

Interactive comment on “Validation of MIPAS IMK/IAA temperature, water vapor, and ozone profiles with MOHAVE-2009 campaign measurements” by G. P. Stiller et al.

Anonymous Referee #2

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General Comments

This paper describes the validation of MIPAS IMK-IAA temperature, water vapour, and ozone profiles using measurements obtained during the MOHAVE-2009 campaign. The validation data sets are obtained from radiosondes, frost point hygrometers, lidars, microwave radiometers, and FTIR spectrometers, as well as coincident satellite measurements by Aura-MLS, ACE-FTS, and AIRS. In most cases, the number of coincident measurements is relatively small (less than 100 for all but four pairs) given the single location and limited duration of the campaign. However, the comparisons

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are done thoroughly, with careful attention to assessing the observed differences in the context of the instrument errors and precision. The validation methodology is clearly explained, including the formalism for accounting for different altitude grids and vertical resolutions. The paper is logically organized and the results are described as concisely as possible given the large number of comparisons. This paper will be a useful reference for anyone using the MIPAS IMK-IAA temperature, water vapour, and ozone versions that are validated in this study. I recommend publication in AMT after the minor comments below are addressed.

Specific Comments

Section 3.1: There is some inconsistency in the level of detail provided for each instrument. In some cases, instrument performance is assessed, including estimates of systematic errors and precision, as well as vertical resolution. However, for other instruments, no such details are provided. Since this information must be available for all instruments, as it is used in the validation comparisons, it would be helpful to provide it for all instruments for greater consistency. One possibility would be to add a table summarizing vertical resolution, systematic error, and precision for all validation instruments.

Page 4410, line 20: Elaborate briefly on the “few typical signal corrections”.

Page 4411, line 22-29: This paragraph should be revised for clarity. e.g., line 23: The first was the ozone mode. . . line 24-25: ozone, temperature, aerosol, and water vapor were retrieved from these data. Same for line 26-27. Line 27: Explain the wavelengths included in third mode - the sentence first says only 355 nm was transmitted, but then says the filter blocked 355 nm, transmitting 387 and 407 nm.

Page 4412, line 10-13: Is this paragraph needed? This section 3.2.1 has described the three lidars used in the study: TMF/TMW Raman lidar, ALVICE, and STROZ. What are the “Two other lidars permanently deployed at TMF”? If their data sets are being used in the paper (apparently not), why mention them? If they are, include full descriptions.

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Why mention STROZ and ALVICE again? List the measurements made by each lidar in the paragraphs describing them.

Page 4413, line 9-14 and 15-19: Add references for the frost point hygrometer - RS92 biases, and for the ozonesondes.

Sections 3.1.2 and 3.1.3: Perhaps the order of these two sections should be swapped, as the RS92 radiosondes are introduced in 3.1.3, but are discussed in the context of comparisons the frost point hygrometers in 3.1.2.

Page 4416, line 16: This sentence leaves the reader hanging. State briefly the results of the MIPAS-MLS v2.2 temperature, water vapor, and ozone comparisons by Chauhan et al.

Page 4417, line 6: Are there really oscillations in pressure profiles, or just in the temperature profiles?

Page 4421: It would be helpful to add a table summarizing the transformations that were made on each MIPAS-validation data set.

Page 4424, line 18: Qualify this statement as "just above". Not true for all altitudes above the tropopause.

Page 4425, para 2: Comment on the STROZ results being opposite to those from the TMF lidar and ALVICE - negative differences below the tropopause, while the other two comparisons are positive in this region.

Page 4434, Section 5.2.6: State how many profiles are included in Figure 15. Is there a consistent difference between the LTE and non-LTE profiles? If so, could a systematic correction be applied to the MIPAS data?

Page 4443, Acknowledgements: This section seems short given the large number of validation instruments; acknowledgements are missing for many, including MLS, ACE, and AIRS.

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Page 4454, Figure 1: The caption for the right panel refers to a dotted line, which turned out as a solid line when printed. However, it is a dashed line (really two lines) in the electronic version.

Page 44, Figure 2: This figure is very small. It would also be preferable to replace the dotted line in the right panels with a solid line for this figure and all similar ones, 4, 6, 7, 9, etc.

Technical Corrections

Page 4405, line 11: define FTIR

Page 4406, line 1: altitude-resolved

Page 4406, line 12: particularly

Page 4407, line 6: measurements at the original

Page 4407, line 8: The text below seems to more consistently use the phrase "optimized-resolution nominal observation mode". Use that here for consistency.

Page 4407, line 18: allows coverage of the globe

Page 4407, line 21: field-of-view

Page 4409, line 6: Network for the Detection of Atmospheric Composition Change

Page 4409, line 9: Hygrometer

Page 4409, line 12: campaigns

Page 4409, line 22: The MOHAVE-2009 campaign not only... or MOHAVE-2009 not only... Hosted used three times in this sentence.

Page 4409, line 26: centered (US) or centred (UK)

Page 4410, line 3: define PV; provide a reference for MIMOSA or elaborate on (Hauchecorne/CNRS)

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Page 4410, line 8: and instruments operated
Page 4410, line 15: elsewhere referred to as Raman lidar
Page 4410, line 20: radiosondes
Page 4411, lines 8, 12, 13: add commas after measurements (8), measurements (12), and vapor (13)
Page 4411, line 17: signal-dependent
Page 4413, line 5: delete the
Page 4413, line 17: were the same model
Page 4414, line 3: launched during MOHAVE-2009
Page 4414, line 16: from the University of Bern
Page 4414, line 23: the altitude covered depends on the signal-to-noise ratios
Page 4414, line 26: provides an estimate
Page 4415, line 9: high-resolution
Page 4415, line 17: MLS has been used several times, but has not yet been defined
Page 4416, line 3 and 9: geo-potential or geopotential - choose one
Page 4416, line 5: in the case of
Page 4416, line 21: high-resolution
Page 4417, line 1: field-of-view . . . details of the ACE-FTS
Page 4417, line 9: define AIRS . . . into Earth orbit
Page 4417, line 10: medium-resolution
Page 4417, line 18: used CO2 above (line 3)

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Page 4418, line 3 and 4: coincident or co-incident? Choose one and use consistently. Both are used throughout the paper.
Page 4418, line 13: better-resolved profiles
Page 4418, line 14: lower-resolved
Page 4418, line 22: (Rodgers, 2000; Chapter 10.3.1)
Page 4419, line 1-3: Here and elsewhere, inconsistent use of hyphens in compound adjectives: better-resolved, low-resolved - change to lower-resolution?
Page 4419, line 13: what does set union mean?
Page 4420, line 13, 16: add periods after equations (also Eqns. 13 and 15 on page 4422)
Page 4420, line 19: define vmr (why not VMR throughout?)
Page 4421, line 7: use water vapor for consistency
Page 4421, line 19: remove paragraph indent
Page 4421, line 20: on the coarser grid
Page 4421, line 26: is the mean difference
Page 4422, line 8: Why is root mean squares used throughout? Usually rms/RMS means root mean square.
Page 4422, line 22: into day
Page 4423, line 1: Replace "in special sections" with the actual section numbers for those following sections that discuss non-LTE, e.g., 5.1.5, 5.2.6, 5.3.4
Page 4423, line 4: nightly means
Page 4424, line 18: Qualify this statement as "just above". Not true for all altitudes

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above the tropopause.

Page 4424, line 19: differences relative to ECMWF

Page 4425, line 7: temperatures throughout the stratosphere

Page 4426, line 28: with MIPAS

Page 4426, line 27: hinting at overly optimistic

Page 4427, line 25-16: two mean temperature profiles . . . in the case of MIPAS, which

Page 4429, line 22: but did not

Page 4431, line 18: Here and elsewhere in the paper, replace “in the order of” with “on the order of”.

Page 4431, line 19: consistent with

Page 4431, line 23: This is inconsistent with . . . or This disagrees with . . .

Page 4433, line 20: which causes

Page 4433, line 24: provides a picture consistent with

Page 4434, Section 5.2.6: State how many profiles are included in Figure 15. Is there a consistent difference between the LTE and non-LTE profiles? If so, could a systematic correction be applied to the MIPAS data?

Page 4435, line 5: thus the latter are

Page 4436, line 1: consistent with

Page 4437, line 13-14: below 25 km and above 35 km . . . differences are larger.

Page 4438, line 4 and 7: 60-65 and 65-70 use single and double hyphens – use AMT format

Page 4439, line 4: well captured . . . with the TMF lidar

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Page 4439, line 5: throughout the stratosphere

Page 4439, line 10: temperatures

Page 4442, line 25: explicitly

Page 4443, line 1: as a consequence

Page 4443, line 5: into the instrument’s optics by internal parts.

Page 4443, line 7: are accounted for

Page 4443, line 12 and 14: change “not further identified” to unidentified

Page 4453, Table 2 caption: Number of observations coincident with MIPAS for

Page 4455, Figure 2 caption, line 3: coincident with the MIPAS

Page 4468, Figure 15: State the number profiles included in this comparison - one or many?

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 4403, 2011.

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