

Interactive comment on “SCIAMACHY validation by aircraft remote measurements: design, execution, and first results of the SCIA-VALUE mission” by A. Fix et al.

Anonymous Referee #2

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1. General comments

In general, this is a nice and well-written paper about the SCIA-VALUE mission, a series of aircraft campaigns to validate the SCIAMACHY data product. The two aircraft campaigns in 2002 and 2003 followed a very impressive flight schedule and covered huge areas. Besides the scientific aspects, I also enjoyed reading about the various surprises and problems that can occur during such a long flight campaign: cabin temperature problems, adverse weather conditions and the logistical difficulties of getting

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hold of cryogenic liquids in the middle of Africa sound very familiar. I also agree with the authors that an aircraft equipped with remote sensing instruments are an excellent (if not the best) platform for the validation of satellite instruments. Actually, this point should be picked up again in the conclusions!

However, the paper also falls short in some aspects. The paper is meant as an introductory paper for the whole SCIA-VALUE mission and the bulk of the validation work is supposed to appear in follow-up articles that are - for the most part - not available yet. It is the appetizer that is meant to wet our mouths for the real food. But the appetizer leaves us hungry: some example measurements are provided but the results are hardly interpreted. In fact, the title itself is very misleading and should be changed: the whole article does not show a single data point from SCIAMACHY. Something like "Airborne remote-sensing measurements during the SCIA-VALUE campaign" would be much more appropriate. And I would definitely like to see more interpretations like

- how well did O3 measurements from all three instruments agree and how well did you expect them to agree?
- there is a plot (Fig. 11) that shows two single profiles from OLEX and ASUR and a contour plot of OLEX O3 for a single flight. I think you should produce a similar contour plot for OLEX O3 for the same flight (or a difference plot of the two). This way, you could provide some statistics on the differences between the two instruments for the whole campaign.
- are there expected or unexpected correlations between different parameters measured by the three instruments (O3 vs. NO2 etc.)?

If these issues will be addressed in the follow-up articles, please say so. If not, you should answer at least one or two of the three questions above. This would greatly improve the paper.

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2. Specific comments

1. p. 8383, l. 25: since you took the effort to dig up most of the previous airborne satellite validation campaigns, you might be interested to know that the MAS CIO validation was done by Paul Hartogh and Christopher Jarchow from MPAe in 1992. The results were published later in the MAS CIO validation paper:

D. G. Feist et al.: Validation of stratospheric CIO measurements from the Millimeter-wave Atmospheric Sounder (MAS), Journal of Geophysical Research, vol.: 105, no.: D7, pp.: 9053-9062, 2000.

2. p. 8386, l. 1: that is an impressive list of molecules for ASUR. However, we only get to see plots of O3 and N2O. What happened to the HNO3, H2O, NO and BrO measurements that are mentioned on page 8395? I would love to see some profiles or at least spectra. Why are these species not listed in Table 2 on page 8407?
3. Figure 1: ASUR H2O profiles from 15-35 km? That sounds like a very strange altitude range. The 15-20 km range should be rather difficult to retrieve but I don't see why the retrieval should stop at 35 km. Please check these numbers with the ASUR team.
4. Figure 9: I might post a separate reviewer's comment on this issue because I think it is very important. You should be aware that it is rather dangerous to directly compare microwave profiles with high-resolution profiles from sondes, lidar etc. The high-resolution profiles should be folded with the microwave retrieval's averaging kernel to avoid the rather large smoothing error. I also suspect that the ASUR profile error bars do not include this smoothing error. Folding with the averaging kernel is common practice and has been described by Tsou et al. in JGR 100, 3005-3016, 1995. Besides, what is the integration time for the OLEX and ASUR profiles?

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3. Technical corrections

1. p. 8384, l. 2: is it appropriate to talk about "novel instrumentation"? At least OLEX and ASUR have flown on the Falcon many times before. Please explain the novelty of this setup in more detail.
2. p. 8392, l. 10/p. 8393, l. 1: why do you speak of first and second "main" validation campaign? I understood that there were only these two.
3. p. 8405, l. 21: replace "C1O" with "CIO" (as in "CLO")
4. Table 1: you might want to put the MAS validation campaign here as well.
5. Table 3+4: the date format in the two tables is inconsistent and confusing. Please use 4-digit years and preferably list the dates in ISO-8601 format (YYYY-MM-DD)
6. Figure 6: the y-axis label should be "time difference" instead of just "time". You should also replace "In summary" with "In total" and "criterion" with "criteria" (because there are two).
7. Figure 7: replace "are" with "were".
8. Figure 8: replace "leads" with "lead" (past tense)
9. Fig. 10: where is the "shaded area"?

3.1. Use of English language

Please excuse me for being picky here. I took English as one of my majors and my mother used to be an English teacher. Therefore, I know English grammar very well, even though I am not a native speaker. My corrections are meant to improve your paper, not to annoy you.

1. present perfect (e.g. "have been", "have done", etc.): while you (correctly) used past tense for most sentences in your paper you switched to present perfect a few times. In practically all the cases, this is semantically wrong. Present perfect is used for something that started in the past and continues to the present. This could rarely be the case for the things you describe in your paper. Please make sure to use past tense instead. The general rule for scientific papers is:

- present tense for well known facts ("water boils at 100 C") or results from the published literature ("Smith et al. proved that water boils at 100 C").
- past tense for everything that you did or observed ("In our experiment, the water boiled at 100 C").

Source: *Robert A. Day, How To Write & Publish a Scientific Paper, Oryx Press; 5th edition (June 18, 1998)*. This is the official reference guide for many scientific journals, including all AGU journals.

2. p. 8393, l. 7: "respectively" does not make sense here. Rather use "problems with ENVISAT or SCIAMACHY".
3. p. 8393, l. 12: "compensating" can only be a present participle or a gerund. Neither makes sense here, you probably wanted to say "to compensate".
4. p. 8393, l. 24: I'd rather say "Operation summary" or "Summary of operations". The genitive plural form looks strange to me.
5. p. 8394, l. 1: replace "much" with "many" (because the matches are countable)
6. p. 8394, l. 2: replace "are" with "is" (because the subject of the sentence "distribution" is singular)

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7. p. 8394, l. 12: do you really know what "prone" means (having a tendency toward something)? I suspect you meant something like "without being too dependent on weather conditions on the ground".
8. p. 8394, l. 21-23: "The quality ..." is a very confusing sentence. Please write something like "The quality of the data was generally better at higher latitudes where he typically larger solar zenith angles lead to stronger absorption and thus better signal to noise ratio."
9. p. 8394, l. 26: write "Over Germany" instead of "In Germany".
10. p. 8395, l. 3-5: The sentence "As can be seen ..." is ambiguous. Did you not expect too much variation in the stratospheric signal or do you mean that there was less variation than you expected?
11. p. 8395, l. 24: "the sudden unavailability of liquid cryogens in Africa" is a funny way to say that you ran out of liquid cryogens and couldn't get new supplies in the middle of Africa. Your sentence suggests that liquid cryogens are usually available in Africa but unexpectedly were not when you needed them.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 8381, 2004.

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