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Interactive comment on "SCIAMACHY Absorbing Aerosol Index – calibration issues and global results from 2002–2004" *by* M. de Graaf and P. Stammes

Anonymous Referee #1

Received and published: 8 June 2005

General remarks

From the initial review prior to publication in ACP Discussions, some points raised by the reviewers have been addressed. The paper is short but contains a number of new results which are displayed to good effect in the chosen figures. The paper is now much better referenced and the technical content is adequately discussed; however some of the definitions need to be clarified. The theory section (§2) is very short and should be merged into the Introduction, somewhere near the beginning (see comments below). The paper needs to have a number of textual issues clarified, and there are a number

of statements which are left hanging and require further explanation. I recommend the authors to engage the services of a native English speaker to improve the standard of written English.

I recommend publication subject to the above remarks and necessary changes (mostly minor) to be made as listed next.

Specific Comments

P3368.

There is a problem with definitions at the start. We learn that the AAI is derived from the residue which is derived in turn from the reflectances, without learning what the "residue" is. You need to define this all-important quantity here, rather than wait for the theory section. This is why I suggested merging section 2 into the Introduction, and here at the beginning is a good place to do it.

P3369

L 7-9. SCIAMACHY does not add to AAI records, this is done by people. Rephrase: "SCIAMACHY results will now be added to the AAI records." I think you should drop reference to Aura/OMI AAI being added unless you are confident that these results are ready for such inclusion.

L12. Move word "dimensionless" to the definition in L18 of the previous page.

L14. What is a "meaningful AAIs"? You must be more specific to provide some context, e.g. give expected ranges.

L16. LUTs are not predefined, they are pre-calculated.

P3370

L23. Drop this sentence (So mu0E0 is theĚ)

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L7. What do you mean by an “inversion process”? What are you inverting? You must be clearer here. See additional remarks below.

P3372

L5-7. These two sentences need to be rephrased. How can “four seconds” be “called a swath”? Suggestion: The nadir state swath is approximately 960x460 km2, and it is scanned from east to west in four seconds by rotation of one of the two internal mirrors.

L9-10. Again you need to be more specific about what exactly is being controlled and who is doing the controlling. Probably best to cut this sentence.

L23. What do you mean “averaging window”?, and why is it unknown?

P3373

This reviewer still has problems with this paragraph. These issues were partially addressed by the authors in the initial response phase, but further clarification is required. There are two points. (a) The first 2 lines need to be rewritten because the inference is still clearly that the first major flaw is due to the use of the LIDORT model. This is not the case, even though the subsequent explanation makes it clear that it is the use of scalar radiances that is the source of the problem. I suggest the following: “Firstly, the original LUTs were calculated with the use of a scalar radiative transfer model, so that polarization was not accounted for in the Rayleigh scattering computations. Since the residue calculations are sensitiveĚĚĚ.”. (b) I am not sure that these two “major flaws” are comparable, and are they decoupled? It seems to me that the use of uncorrected SCIAMACHY measurements is a show stopper which precludes any sort of “meaningful” AAI, whereas it is presumably the case that an AAI result can be obtained even with scalar LUTs, provided reasonable L1 data is used.

L25-27. This sentence is somewhat confusing. Eq (2) is the “inversion process”, that is, the inference of an albedo As which satisfies Eq. (2). Does this reference to Chandrasekhar indicate that you are considering the atmosphere as a single-layer slab and

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deriving an analytical formula for the albedo? More detail would be useful, perhaps you can summarize some of the methodology in the 2005 paper which is referenced here.

P3374

L14. In what way do these typical examples highlight the possibilities (what do you mean by this?) and problems (what are they?) of SCIAMACHY AAI data? You need more context here. Either that or (perhaps better) you can drop this sentence altogether.

P3375

L1. How can a processor number be steadily updated? Rephrase. I find this paragraph confusing and not very helpful. The data record seems to be a jumble of versions.

L18. Context - why and in what regard are these results “very promising”?

L19-24. There is a lot of vagueness in this paragraph, and you should put in more detail (e.g. certain peaks - what are these?, rather profound - what is this?). The following paragraph also contains some wool-gathering (“not necessarily a bad thing”, “generally believed” (by whom?), “seems to doing rather well”, etc.).

P3376

L21. Sun glint is a problem that occurs throughout the year. (not occurred). Sun glint generates a high SC-AAI signalĚĚ

L26. Please define the symbols used in Eq. (4) immediately after its use.

P3377

L29. locations (plural). The sun-glint discussion is interesting and well explained here.

P3379

L9-10. How has the TOMS AAI definition changed? How is it different from the one you use for SCIAMACHY? I was under the impression that the GOME and SCIAMACHY

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AAI algorithms were closely based on the TOMS AAI algorithm, with the same or at least similar definitions. Also, how has the sensitivity increased and what factors are responsible for this increase?

L14. Why are TOMS residues no longer available (is this due to the well-known calibration problems with EP TOMS after 2001?).

L16. “Lower than expected”. The inference here is that the TOMS values are better or more realistic. Since the AAI is really only a qualitative indicator, you can only say that SCIAMACHY values are lower.

L17. SCIAMACHY itself did not perform badly in 2002 - only the AAI results are not very satisfactory.

P3380

L7-8. What do you mean “fine tuning”? Figure 6 seems to indicate gross differences between TOMS and SCIAMACHY. The application of constant multiplication factors to reflectances is really a coarse correction, and no amount of fine tuning is going to get round the fact that until the SCIAMACHY Level 1 radiances have been properly calibrated in a reliable and consistent way, there will never be a wholly believable AAI product from this instrument.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 3367, 2005.