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Interactive comment on "Nighttime O(^{1}D) distributions in the mesopause region derived from SABER data" *by* Mikhail Yu. Kulikov and Mikhail V. Belikovich

Anonymous Referee #1

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The manuscript presents a retrieval and a 3-year climatology of nighttime O(1D). The retrieval is based on recent ideas by Kalogerakis, Sharma and co-workers on production of O(1D) through the reaction OH(v>=5) + O(3P). O(1D) is estimated based on primary retrieval products from SABER (essentially OH volume emission rates, O(3P), O3 and T). Central to the analysis is the use of the OH airglow model by Fytterer et al. (2019).

This is indeed a very promising approach with large potential of providing new insights into the chemistry of the mesosphere and lower thermosphere. I recommend the manuscript for publication after an improvement of the discussion of uncertainties

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and limitations of the method.

Uncertainties are briefly discussed in the last paragraph of Section 3. Basically, the authors refer to the uncertainty analysis by Fytterer et al (2019) which they have repeated. This needs to be extended. Please summarize the ideas of the uncertainty analysis (based on Fytterer et al.) and state in particular which reaction steps and reaction rates are critical for the uncertainty. This extended paragraph should be moved to the end of Section 2, i.e. the uncertainties of the method should be discussed before the results are presented.

Validation of the O(1D) retrievals is beyond the scope of this manuscript. Nevertheless, I would like the authors to comment on perspectives towards a future validation of these SABER retrievals.

Some minor comments:

Line 9, 11: remove "the" before "values" (3 times)

Line 13: "a useful data set"

Line 14: "on the chemistry"

Line 31: replace "constant" by "a continuous"

Line 34: "via the process"

Line 54: "use the known"

Line 77: "Half a year"

Line 78: "A similar pattern"

Line 83: "There is a pronounced"

Line 84: "found similar features"

Line 84-85: I do not understand the notation "nighttime ozone chemical equilibrium

boundary", in particular the term "boundary". Please clarify.

Line 86: "of the stratospheric"

Line 93: remove "the" before "values" (2 times)

Line 94: remove the word "correspondingly"

Line 98: replace "summarized" by "the total"

Line 108: "use of a global"

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