

Interactive comment on “Cross-verification of simulated GEMS tropospheric ozone retrievals and ozonesonde measurements over Northeast Asia” by Juseon Bak et al.

Anonymous Referee #2

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Main comments

This paper intends the validation of GEMS tropospheric ozone retrievals with respect to ozonesonde measurements, before the launch of GEMS. The following main issues need to be addressed:

1. GEMS ozone profile algorithm is applied to OMI BUV measurements. It should be explained why GEMS radiances has not been simulated instead and what is the impact of using LEO measurements for a GEO instrument.
2. The use of OMI measurements makes the title of the paper confusing as the validation is of OMI using GEMS algorithm, but not of GEMS. This needs to be changed.

3. Simulated GEMS retrievals are used to verify the ozonesonde observations, i.e., to identify the good stations, and in turn, these stations are used to validate the simulated GEMS retrievals. Using this approach it is hard to expect bad results for the simulated GEMS retrievals. The ozonesonde observations should be considered as the truth, and if they need to be validated and screened, this should be done using an independent dataset, but not the same dataset that we intend to validate, in this case the simulated GEMS retrievals.

4. According to the results shown, the time frame established of ± 12 hours seems too large for the evaluation of tropospheric ozone, especially for mid-latitudes location where a stronger daily cycle can be found.

Minor comments

- Line 50: Satellite name should be Sentinel-4
- Line 75: "... have yet to be not been ..." please correct this
- Line 178: Among ECC stations
- Line 183: "Kula lump", please correct. Also all along the paper, the name of this station is written in different ways (Kuala lump, Kuala Lumpur). Please homogenize the station names in the text, figures and tables.
- Line 221: biased -> bias
- Line 225: Please specify the units
- Line 231: troposphere -> stratosphere
- Line 234: Should be photons?
- Line 242: xa should be placed after (1-A)
- Line 282: Please rephrase, maybe "of" -> "with values ranging from"
- Line 290: "Japanese stations" or "stations from Japan". Same in Line 296

- Line 314: Please unify or explain the differences between LT, LS and LST across the paper
- Line 322: “oznesonde” -> “ozonesonde”
- Line 324: Please list stations after “mid-latitude” and refer to Figure justifying this and the following statements.
- Line 326: “- a few %” please rephrase this
- Line 338: 4.2 -> 3.2
- Line 358: “... gives the good information ...” please rephrase. SOC has not been defined
- Line 367: “espeically” -> “especially”. “TCO” -> TOC
- Line 308: Shouldn't it be “latitudinally” as it is used in other parts of the manuscript? Same in Line 398 and Line 400 (in this case, why capital L?)
- Line 399: Extra s “is similarly”
- Figure 2: Latitudes and Longitudes are not correct
- Figure 3: Please explain what is CF(O) and CF(X). Even if no CF is applied to MF sondes, it would be interesting to add them in Figure 3.
- Figure 4: Please specify how you differentiate the different type of sondes. Is it using diamonds, full dots and empty dots? Which one is which? Also indicate what is the horizontal axes, eg. “time (years)”
- Figure 6: I would suggest rewriting the last sentence as follows “The relative difference (in %) is defined as $100 \times (\text{SONDE AK} - \text{GEMS}) / (\text{A priori})$ ”. Why is multiplied by 2?
- Figure 7 and 8: Please replace TCO -> TOC and SCO -> SOC to be consistent with the text.

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