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Interactive comment on "A Global Total Column Ozone Climate Data Record" *by* Greg E. Bodeker et al.

Anonymous Referee #2

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The paper presents the datasets of total ozone column (TCO), which are created using the data from several satellite measurements. One dataset is an improved version (v3.4) of NIWA-BS TCO dataset, while another is gap-free BS-filled TCO database. The paper describes the methods used in the construction of the datasets, and some evaluations of dataset, including evaluation of ozone trends.

These datasets are valuable contributions to the ozone research. The paper is well written. Several minor comments and suggestions for paper improvement are below.

MAIN COMMENTS

1. The differences between individual datasets are evaluated using zonal mean values. Does this approach work also in presence of polar vortex? Please add a discussion or

evaluation.

2. P.18: "For some applications, there is a need for gap-free TCO fields". Please indicate these applications.

3. Conservative filling algorithm (Section 9.1). In general, it is easy and advantageous to demonstrate the quality of the filling procedure with artificially created missing data: from a full field some data can be masked and the filling algorithm applied. Then the quality of filling and the quality of uncertainty estimates can be directly evaluated using the true and reconstructed data. For the conservative filling, using the data from previous of following day is a dangerous operation, in my opinion. The air masses are moved, thus such interpolation can result in significant errors, especially in regions of high ozone gradients. The calculation of uncertainties is not described in detail. In particular, it is unclear how the distance from available measurements is taken into account, and this is not seen in Figure 13.

4. Machine learning estimated ozone: It is important to assess the quality of this approach in unexpected ozone conditions, for example Arctic ozone hole in 2011 and 2020. For example, data from 2011 can be excluded from the training dataset, and then tried to reproduce. In general, demonstration of ozone hole evolution in the created datasets would be a very interesting and valuable addition to the paper.

5. Section 10. More details on the regression model would be useful. In particular (a) If possible, repeat the sources of proxies (P.27, L.28) instead of reference to Bodeker et al. (2001), (b) Please add a note on performance of this global fit when data from some months are missing (in polar night conditions). Please add the figure with TCO trends after 2000 (in addition to change trends). This will allow direct comparison with other studies.

SPECIFIC COMMENTS

1) Please write direct links to the datasets, not via tinyurl.com, which do not work

properly.

2) P.4: A map showing locations of Brewer & Dobson stations would be useful. Also a statement on compatibility/similarity of Dobson and Brewer data and their quality would be useful.

3) P.4, L1: Please clarify what you mean by “a higher quality data set”: a higher spatial resolution?

4) P.5, around Eq.(2): Since you use integer numbers for f, please indicate also the units of t. It is also worth to note that the choice Nf,b=0 corresponds to the assumption of a constant drift.

5) P.7, Fig.3 caption: “Regions shaded in grey” –should be “in black”?

6) Table 2. Please indicate that all uncertainties presented in the table are averaged/typical values, which can be different from the uncertainties for a particular location and time.

7) P.9 L 2: should be sigma_Delta (big Delta)?

8) P.9, Eq.(6), sigma_i should be squared

9) P.10, L.5. Some data are on 1x1 deg grid. Please clarify how the re-gridding is done.

10) Fig.7. It would be useful to indicate also standard deviation of differences.

11) Figures 9 -11: please use smaller color limits.

12) Eq.9, LHS: comma instead of “-“

13) P.23, lines 22-26: The description is not clear, perhaps, an illustration (can be put in the Supplement) would be useful.

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