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Interactive comment on “Carbon monoxide total columns from SCIAMACHY 2.3 μm atmospheric reflectance measurements: towards a full-mission data product (2003–2012)” by T. Borsdorff et al.

Anonymous Referee #1

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This paper describes (1) the methods applied for creating a CO total column data product from SCIAMACHY spectra and (2) performs a validation of the generated dataset using independent observations. A special challenge of the work lies in the fact that the instrumental characteristics of the SCIAMACHY near infrared observations suffered from significant variations during the mission lifetime. The investigation is sound, covers a relevant topic, and meets the scope of AMT. The quality of the presentation is very good. I recommend publication of this work after minor revisions.

Comments in detail:

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Abstract: The term “soft-calibration” is not familiar to me. It might be useful to provide a short explanation why the calibration which was performed is termed “soft”. The bias values are provided signed, but without clear specification of the meaning of the sign. Instead of signs, I would prefer statements as “the SCIA-CO data product is biased high / low in comparison to . . .”.

Introduction: Line 63 “The extensive degradation . . .” - is not a sentence.

Retrieval approach: Equation (7) and (8) and text in between: decide to use either rho or x. According to the description below equation (2), x is the full state vector of the retrieval, whereas rho denotes only the CO entries? Moreover, it would be helpful for the reader to clarify what rho actually stands for, possibly a layer-averaged, air density weighted mixing ratio? Comment on null space error (line 198 ff): This line of arguments should be completed. It is true that the null-space error is negligible when compared to the noise error of an individual retrieval, but later on averaged data are used in the validation. Is the null-space error still negligible in such kind of data treatment?

Instrument calibration: Line 217: I would have assumed that the along track pixel size is affected? Figure 5: There seems to be a persistent difference pattern between the offsets derived from observations over Sahara and Australia (maximal difference of about 3% in spring, excellent agreement in autumn). Do you have a guess concerning the causes?

Validation: Beyond the quantification of bias and scatter of the SCIAMACHY CO data product, it would be interesting to investigate whether the satellite data are able to significantly detect the variability of the CO total column amount as function of season as observed by NDACC-IRWG and TCCON networks, as this feature seems to be - apart from the latitudinal variation - the strongest actual signal in the CO global distribution.

Potential data application: 467: “. . . the retrieval is much higher. . .” better: “the retrieved values / retrieval results are much higher”

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