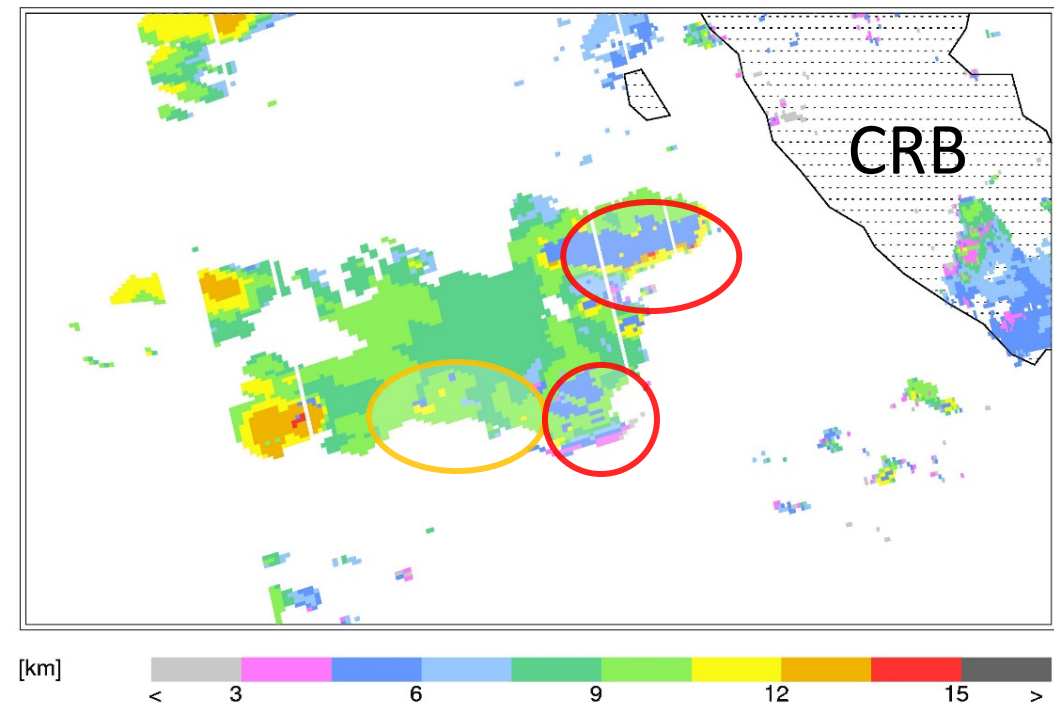
NRTI CF [V01.00]: 20180621 (03560-03560)



NRTI CTH [V01.00]: 20180621 (03558-03560)



OFFL CTH [V01.01]: 20180621 (03558-03560)



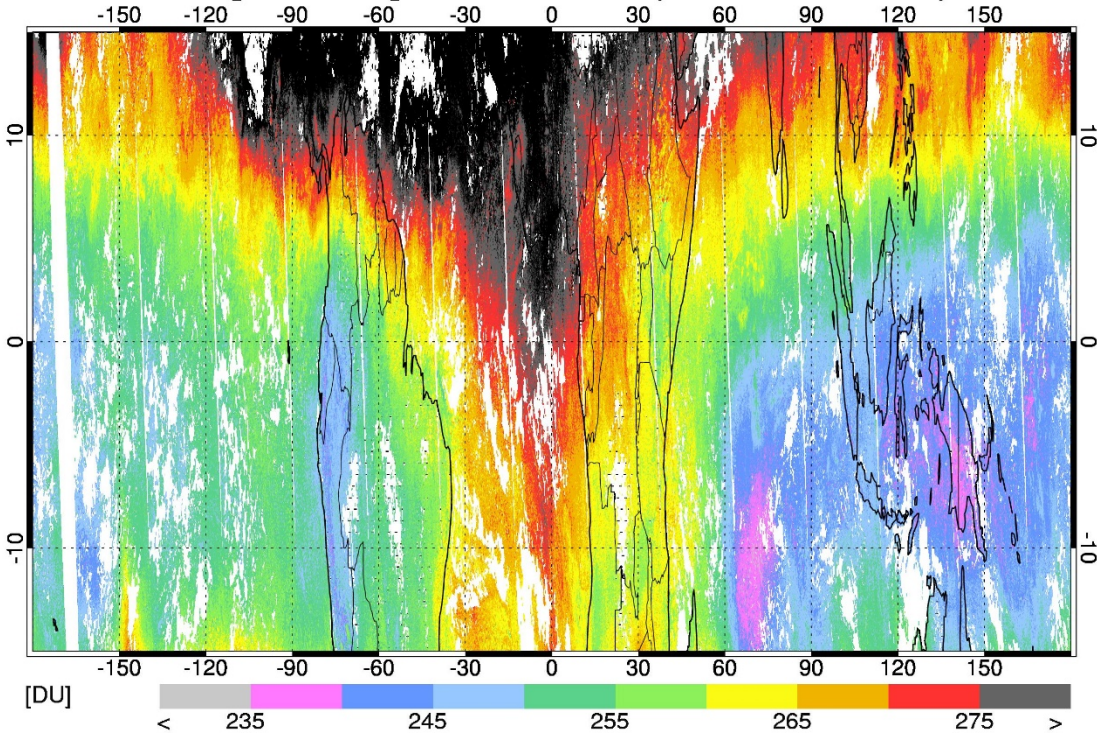
- CF are the same in NRTI/OFFL datasets.
- CTH differs due to different treatment of the cloud physics. CRB (OFFL) is generally lower.
- **CRB: Lower clouds than in surrounding areas can be filtered, but clouds of same height as surrounding not!**



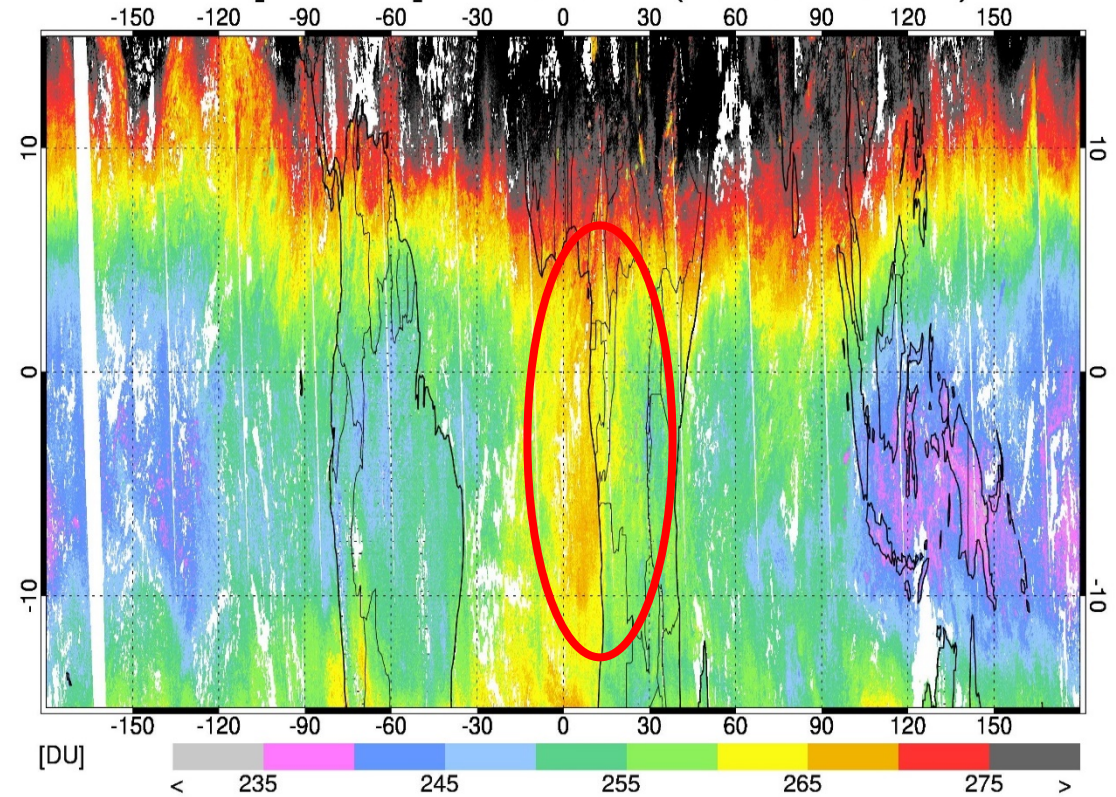
# Input data: Total ozone

- All data displayed:  $QF > 50$ ,  $CF = 0$ ,  $CTH = 0$ .
- Columns of V01.01 are as expected.

NRTI O3 [V01.01]: 20180722 (03997-04010) All



OFFL O3 [V01.01]: 20180621 (03556-03569) All

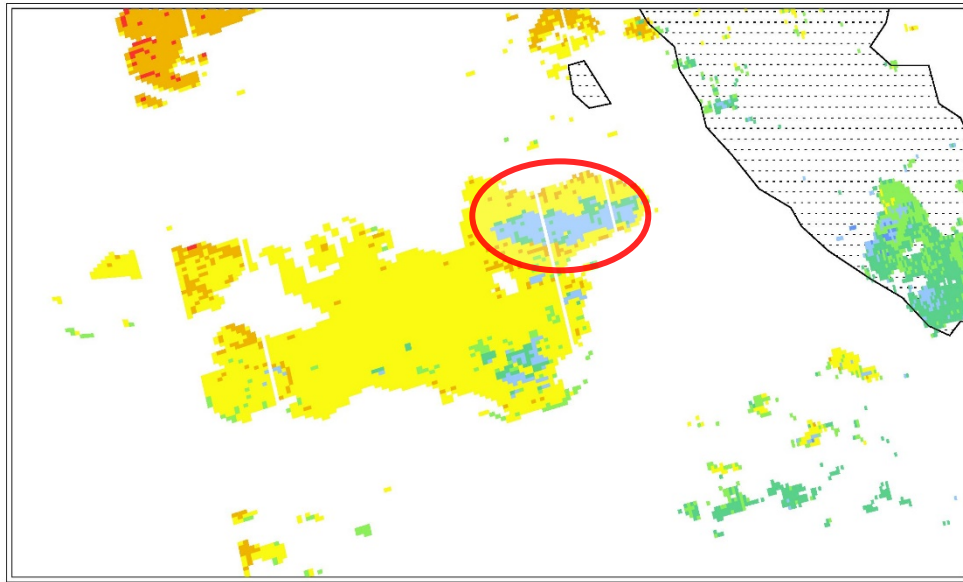


- OFFL: Strong land/sea contrast ( $\sim 10$ DU) over Africa is smaller (smoother) in NRTI data.

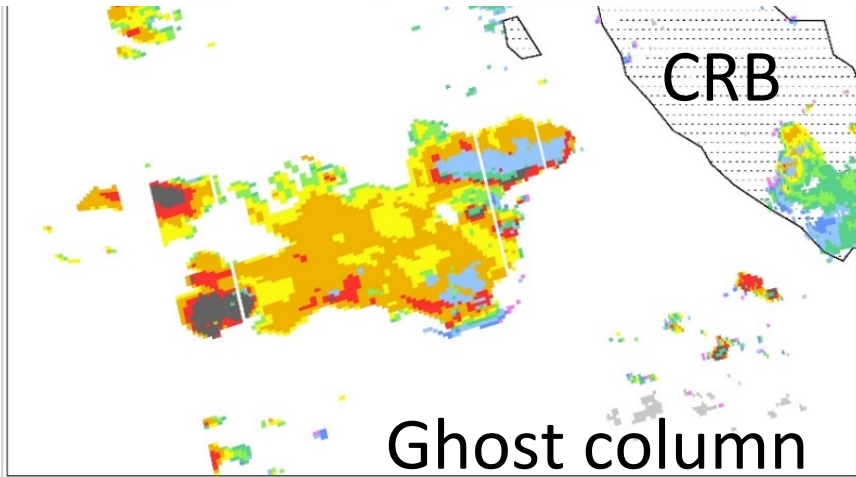


# Zoom in: Total ozone and ghost column

OFFL O3 [V01.01]: 20180621 (03558-03560)



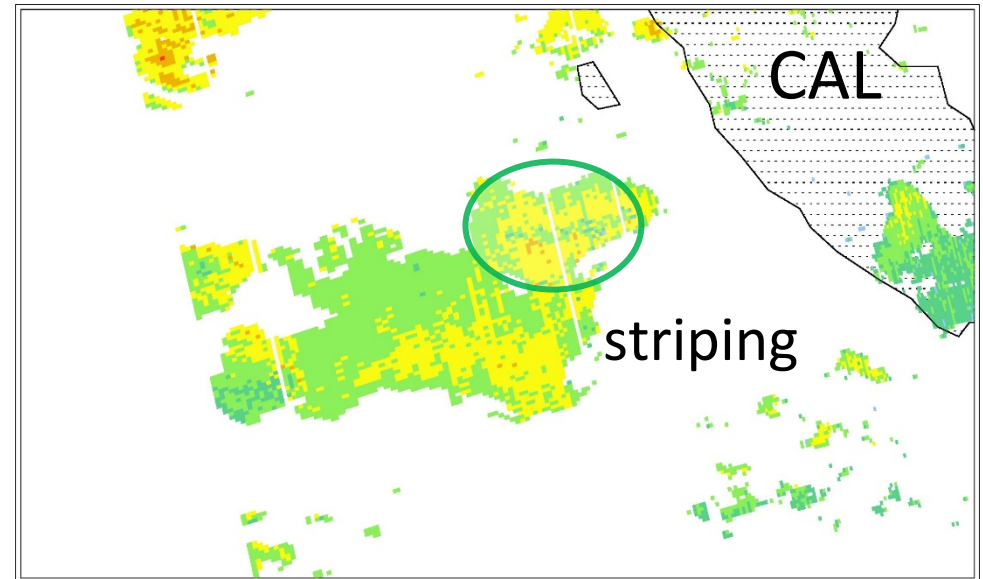
[DU] < 225 235 245 255 265 >



[DU] < 4 8 12 16 20 >

- Impact of OFFL CTH outliers are also detectable in ozone: regions of **low total ozone** over high cloud areas.
- QA value in both datasets nearly always 100 -> No filtering of data possible.

NRTI O3 [V01.00]: 20180621 (03558-03560)

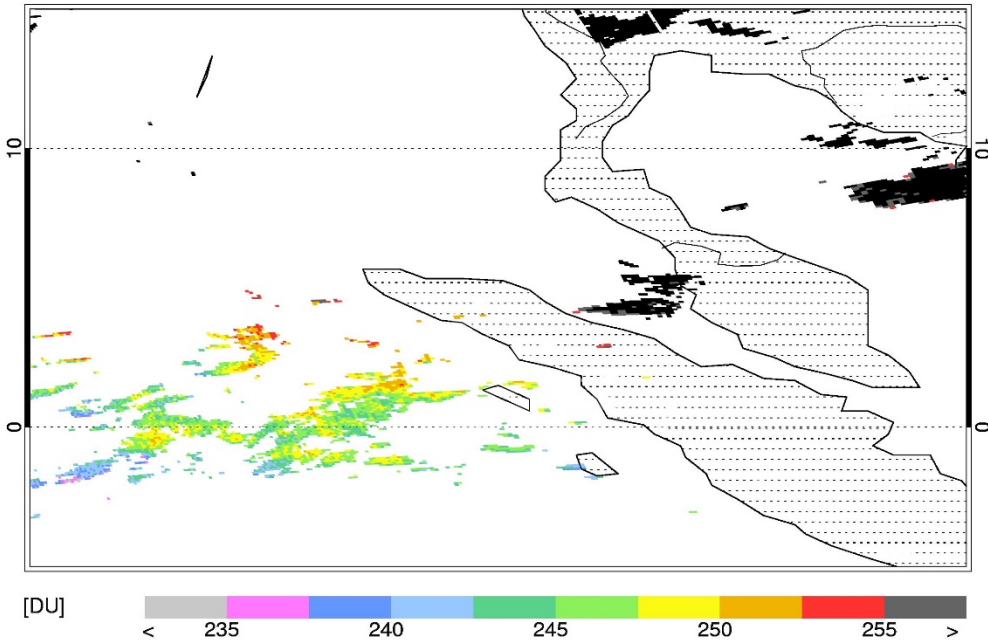


[DU] < 225 235 245 255 265 >

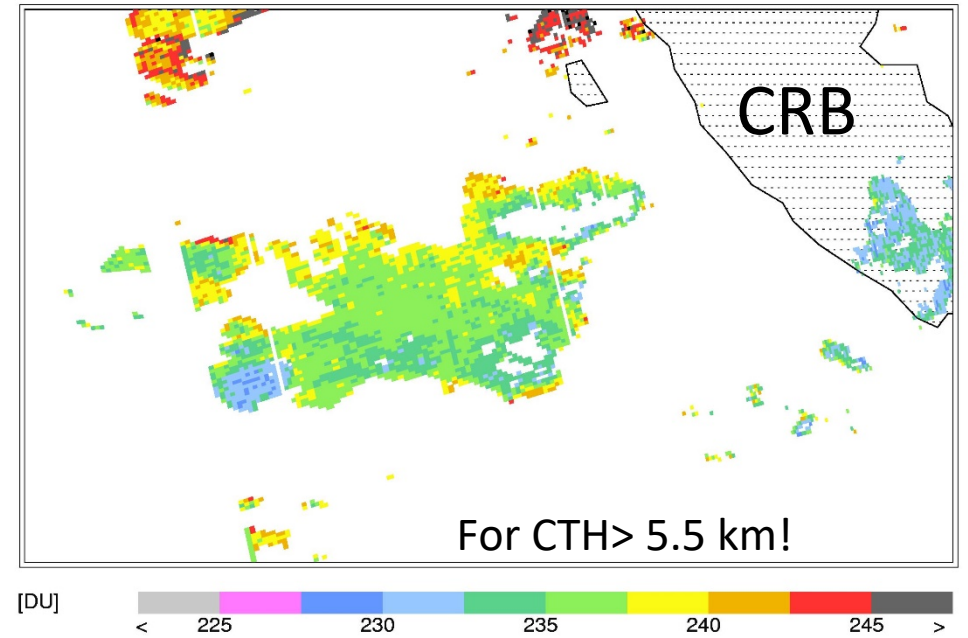
# Above cloud column ozone

- OFFL: low CTH are visible in ghost columns. Avoid retrievals with CTH <5km. But problems with some CTH above 5km may still be possible.
- NRTI: ACCO can be correctly calculated for V01.01 data.

NRTI ACCO [V01.01]: 20180720 (03970-03972)



OFFL ACCO [V01.01]: 20180621 (03558-03560)



## Tropical averages of ozone

- V01.00, 2018-07-16: TOZ=263DU, **ACCO=141.7DU**
- V01.01, 2018-07-22: TOZ=261DU, ACCO=254.1DU

# Results

- **NRTI version 1.00 ozone**: averaging kernels are not correct -> Computation of ACCO with AK is not possible (-2018-07-18).
- **OFFL cloud top heights** can be totally different in comparison to NRTI.
  - The CTH are below 5 km sometimes where NRTI >12km. These are easy to avoid (CSA requirement: CTH > 5 km).
  - But in other cases, CTH are just the same as the surrounding area. This will reduce the quality of CSA results.
- The problem is not that big in CCD, as in the reference sector only highest detected clouds are taken into account. This problem is known and will be fixed in next processor version.
- **OFFL total ozone** is also reduced for the extreme case. The difference can be <-10 DU with respect to the surrounding area.

# Summary and Outlook

- OFFL: Quality flag not applicable to exclude the cloud height problem areas.
- Problem needs to be addressed in respective documents (Cloud, Total ozone) for version 1.xx
- Impact on tropospheric ozone (CSA, CCD) needs to be further analysed.
- ACCO can be calculated for OFFL and NRTI (V01.01) ozone and will be compared.
- Optimization of CSA grid box size ( $5^{\circ} \times 20^{\circ}$ ) and time span (5d) needs to be done.