Atmos. Meas. Tech. Discuss., 7, C2264–C2267, 2014
www.atmos-meas-tech-discuss.net/7/C2264/2014/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Validation of nine-years of MOPITT V5 NIR using MOZAIC/IAGOS measurements: biases and long term stability" *by* A. T. J. de Laat et al.

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Received and published: 19 August 2014

We thank both anonymous referees for their reviews, valuable comments and suggestions for improvements.

We have incorporated most suggestions by the referees. Below follow a number of remarks with regard to referee comments that we felt needed specific clarification on what was changed (or not).

Referee #1

1) - The referee remarks that is should be specified why we focus on MOPITT NIR

instead (or also) including MOPITT TIR.

It is possible that the referee overlooked a remark in the introduction that the NIR product – because it is of much more recent date than the TIR product – limited validation has been performed. The one validation study available essentially focusses on North America using NOAA data, and the MOZAIC/IAGOS database provide a much needed extension to other parts of the world using data that is independent of the NOAA data.

Nevertheless, we made a few adjustments to draw some additional attention to the motivation for focusing on MOPITT NIR in the introduction. We added a remark that MOPITT TIR is much better validated than MOPITT NIR, and that we are also interested in the question of representativity of MOZAIC/IAGOS for the future TROPOMI mission (hopefully lunched late 2015), which will measure CO from a NIR channel.

Obviously the MOZIAC/IAGOS data could also be used for validation of MOPITT TIR as this has not been done before, but given the length of this paper already would be better suited for a separate paper, and there is less need for additional validation of MOPITT NIR.

- A sentence about MOPITT being a gas correlation radiometer was added to section 2.1, also noting that the MOPITT measurement technique is different from the more common grating spectrometers like in for example SCIAMACHY.

2) - with regard to the use of 'range' data: for all figures where 'range' data is used this is explicitly stated in the figure captions.

In addition, it is difficult to come up with a proper alternative for the expression 'range data'. It is a bit of an unusual construction by definition, but one way or the other one wants to get some indication how sensitive validation results are for the CO column variability along the MOZAIC/IAGOS flight path. Use of the 'range' data is a simple approach to get a first order indication. A better method would for example be to use assimilated MOPITT data, which combines the best of two worlds (real but smooth

profile information from MOPITT, detailed information about spatial CO variability from the model). Hopefully this can be done in the near future.

- A sentence was added to section 2.3.2 on extending the MOZAIC/IAGOS CO profile for applying the MOPITT averaging kernel.

- We implemented a few modification to section 2.3.2., lines 11-21, which should make it more readable and easier to understand.

Other comments:

- Note on Figure 1: due to the AMTD paper format this figure becomes very small, but in the final online paper Figure 1 should be better readable, as it would be one column wide (that was our intention to start with).

- Figure 1a: remark about "relative to . . .", this statement has been removed. What was meant was to state that the MOZAIC/IAGOS dataset spans a range of CO total columns, and that the variability of MOPITT along an individual MOZAIC/IAGOS profile path is as large as the range of columns measured by MOZAIC/IAGOS. This statement was removed, as it is not relevant.

- Figure 9 was modified according to the referee's suggestion (title changed).

Referee #2

- We added a few sentences providing some general characteristics of MOPITT (wavelength, orbit, swath width, global coverage, period of operations) to section 2.1 describing the MOPITT instrument.

- Deeter et al. [2013], as well as previous MOPITT validation studies, assume that in situ profile measurements used for validation are representative for a certain horizontal range. For the NOAA flask profiles this is assumed to be 50 km – which is justified, in which case the horizontal inhomogeneity of CO is less of an issues compared to the MOZAIC/IAGOS profiles. For the HIPPO field campaign data this range is assumed

to be 200 km, which is justified by noting that HIPPO has been measuring over the central Pacific Ocean which is remote from major CO sources. This is then not further elaborated on. It could be argued that parts of the Pacific are actually not that remote, as it is well established that "rivers" of air pollution travel along the subtropical jets (Asian anthropogenic in the NH, biomass burning in the SH) causing considerable spatio-temporal variability in the middle and upper troposphere.

We added a remark about how this is addressed in Deeter et al. [2013], although not in section 3 discussing results but in the introduction, which we think is a better place for mentioning this.

- Table 3: modified as suggested by referee #1

- Clarifying section 2.3.2: this was also mentioned by referee #1. We made some adjustments to this section that should make it more understandable.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 5251, 2014.