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Comment

Interactive comment on “Technical Note: Intercomparison of ILAS-II version 2 and 1.4 trace species with MIPAS-B measurements” by G. Wetzel et al.

G. Wetzel et al.

Received and published: 23 January 2008

First of all we thank the referee for his effort to carefully reading the manuscript and for all comments.

Specific comments:

Issue 1: Page 16229, line 15 and the following: "...good match..." can you be more specific here? What do you consider a good match. Maybe repeat the main details describing the match (geolocation, time....), as done in Wetzel et al. (2006). Have you performed some trajectory calculations, showing that the same air masses were probed by both instruments? This can be important for species with a strong diurnal variation.

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We performed NASA/GSFC backward trajectory calculations. These trajectories show that air masses measured by MIPAS-B were within a 500 km horizontal distance to ILAS-II at the time of the ILAS-II observation (valid for all coincident altitudes). The mean horizontal distance of the observed tangent points of both sensors was less than 100 km and the time difference was 5.5 hours. This is stated more clearly in the text now (introduction and section 2).

Issue 2: Page 16240, Table 1: If possible, you could add the vertical resolution for each species.

The vertical resolution varies not only slightly from species to species but also with altitude. For both sensors and all intercomparison species it lies between about 1.5 and 3 km. This is mentioned in the text more clearly now.

Issue 3: Page 16230, line 10 and Page 16249, Fig. 9 and Page 16235 8211; discussion about NO₂: ILAS-II uses an onion peeling algorithm for profile retrieval. For occultation measurements, with SZAs (Solar Zenith Angles) around 90 degrees, this is probably not sufficient to retrieve a profile of species like NO₂, which undergo a strong diurnal variation. During sunrise (sunset) NO₂ concentrations vary largely with SZA and the satellite observes a whole composition of SZAs between at least 85 and 95 degrees. So if you scan the atmosphere from low tangent height to higher tangent heights (sunrise), then e.g. the photochemical change in the different SZA-regimes that are observed can be misinterpreted by the profile inversion as higher or lower concentrations. Thus it is not sufficient to just scale the MIPAS NO₂ profile to the location and time of the satellite measurement. Butz et al. (2006) introduced a photochemical weighting factor in order to compensate for this effect, which can be quite significant. Actually I would be surprised and consider it coincidence if the balloon and satellite measurements were to match. This might also partially explain the discrepancy for N₂O₅. Maybe you can comment on this issue and make a statement in the text, considering this effect as an additional error source and reason for the discrepancy.

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Of course, the reviewer is right that the variation of the SZA along the line of sight is an error source for occultation measurements when short-lived species like NO₂ are retrieved from the observed spectra. Payan et al. (J. Geophys. Res., 104, 21585–21593, 1999) performed sunset infrared solar occultation measurements in the 1997 late winter arctic vortex which are comparable to the observations performed by ILAS-II. They used box model derived correcting factors in their global fit retrieval algorithm to correct the NO₂ volume mixing ratio (VMR) along the line of sight for their solar occultation measurements. With this method they got VMR differences of less than 6% at any altitude level as compared to a photochemically non-corrected profile. Such VMR variations can only partly explain the observed differences between ILAS-II and MIPAS-B (particularly below about 27 km where the diurnal variation of NO₂ decreases). We mention this now in the text in section 3.4. Furthermore, we should allude that we already applied our NO₂ correction method during the ILAS validation in March 1997 (Irie et al., J. Geophys. Res., 107, doi: 10.1029/2001JD001304, 2002). Here, our method worked fine under conditions comparable to the case in March 2003 (VMR differences between ILAS and all balloon data are within 10% between 25 and 30 km).

Technical comments:

1. *Please change the order of the dates **throughout the text (and in Figure legends)** to the English notation, i.e. month day, year. For example - page 16228, line 3: "14 December 2002" should read "December 14, 2002".*

Meanwhile, both types of date formats are possible. However, the Atmos. Chem. Phys. layout is requesting the "day month year" format. Hence, we let this issue unchanged.

2. *Page 16228, line 11, page 16235, line 16 and page 16236, line 16: "Northern Hemispheric" is spelled in lower case letters "northern hemispheric".*

The Atmos. Chem. Phys. production office wanted to have "Northern Hemispheric" spelled with capital letters at the beginning such that we do not change this.

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3. Page 16228, line 24: "...measurements above large..." change to "...measurements over large..."

Modified as suggested.

4. Page 16229, line 6: spelling - "quasi-Lagragian" change to "quasi-Lagrangian".

Corrected.

5. Page 16229, line 9: "...quality of coincidence..." add the spatial and temporal...
"...quality of the spatial and temporal coincidence..." for clarity.

Modified as suggested.

6. Page 16229, line 17: delete the "...too", it is not necessary and refers to something in the previous sentence.

Modified as suggested.

7. Page 16229, line 24: "... has been..." change to "...was..."

Modified as suggested.

8. Page 16230, line 2: "...high latitudes..." hyphenate "...high-latitudes..."

Corrected.

9. Page 16230, line 2: "... (57N-73N and 64S-90S) ..." change to "... (57N to 73N and 64S to 90S) ..." to make it more readable.

Corrected.

10. Page 16230, line 19: "... to data version 1.4..." change to "...to version 1.4 data..."

Corrected.

11. Page 16230, line 22: no need to capitalise "Northern Hemisphere".

Please, see answer to point 2 above.

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12. Page 16231, line 1: "...midinfrared..." hyphenate "...mid-infrared..."

Corrected.

13. Page 16231, line 21: "...approach constraining..." change to "...approach was applied, which was constrained with respect to the form of an a priori profile." 8211; if that is what you mean and how I understand it.

Modified as suggested.

14. Page 16232, line 19: "...around 30 km, differences..." add the "...around 30 km, the differences..."

Modified as suggested.

15. Page 16232, line 21 and page 16233 line 5 and 6: "...amounts only..." add to "...amounts to only..."

Corrected.

16. Page 16233, line 11: "A slightly downwards increasing CH₄ positive bias is visible below 23 km." rephrase "A positive bias for CH₄, which is slightly increasing downwards, is visible below 23 km."

Modified as suggested.

17. Page 16233, line 21: "...mesh points..." not sure if mesh-points is the right term here, maybe just use "...values..."

Modified as suggested.

18. Page 16234, line 13: "...have been..." change to "...were..."

Modified as suggested.

19. Page 16235, line 17: "Southern Hemispheric" is spelled in lower case letters "southern hemispheric".

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Please, see answer to point 2 above.

20. Page 16235, line 21: "... such that this latter..." change to "...such that the latter..."

Modified as suggested.

21. Page 16235, line 25: "... except the altitude region near 30 km ..." change to "...except at the altitude region around 30 km..."

Corrected.

22. Page 16236, line 9: "Such an increase appears not ..." change to "Such an increase does not appear..."

Modified as suggested.

23. Page 16237, line 11: "... the Esrange team of Swedish..." add the "... the Esrange team of the Swedish..."

Corrected.

24. Page 16241, caption of Fig.1: "...profile **as** measured..."

Corrected.

25. Page 16244, caption of Fig.4: " N_2O - CH_4 relationships..." I guess "correlation" is a better term.

Modified as suggested.

26. Page 16244, legend of Fig.4: remove "year" in the expression "year 2003" or use "...adjusted to the year 2003".

Modified as suggested.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 16227, 2007.

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