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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Using photochemical models for the validation of NO_2 satellite measurements at different solar zenith angles" *by* A. Bracher et al.

Anonymous Referee #1

Received and published: 19 November 2004

The present paper describes a first validation of ENVISAT/SCIAMACHY Limb NO_2 observations by collocated observations of the SAGE II and HALOE satellite instruments. Temporal mismatches of the individual observations – important due to the diurnal cycle of stratospheric NO_2 – are accounted for by photochemical model calculations. Spatial mismatches of the individual observations are accounted for by selecting those pairs of observations that were likely conducted in air masses of the same stratospheric circulation regimes. While the former two approaches can be considered to be state of the art, the latter approach falls short with respect to similar studies conducted earlier (i.e., Bacmeister et al., JGR, 104, 16379, 1999; Lu

et al., JGR, 105, 4563, 2000; Harder et al., 2000, GRL, 27, 3695, 2000; Randall et al., 2002, JGR, 107, doi:10.1029/2001JD001520; Vogel et al., JGR, 108, 8334, doi:10.1029/2002JD002564, 2003 and others).

Therefore, I rate the scientific significance and quality as good and fair, respectively.

Detailed evaluation:

1. Does the paper address relevant scientific questions within the scope of ACP? Yes, the paper is best suited for the ACP special issue on ENVISAT/SCIAMACHY.

2. Does the paper present novel concepts, ideas, tools, or data? The paper uses the data from the novel ENVISAT/SCIAMACHY instrument.

3. Are substantial conclusions reached? The paper comes to major conclusions concerning the quality of the present SCIAMACHY NO_2 Limb and SAGE II solar occultation retrievals.

4. Are the scientific methods and assumptions valid and clearly outlined? Yes, at most places except some obscurities in chapter 3.1.5. Here a major problem comes with the author's confusion with the technique of solar occultation measurements and the correctly stated notation of 'solar zenith variations along the line-sight'. I largely recommend therefore to rethink and correct the sentence . . .'This means that the variation of the solar zenith angle. . .

5. Are the results sufficient to support the interpretations and conclusions? Yes, for a preliminary study on the quality of the ENVISAT/SCIAMACHY NO_2 measurements, as correctly state by the authors in the conclusions.

6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Yes!

7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? In part, for the reminder part see the refs. provided above.

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8. Does the title clearly reflect the contents of the paper? No! My impression is that the authors used only a single photochemical model (which is no fault), therefore the used notation 'models' is incorrect. Please skip the 's' in the word models.

9. Does the abstract provide a concise and complete summary? Yes!

10. Is the overall presentation well structured and clear? While in the first two thirds of the manuscript the English has considerably be improved from the first version, the English of the remaining last 1/3 part is still poor. Please English correct the latter part as well!

11. Is the language fluent and precise? See point 10.

12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes!

13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? See point 10!

14. Are the number and quality of references appropriate? See the points above! Also according to what has been said already in the previous iterations of the review process, the manuscript would benefit to correctly cite earlier studies at the appropriate places, i.e. von der Gathen, Nature, 375, 131, 1995; McKenna et al., JGR, 107, doi:10.1029/2000JG00114, 2002; Roscoe, H. K., J. R. Drummond, and R. F. Jarnot, Infrared Measurements of Stratospheric Composition III. The Daytime Changes of NO and NO_2, Proc. Roy. Soc. (Lond.), A375, 507, 1981) and others.

15. Is the amount and quality of supplementary material appropriate? Yes!

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 5515, 2004.