

Interactive comment on “Assessment of NO₂ observations during DISCOVER-AQ and KORUS-AQ field campaigns” by Sungyeon Choi et al.

Anonymous Referee #3

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Overview

The paper by Choi et al. compares aircraft (from several campaigns) measurements from two different instruments and ground-based PANDORA measurements to satellite observed NO₂ columns from OMI. The paper aims to interpret the differences between the datasets and explores different techniques how the satellite observations can be compared to aircraft measurements. The authors look into the effect of using a more accurate NO₂ a priori profile and the effect of correcting for the large satellite pixel size. Overall, I found the paper was well-written and scientifically sound, it fits well in the scope of Atmospheric Measurement Techniques. I have some suggestions (listed

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below), after addressing these, I would recommend the paper for publication in AMT.

Specific Comments

Abstract and Introduction: It would be helpful to include the time period of the campaigns in the abstract and introduction, just roughly, e.g. “. . .these campaigns took place between 2011 and 2016.”

p. 9, l. 254: Include what filters have been applied to the OMI data. Here, you mention the row anomaly, but what other filters? I think it would be good to mention it here, instead of l. 369 “quality-controlled, cloud-free”. What do you mean specifically with “quality-controlled”?

The correlation is discussed for each location (in Sects. 2.3.2 and 3.2); I think that there might not be enough measurements for many of these for the correlation to be meaningful. Some of the high correlation appears for locations where there are only a handful of measurements (e.g. Korea), with 1 or 2 high column amounts. I think it would be better to just discuss the correlation for all measurements from all locations rather than separating them. I think it's ok to talk about the differences for each location.

Table 3 (and A2-A4): Include the correlation and difference for all locations (total), also include columns for the sample size (N)- I know it is listed in Table 2, but it would be helpful to have this information all together in these tables. I believe from this it will be clear that maybe not too much weight should be given to the correlation for individual sites.

Where are the spirals relative to Pandora? Are the spirals flown over the Pandora locations? Or how far is the distance? It might be useful to show maps (could be in the appendix), one for each of the five sites with the location of the spirals, PANDORA site and maybe (if it's not too busy) the pixel outline from OMI observations used for the comparison. This will be helpful for the discussion and interpretation of the differences between the measurements taken on the aircraft, from the satellite and from the

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ground.

Fig.5: Where is this? Please include lon/lat ticks, and the location name in the caption.

Fig. 9: The error bar is cut off from Olympic park. I would suggest changing the figure slightly (it is necessary to read the caption to know which colorbar applies, it is not immediately obvious to the reader): Maybe instead of using two different y-axes, it might be better to include a scale break for the Olympic park columns, or a logarithmic scale.

Table 2: It says in the caption "Pandora in parenthesis", many do not have a number in parenthesis, is that if the spirals are the same number as Pandora, or are no Pandora measurements available? This is not clear. To make it easier for the reader include parenthesis with the number of PANDORA measurements everywhere.

Did you evaluate the effect of changing the time difference slightly to a stricter or more relaxed criteria to 1.5h (1h or 30min, or 2h)? Are some of the outliers related to a large time difference?

I guess you only considered the OMI pixel that overlapped with the aircraft data, or did you average the OMI observations? Was this specifically mentioned somewhere? It should be explained.

Technical Corrections

p.1 l.15: "very well, but . . ."

p.2 l.18 "but mostly to OMI's areal (>312km²) averaging" change to "but mostly to OMI's large footprint (>312 km²)."

p. 5 l.138: "figures below" change to "Figs. X-Y." (Which figures? Please specify.)

p. 9, l. 252: Space is missing ". Since"

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