

## Comment on essd-2022-315

Anonymous Referee #1

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Referee comment on "Global Ozone Monitoring Experiment-2 (GOME-2) daily and monthly level-3 products of atmospheric trace gas columns" by Ka Lok Chan et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-315-RC1>, 2022

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Chan et al. presented a new suite of L3 GOME-2 product including total O<sub>3</sub>, total and tropospheric NO<sub>2</sub>, total H<sub>2</sub>O, BrO, HCHO, and SO<sub>2</sub>. They inter-compared data from 3 sensors and evaluated the dataset with ground-based observations. The gridding strategy for producing L3 data is also documented. A user-friendly and well-documented L3 product presented is extremely valuable for the community and for wider usership. The paper is clearly written but additional information that guides a potential user may be added to improve the manuscript. I recommend the paper and data to be published in ESSD if the following comments are addressed.

### Main comments

As the intended users for the L3 data include non-expert users, it would be useful for authors to provide advices or guidelines (including recommendations and/or cautions), but this is in general inadequate in the current manuscript. For example, do you recommend to use monthly average or daily data for a specific species, based on the evaluation? Is the current evaluation adequate to characterize the error statistics?

Performance statistics are important information for a user. However, very different amount of ground-based data are used for evaluation. Some are from global network, and some other are from only one site (e.g., Mexico city for SO<sub>2</sub>). I'd suggest to comment on how representative the derived bias & correlation are, and make proper recommendations to authors about the uncertainty.

### Specific comments:

Page 5 Line 30: Unclear whether the stratosphere-troposphere separation is done on the initial total vertical columns or total slant columns

Page 12 Line 29: Here observation at Mexico City is used for evaluation, but the above L2

description stated that retrieval algorithm assumes SO<sub>2</sub> from volcano. What is the implication of this inconsistency?

Page 14 Eq (2) & Eq (3): I do not see any results related to Eq (2) and (3) presented in the manuscript. Are they included in the L3 product?

Table 2 does not appear to have enough information. Can merge with Table 4

Section 5.1.1 & 5.1.2: Use separate paragraphs for each species. So readers can find information on species of interest easily.

Table 3: It would be helpful if you also list relative metrics for biases.

Page 25 Line 9. Discrepancy appears to be large also in Northern mid-latitude based on fig. 7.

Page 34 Line 7-8: does this indicate that a user should use monthly HCHO data for analysis, or daily data should be used with caution?

Table 4: Are reported metrics derived from daily products or monthly products? Consider to report as accuracy (bias) and precision, as these are often useful metrics when model-satellite comparison is done.

Minor text edits:

Page 2 Line 12-13: "Together with its successors, Global Ozone Monitoring Experience 2 ...". I'd suggest to rephrase. It reads like GOME-2 and its successors (that would be GOME-3...).

Page 2 Line 28: In order "to"

Page 2 Line 31: includes -> include

Page 9 Line 21: capitalize O in So<sub>2</sub>

Page 21 Line 25; Page 22 Line 2; Page 23 Line 1; Page 29 Line 21 and elsewhere: "result" -> "result in"

Figure 7: Texts are too small to read. May consider to remove repeated color bars for 1st and 2nd columns and increase the font size of the 3rd column.