



2nd Product Release Webex Meeting





Validation results of TROPOMI/S5p L2_O₃ OFFLINE

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Validated Product

Level 2 Total Columns of Ozone (OFFL):

 7/11/2017 - 1/8/2018
 RPRO_L2_O3_____v010102

 2/ 8/2018 - 10/9/2018
 OFFL_L2_O3_____v010102

Using OMI/Aura & OMPS/Suomi NPP data for the same time period, processed with GODFIT_v4, (acknowledgements to C. Lerot)

Compared to **Dobson and Brewer** ground-based measurements from
 (a) WOUDC (QA) & (b) nrt data submitted to and processed by the WMO mapping centre

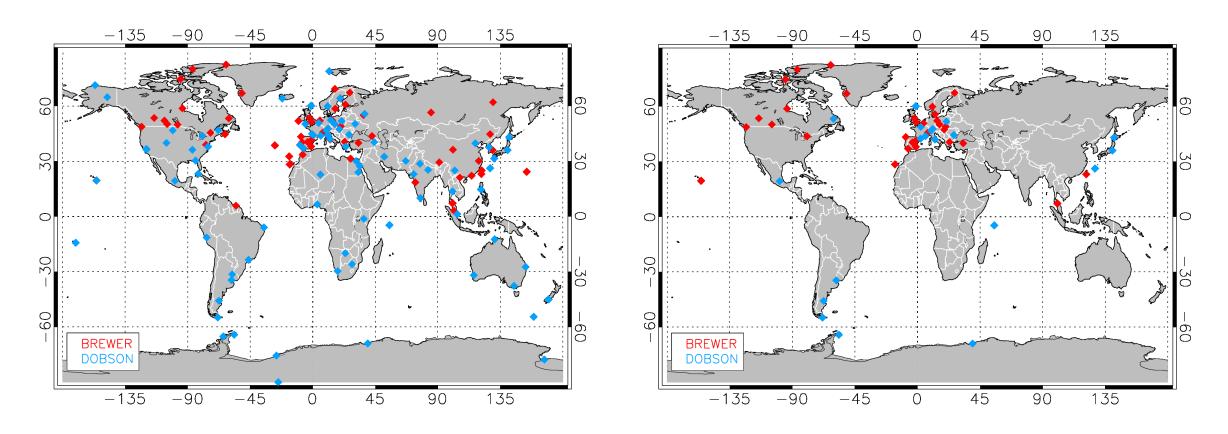
Four data series were investigated:

(a) keeping all collocations within 50 km (QA and nrt GB meas.) and

(b) keeping only the closest collocation within 50 km (-//-)

 \Rightarrow <u>No significant differences were seen</u>, so the case (a) timeseries, compared to WOUDC data will be presented, mainly due to the higher number of collocations.

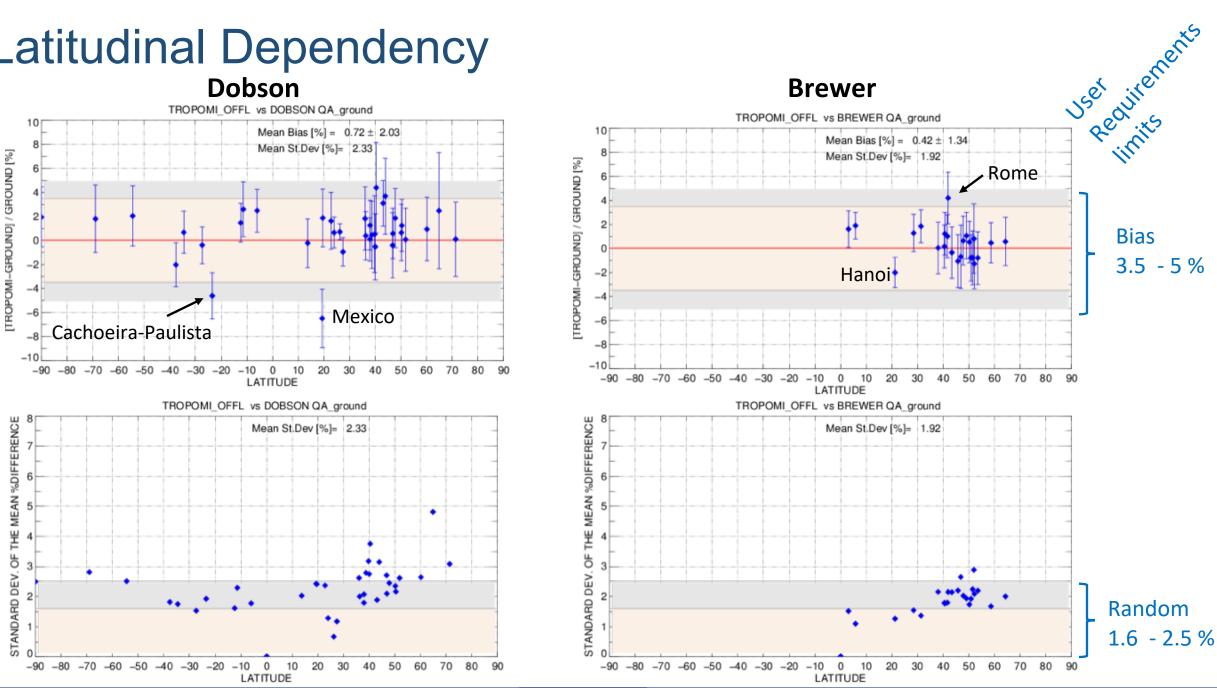
Geographical spread of QA and NRTI ground-based stations



93 Brewer | 85 Dobson Reporting to WOUDC https://woudc.org/

38 Brewer | 20 Dobson Reporting to the WMO Mapping Centre http://lap.physics.auth.gr/ozonemaps2/

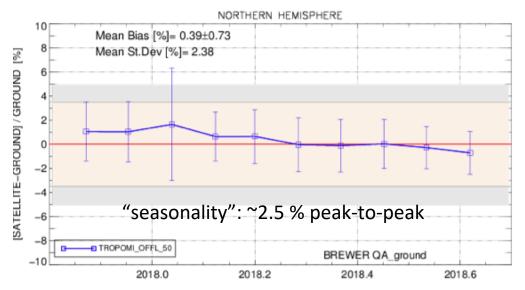
Latitudinal Dependency



Time series of the differences

Dobson NORTHERN HEMISPHERE 10 Mean Bias [%]= 0.88±1.57 Mean St.Dev [%]= 3.10 [%] GROUND] / GROUND 2 -2 SATELLITE--4"seasonality" : ~ 5% peak-to-peak TROPOMI_OFFL_50 DOBSON QA_ground -10 2018.0 2018.2 2018.4 2018.6 SOUTHERN HEMISPHERE 10 Mean Bias [%]= 0.98±0.86 Mean St.Dev [%]= 2.63 % GROUND 2 GROUND] / -2 SATELLITE-TROPOMI OFFL 50 DOBSON QA_ground -102018.0 2018.2 2018.4 2018.6

Brewer



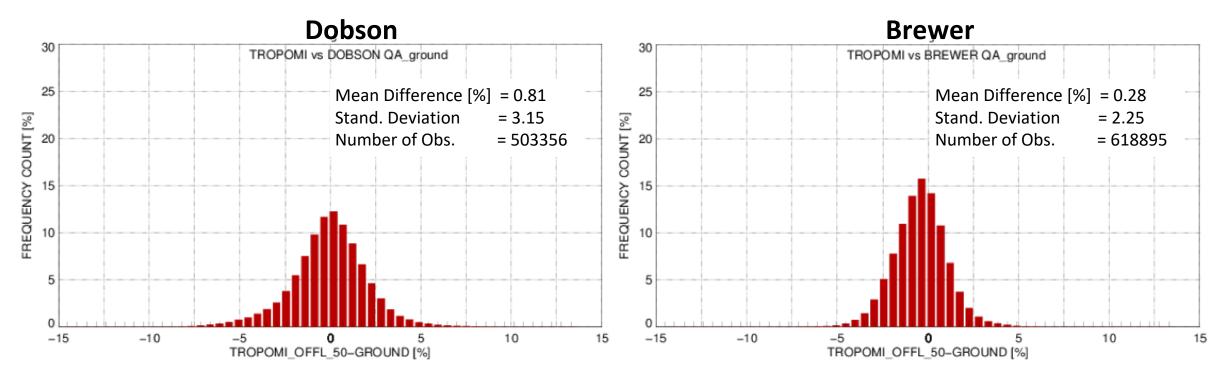
Beware: The mean bias estimation is dominated by the incomplete seasonality!

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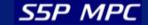


Some overall statistics

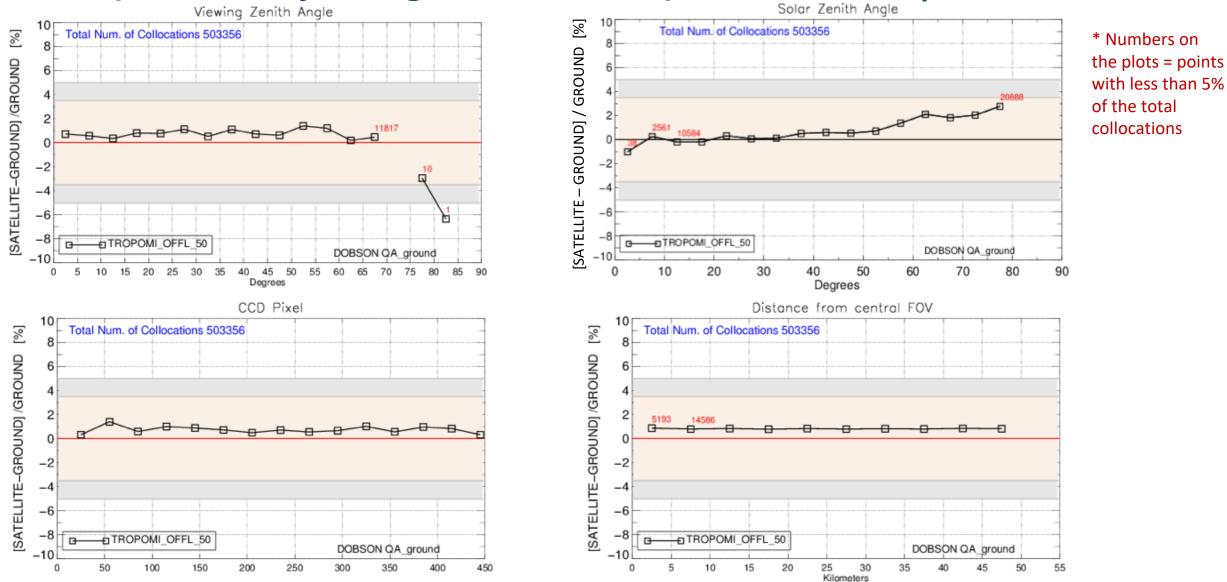


> Mean Bias: within requirements

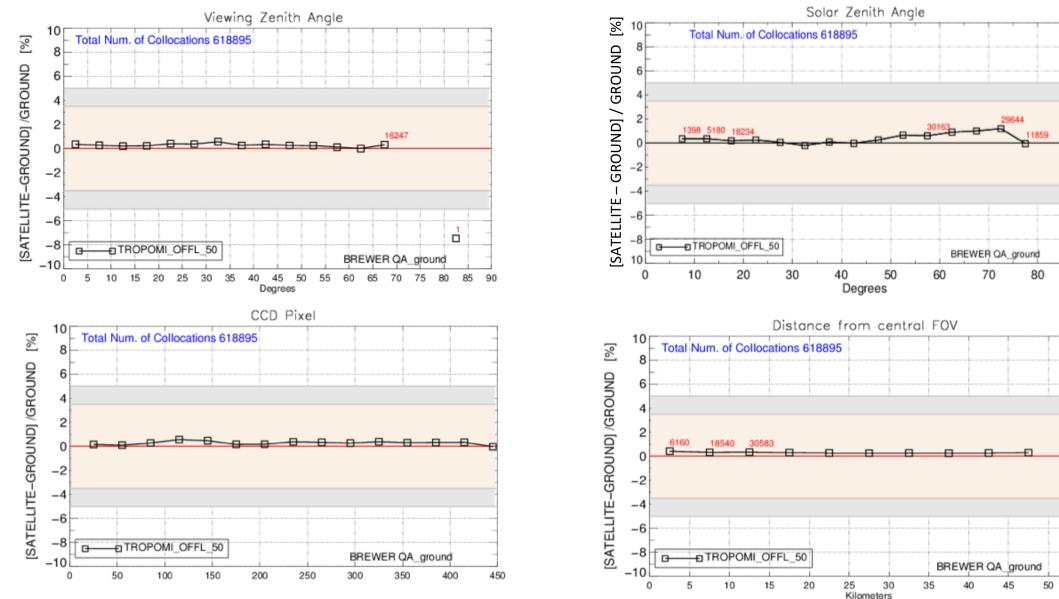
> Standard Deviation: mostly within requirements



Dependency on geometrical parameters | Dobson



Dependency on geometrical parameters | Brewer



SSP MPC

90

55

Dependency on input data parameters | Dobson

Cloud Fraction

0.4

0.5

0.6

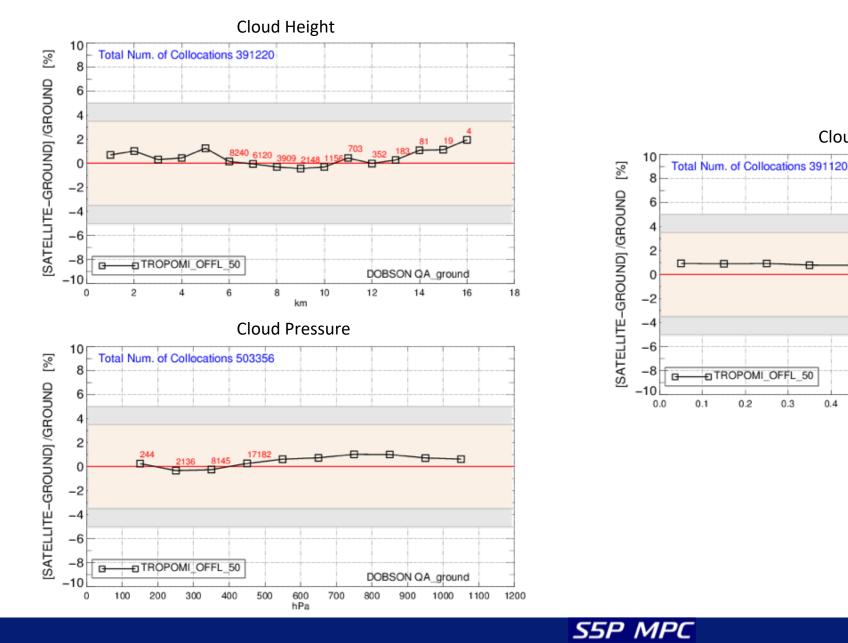
DOBSON QA ground

0.8

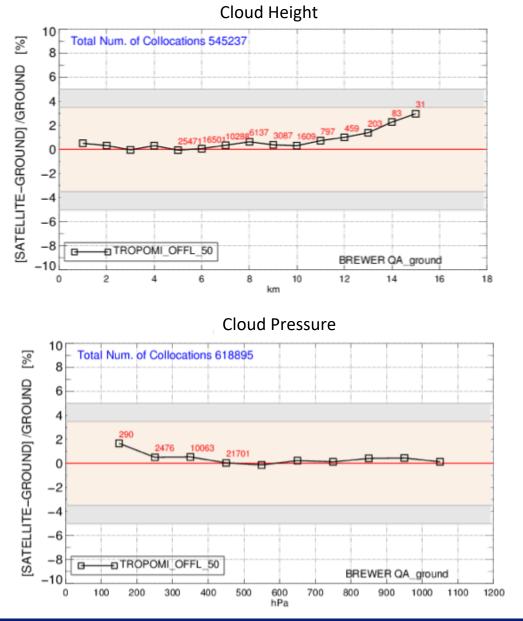
0.9

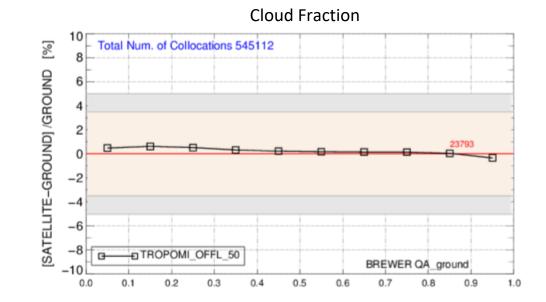
0.7

1.0



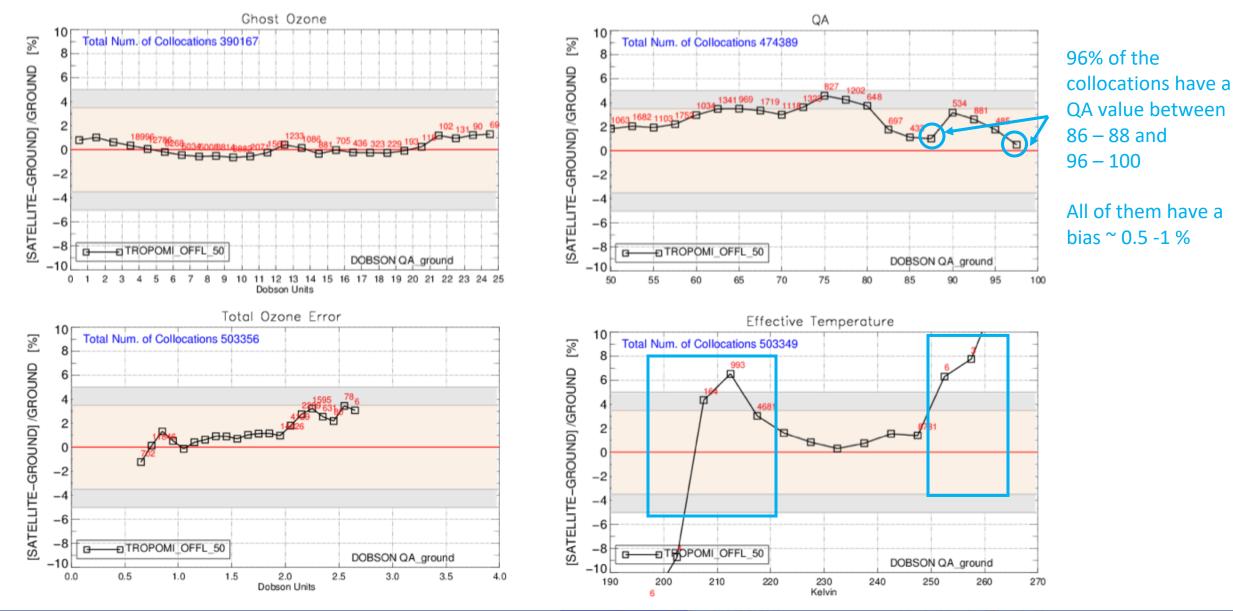
Dependency on input data parameters | Brewer



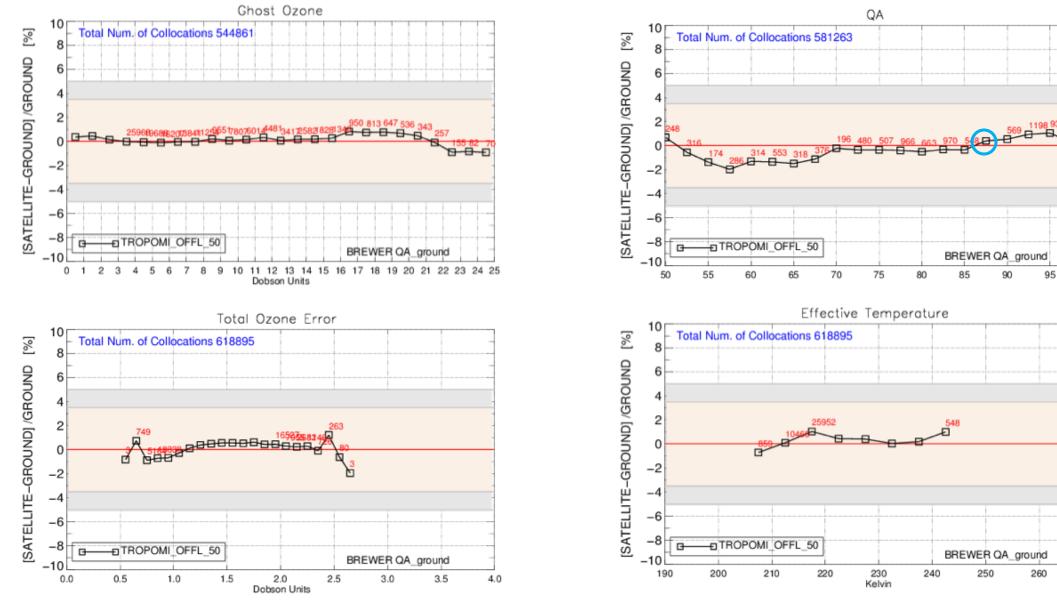




Dependency on product parameters | Dobson



Dependency on product parameters | Brewer



SSP MPC

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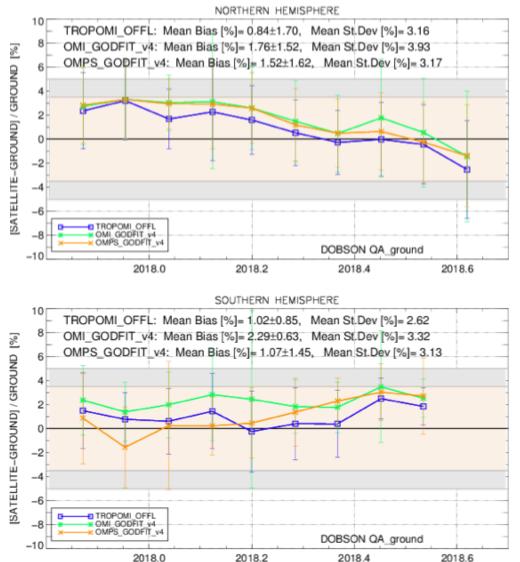
100

270

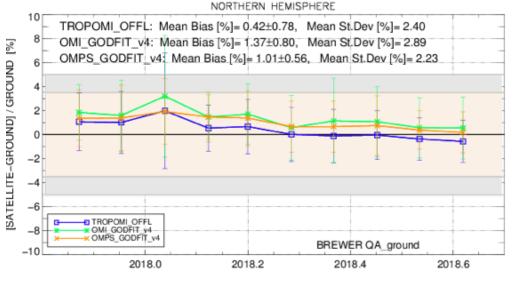
Comparison to OMI & OMPS (GODFIT_v4) | Timeseries

SSP MPC

Dobson



Brewer



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TROPOMI compared to OMI_GODFIT_v4:

- Underestimation ~ 1 % (NH) 1.3 % (SH)
- The same or slightly lower mean standard deviation

TROPOMI compared to OMPS_GODFIT_v4:

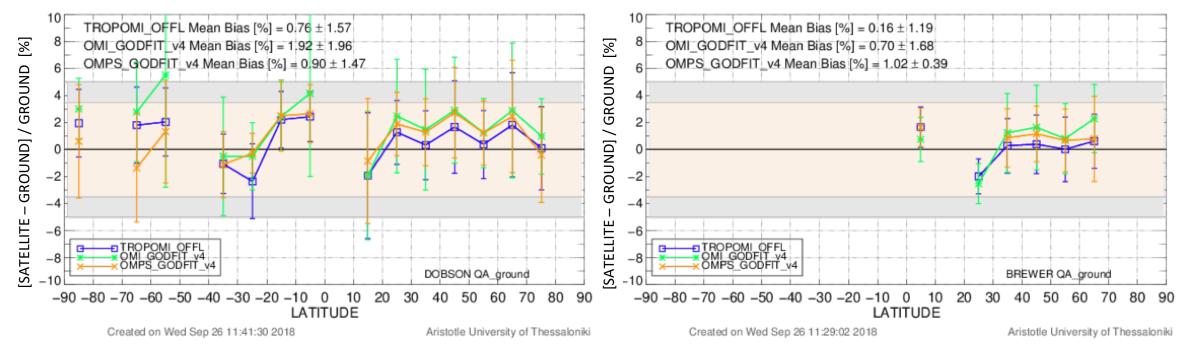
- Underestimation ~ 0.1 % (SH) 0.7 % (NH)
- The same or slightly lower mean standard deviation

Many thanks to Christophe Lerot for the OMI and OMPS data!

Comparison to OMI & OMPS (GODFIT_v4) vs Latitude

Dobson

Brewer

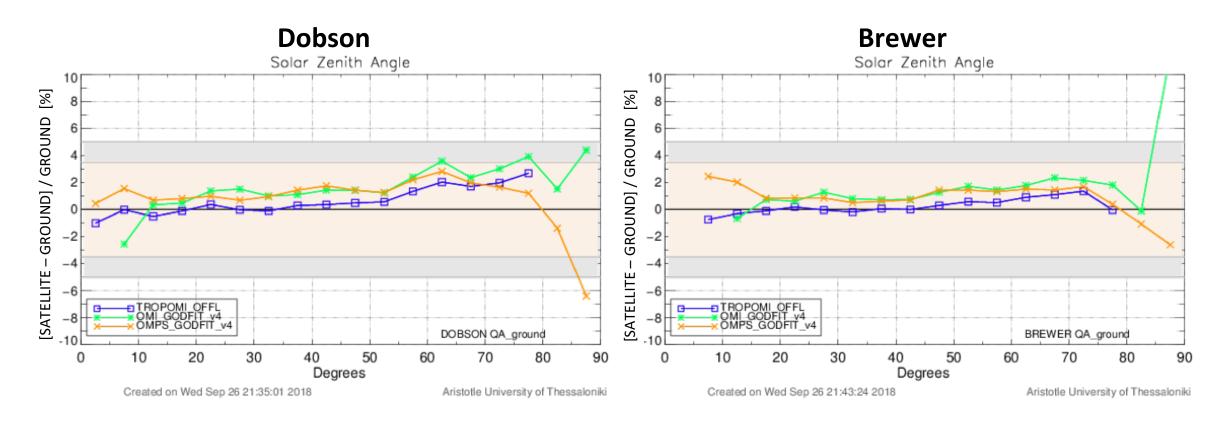


The latitudinal consistency with OMI and OMPS is good and rather stable, especially for the NH

SSP MPC

Many thanks to Christophe Lerot for the OMI and OMPS data!

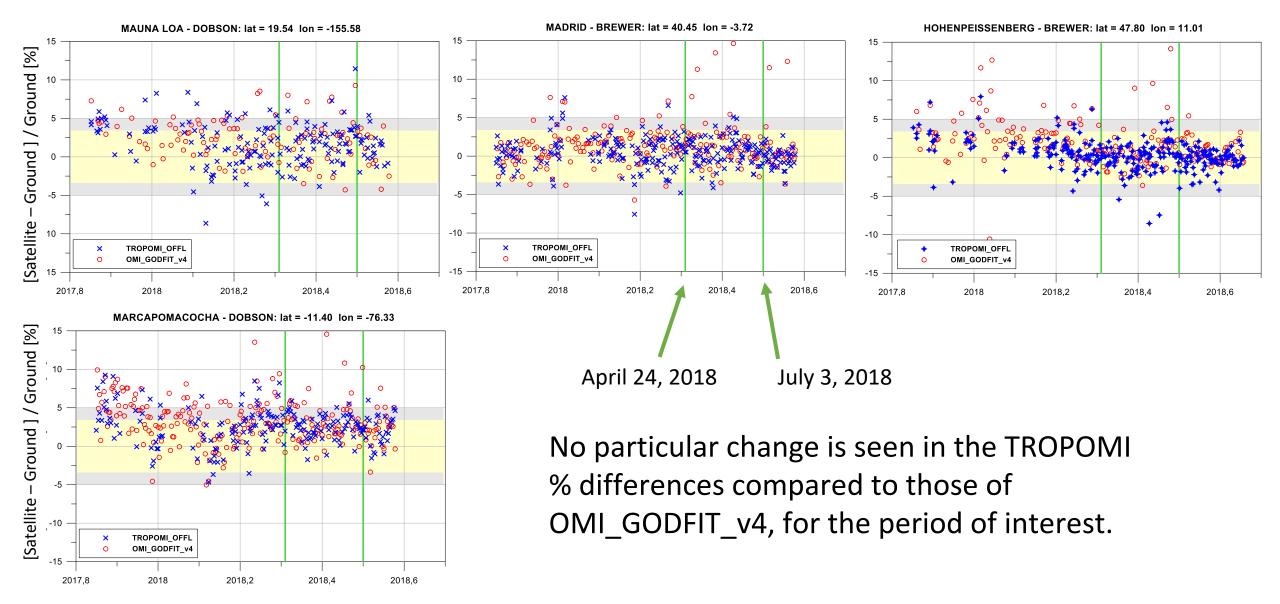
Comparison to OMI & OMPS (GODFIT_v4) vs SZA



- The Dobson dependency is enhanced, as expected, due to the effective temperature effect
- The 3 instruments follow the same pattern for moderate SZAs, with ~1% difference between them

Many thanks to Christophe Lerot for the OMI and OMPS data!

The effect of the irradiance problem





Conclusions

OFFLINE L2 TOC

- No significant dependencies on geometrical, input or product parameters are detectable (except for Dobson comparisons at high and low Teff values)
- The TROPOMI mean bias and mean standard deviation was found to be within specifications:

	Dobson	Brewer	User requirements
Mean bias (%)	0.8-0.9	0.3 – 0.4	3.5 – 5 %
Mean St. dev.	2.3 - 3.1	1.9 – 2.3	1.6 – 2.5 %

- The missing months (Sept.18 Nov.18) in the time series will affect the seasonality and the mean bias estimates!
- Compared to OMI and OPMS processed with GODFIT_v4, TROPOMI shows an underestimation of the order of 1 %.
- [Previous teleconf] Compared to OMI/Aura DOAS and TOMS, TROPOMI shows an overestimation of the order of 1 – 1.5 %.
- TROPOMI/S5p L2_O₃ OFFLINE
 Ready for release