

The manuscript by Coldewey-Egbers et al. presents a very interesting and innovative merged ozone profile data set from nadir observations (GOP-ECV). The authors introduce the main aim of the work, the harmonization procedure used for the merging of the data sets and the scaling procedure with respect to the GTO-ECV time series. This paper fits the scope of AMT, it is well written and scientifically sound. I found the given explanations overall convincing, with clear descriptions of the multiple, and sometimes complicated, steps. From my side, I only have some minor comments on specific aspects and some technical corrections.

### **Specific comments/questions**

- I am wondering about the usage of SCIAMACHY data set over the period 2002-2004, as reported in Tab.1. Is it only used over these two years for the generation of GOP-ECV? Does the usage until 2012 have a negative impact on the merged dataset? I would suggest to include a short explanation in the manuscript about this choice. Regarding limb observations, in Sofieva et al. (2017) the usage of the first months of SCIAMACHY were not recommended due to some unexplained features in the anomalies (for SAGE-CCI-OMPS it is used from August 2003). Have you noticed any larger discrepancy in nadir data at the beginning of the SCIAMACHY period?
- OMI time series is used in this work as reference for the other datasets, also to remove drifts. Does the drift affecting OMI total column time series or its row-anomaly, e.g. Torres et al. (2018), Gaudel et al. (2024) supplements, have any potential impact on this choice?
- Just a couple of clarifications regarding the used neural network approach, as I am not very familiar with this. Is the described NN approach a sort of ozone profile retrieval? Are the derivatives extracted in a second step or directly provided by the NN?

In the simplest case from Tab.2, are you feeding the NN only with TOC for each class and let the hidden layers find a mapping between TOC and profile shape? It seems to me that in this case there could be profiles with the same TOC but different shape even within the same class. I just wonder how the NN is able to distribute the TOC variations vertically without having unique solutions.

How do you get to the number 420 in Table 2? I understand the 242 possible combinations in Table 3, as you have 2 hidden layers and 11 possibilities for each, times 2 options for the inputs, but I could not get to 420 combinations in Tab.1.

- A side note: is the spiky shape of the profiles in Fig. 5 a feature of the RAL retrievals? Most of them tend to have three local maxima.

### **Technical corrections**

Line 13: I would add “presented in this manuscript” after “the homogenization”.

Line24: “banned” → “prevented”

Line 30-31: “the middle latitudes of the Northern Hemisphere” → “at northern mid-latitudes”

Line 59: Add a , after “data sets”.

Lines ~60: You could mention the advantage/disadvantage to use limb or nadir data to retrieve profiles in terms of vertical and spatial resolution.

Line 79: “allows us to generate” → “enables the generation of”

Line 80: “in particular important” → “particularly important”

Line 82: What is it meant with “investigation of changes in the profile”? Stratospheric ozone trends?

Line 85: “enables us to assess” → “facilitates the assessment of”

Line 97: Add , after “ozone profiles”.

Line 98: The UVN acronym was already introduced in the previous page.

Line 160: Add , after “level-2 products”.

Line 202: Also at northern mid-latitudes SCIAMACHY has a positive bias.

Lines 205-207: I would move this last three lines to the beginning of the paragraph (line 194), as these are general considerations about the seasonal cycle.

Line 216: “drift” is repeated two times.

Lines 220-222: Do you plot in Fig. 2 the fit, for example, to (GOME-OMI) anomalies (as you state in the text) or to OMI-GOME?

Line 227-229: I find hard to read the sentence starting with “From these deviations...”. I suggest to re-formulate such as: “From the time series of the offsets in each available spatial bin, at first, we calculate averages for each calendar month (“climatologies”) and then we average them over five broad latitude bands...”.

Line 242: “aligning” or “harmonizing”?

Line 262: “in particular as to the...” → “in particular in terms of the...”

Line 328: Remove , after “requires”.

Line 360: “of the parameters total ozone...” → I would add “of the parameters, i.e. total ozone...”

Line 371: Add , after “in advance”

Line 402: “only for example poleward of 50° N for 120°-180°” → “mostly at latitudes poleward of 50° N and at 120°-180° E.”

Line 436: “measurements from” → “measurements over”; “data from” → “data over”.

I would remove Line 446 as it repeats what said in the previous lines.