

***Interactive comment on* “Global validation of improved SCIAMACHY scientific ozone limb data using ozonesonde measurements” by J. Jia et al.**

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Comments: This paper is dedicated to validation of SCIAMACHY vertical profiles processed with the scientific UB processor V 2.9 and 3.0 with ozonesonde measurements. The processing algorithms are compared and the influence of their specific features on data quality is discussed. The paper is generally well written. Please find below the comments, which might improve the presentation style. The English of the paper should be also improved.

P.4818, L.8: “data...is” -> “data...are”

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Response: Typo corrected.

P.4820, L.7: The paper (Rahpoe et al., 2015) is in AMTD now.

Response: The related sentence has been changed into '... are also published recently (Rahpoe et al., 2015)'.

P.4822, L.10 : A reference on a paper/webpage with an illustration of SCIAMACHY measurement principle would be useful here

Response: The reference is added. The sentence at L.10 is now '... and 240 km x 400 km (across/along track) in all other channels (Gottwald and Bovensmann, 2011).'

P.4824, L.7-8: Please specify the method for conversion from number density to mixing ratio (source of air density data)

Response: The sentence 'The ECMWF operational pressure and temperature data are used to calculate the air density for converting the number density into mixing ratio.' is added in P. 4824 L.7.

P.4825, L.8: "From the vertical resolution" ->"from averaging kernels"

Response: The sentence is now changed to 'From the averaging kernels ...'.

P.4825, L. 19 "A maximum data..."?? Please rephrase this sentence.

Response: The sentences are rephrased as 'The time difference between ozone sonde and collocated SCIAMACHY measurements should not exceed 24h. The coincident limb profiles having a solar zenith angle larger than 80° are rejected. In general ... '.

P.4826, L.7: "Satellite data has" -> have

Response: Typo corrected.

P.4829, L.1-10: Why the upper altitude is always lower in V.3.0 comparison than in V.2.9 comparisons?

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Response: The comparison results are showed after screening according to Sect. 3.1.2. These two criteria are responsible for the different altitude range at upper and lower parts, respectively. Explanation for the first criterion: The ozone sonde data has to be degraded in the vertical resolution and resampled to coarser vertical grids of V2.9 (1km) and V3.0 (~3.3km). This work is explained in P. 4826. Please notice that the average kernels are used in the process. One criteria for degrading and resampling of the ozone data at each particular altitude layer is that: the AK curve must be within sonde altitude range, in other word, 'must not have non-zero elements above the maximum height of the corresponding ozone sonde mea-surement', otherwise it will require ozone sonde information beyond its maximum height, which obviously we don't have. The consequence will be, for instance, if one ozone sonde profile originally ends at an altitude of 34 km, while V3.0 has tangent heights of ... 29 km, 32 km, 35 km ..., the last sonde layer that is calculated would be at 29 km instead of 32 km, because at 32 km the calculating will still need ozone sonde measurement until 35 km to convolve with the corresponding AK curve (see Fig. 1) to guarantee a correct result. However, for V2.9 the last layer of the corresponding sonde would be higher resulting from a finer vertical step. So it is very common to see the upper altitude of V3.0 lower than in V2.9 with about 3 km differences. The lower part altitude difference, however, is caused by the vertical resolution criterion. The latter is determined by the retrieval sensitivity and is different for V2.9 and 3.0. For instance, at station Nairobi, the V2.9 vertical resolutions are higher than 6 for the latitude range 10-18 km. To offer more details, the author has changed the text at P. 4827, L. 3-8 into 'Firstly, ... of the corresponding ozone sonde measurement. Due to a coarser altitude grid in V3.0, a wider vertical range is rejected when excluding one altitude level, which causes different altitude range at the upper altitude in Figs. 2-7. Secondly, ..., are also not considered. Since the vertical resolution is different between the two versions, some differences in altitude range are expected.'

P.4829, L. 7: remove “.” after “that”

Response: Typo corrected.

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P.4830, 1st paragraph: Please discuss also the features below 18 km at southern high latitudes

Response: The paragraph has been extended at the end to '...', with a significant improvement northwards of 40° N (Fig. 8). One exception remains below 18 km at southern high latitudes, where the relative differences vary strongly. The reasons for this issue are still under investigation.'

Figures: I suggest combining similar figures into one/two figures with subplots, for easy view. In particular, Figures 2-7 can be combined into 1 (or 2) figure with panels and indicated stations and processing versions. The same suggestion on presenting in one figure is for current Figures 13-18. Please improve also quality of Figs. 13-18.

Response: The Figs. 2-7 couldn't be combined in one figure in the discussion paper as they became too small and hardly readable. We will combine them into 1 figure for the final paper. Figs. 13-18 are combined into 1 figure. The quality of Figs. 13-18 has been improved.

In the caption of Fig.9, please indicate the processing version.

Response: 'V2.9' is added in the caption.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 4817, 2015.

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