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Atmospheric Measurement Techniques Discussions

Interactive comment on "The use of QBO, ENSO and NAO perturbations in the evaluation of GOME-2/MetopA total ozone measurements" *by* Kostas Eleftheratos et al.

Anonymous Referee #1

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In this paper some interesting analyses are presented about the QBO, ENSO and NAO signal in various long-term ozone data sets. However, I have some problems to find the main aim of the paper. In the abstract it is mentioned that validation is performed for GOME2-A, yet no direct comparison with ground observations has been made. The correlations have been derived for QBO, ENSO and NAO signals, which although interesting as it is, I would not call validation. The term "evaluation" mentioned in the title is a better description. In the title, on the other hand, only GOME-2A is mentioned, while the authors are evaluating SBUV and GTO-ECV in exactly the same way. I suggest to change the title to "The use of QBO, ENSO and NAO perturbations in the evaluation of long-term total ozone satellite measurements." and to use 'evaluation'

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instead of 'validation' throughout the text.

Throughout the paper correlations are calculated for the comparisons, which I think is very limited. I suggest that the authors provide more information on these comparisons by calculating the regression coefficients.

Detailed comments:

Line 23: validating => evaluating

Line 29: Here the GTO-ECV data set is mentioned for the first time. I don't think most readers will have a clear idea what "GOME-type Total Ozone Essential Climate Variable" mean. A short description to describe this data set would be helpful at this point.

Line 51: Cause&effect are reversed in this sentence. Ozone is considered a greenhouse gas because it warms the Earth's surface not the other way around. In addition, it might be good to mention that not only tropospheric ozone but also stratospheric ozone is a greenhouse gas.

Line 56: "launched in 2018." => "launched end of 2018"

Line 73: Except for the abstract, this is the first time that the SBUV and GTO-ECV data sets are mentioned, therefore, I suggest to add references for both data sets in the text.

Line 89-91: It might be better to refer to more recent papers about the recovery of the ozone layer, for example de Laat et al., Onset of Stratospheric Ozone Recovery in the Antarctic Ozone Hole in Assimilated Daily Total Ozone Columns, JGR, 2017, https://doi.org/10.1002/2016JD025723

Line 150-151: When mentioning the various long-term data sets of ozone, also the Multi-Sensor Reanalysis of ozone comes to mind. This data set has also been analysed for QBO, ENSO, NAO and other perturbations in Knibbe et al., ACP, 2014 and therefore is worthwhile to include here and in the discussion at the end of section 3.3.

Line 223: I prefer to see more than only correlation coefficients. The regression parameters could be given here and in the remainder of the analyses.

Line 239-240: This sentence seems to saying that the origin of the blue zone (i.e. small amplitude) is attributed to the small amplitude in these parts. Please, give the real origin if this is known.

Line 259-265: This analysis was already discussed in section 3.1. Only this time the monthly mean has been subtracted which does not really change the validation. I suggest to remove this or add it in section 3.1

Line 269: A clear phase shift in Figure 5 is mentioned for higher latitudes. Actually for SBUV I see an anti-correlation with the phase for latitudes between -10 and 10, and for GOME2 I see neither phase shift or an anticorrelation. So I would not call this a clear phase shift. A discussion about the clear differences in result of SBUV (pre 2008) and GOME-2 should be added here as well.

Line 291-292: The correlations are not removed but the relation between ozone and QBO has been removed. Please, reformulate.

Line 295: If you are using this equation, it would be very interesting to mention also the fitted a0 and a1 instead or in addition to the found correlations.

Section 3.3, Figure 8 and 9: the GOME2 values in the last 4 year of the Figures 8 and 9 show a much worse comparison than the other years in the time series. Is there any explanation for this? I miss this in the discussion of the results here.

Line 367: A discussion of a comparison with the work of Knibbe et al., ACP, 2014 would be useful at this point.

Line 370: Here the effects of QBO are removed, but what about the ENSO perturbations? Are these also removed before continuing studying the NAO effects. The two effects have to be separated.

Line 293-393: Same as previous remark.

Line 469: This is not a real validation because a lot is still unknown about the quantification of the QBO, ENSO and NAO, therefore it is qualitative evaluation not a quantitative validation resulting in uncertainty estimates.

Figure 1: It is very difficult to distinguish the GOME2-A line and the SBUV-line. The legend doesn't seem to be correct either?

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