

## ***Interactive comment on “Intercomparison of atmospheric water vapor soundings from the differential absorption lidar (DIAL) and the solar FTIR system on Mt. Zugspitze” by H. Vogelmann et al.***

**Anonymous Referee #2**

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### General Comments

This paper compares integrated water vapor measurements made using a solar FTIR spectrometer and a DIAL system over a period of three years. Excellent agreement between the two techniques is obtained, and an estimate of the DIAL precision is derived. Optimal temporal and spatial matching criteria for precision estimates are also extracted from the data. This is a useful study that provides new information on the measurement capabilities of the FTIR and DIAL. I recommend publication in AMT after

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the minor comments below are addressed by the authors.

### Specific Comments

Page 5413, line 5: To better put this work in context, it would be appropriate to acknowledge other work that has been done on FTIR measurements of water vapour, particularly the series by Schneider et al., e.g., Schneider, M., Hase, F., and Blumenstock, T.: Water vapour profiles by ground-based FTIR spectroscopy: study for an optimised retrieval and its validation, *Atmos. Chem. Phys.*, 6, 811–830, 2006, <http://www.atmos-chem-phys.net/6/811/2006/>. Schneider, M., Hase, F., and Blumenstock, T.: Ground-based remote sensing of HDO/H<sub>2</sub>O ratio profiles: introduction and validation of an innovative retrieval approach, *Atmos. Chem. Phys.*, 6, 4705–4722, 2006, <http://www.atmos-chem-phys.net/6/4705/2006/>. Schneider, M. and Hase, F.: Ground-based FTIR water vapour profile analyses, *Atmos. Meas. Tech.*, 2, 609–619, 2009, <http://www.atmos-meas-tech.net/2/609/2009/>. While this sentence is focussed on FTIR measurements of integrated water vapour, these preceding FTIR measurements of water vapour profiles are relevant.

Page 5415, line 25: Explain what adapted dynamically means.

Page 5415, line 28: What are the demanding requirements referred to here?

Page 5417, lines 3–4, 14: Was there any selection for azimuth angle in the 178 pairs? Clarify whether the outliers were removed before plotting the data in Figure 2. The caption for Figure 2 says “all” measurements were plotted, implying that the outliers were not removed. Assuming the outliers are in the Figure, it would be informative if the points representing the 17 and 9 outlier cases were indicated with a different symbol or color.

Page 5417, line 6: Explain what an overdrive in the lidar receiver means.

Page 5417, line 19; and page 5419, line 8: Define how the overall bias was calculated. Make clear which instrument is positively biased relative to the other.

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Page 5418, line 8-9: Figure 2 shows 178 pairs using a 22 minute coincidence interval, while Figure 3 shows “a subset of the coincident pairs of Fig. 2”. However, the time interval extends well beyond 22 minutes on the x-axis of Figure 3. Please clarify.

Page 5419, lines 24-26: While Figure 3 and discussion in the text defines the temporal matching criterion, this sentence in the Summary section of the paper seems to be the first discussion of the <1 km spatial matching criterion. More explanation of the spatial matching should be provided earlier in the paper, in Section 3.

Table 2: State whether the results in the table refer to all pairs, or exclude the type 1 and 2 outliers. Do the numbers in this table change significantly if tighter coincidence criteria are used, such as 18 minutes?

Figure 2: Indicate the type 1 and type 2 outliers by different symbols or colors. Also highlight the 9 pairs that result from temporal coincidence interval of 18 minutes. Could also add the correlation coefficient.

#### Technical Corrections

Page 5412, lines 2 and 5: define FTIR and UFS

Page 5412, line 6: “turned out to be” -> “has been shown to be”

Page 5412, lines 9-10; and page 5419, lines 6-8: the numbers in brackets are ambiguous – define them (fitting errors?) Why not use the same number of significant figures in the text and in Figure 2?

Page 5412, lines 20-21: I think you mean “temporal matching on scales shorter than 10 min and a spatial matching on scales smaller than 1 km.”

Page 5413, line 2: delete already

Page 5413, lines 5 and 6: “has recently been shown to be ... and this has been confirmed by follow-on intercomparison studies”

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Page 5413, line 28: and IS the goal

Page 5414, line 16: Due to its principle OF OPERATION,

Page 5414, line 20: SFIT2

Page 5414, line 24: does the Toth spectroscopy implemented in HITRAN 2000 qualify as “new”

Page 5416, line 5: replace “overtops its surroundings by far”, perhaps with overlooks or dominates, or “is significantly higher than its surroundings”

Page 5416, line 21: change of to from

Page 5417, line 28: is extraordinary a valid description?

Page 5417, line 28: completely different ...

Page 5418, line 18: which is OF the same order

Page 5419, line 16: The agreement (Fig. 2) ALSO reflects

Table 1: wavenumber, microwindows

Figure 1: asl. or a.s.l.?

Figure 3 caption: Define sigma? “as a function of the temporal coincidence...” “for a larger interval” Cut “amount of” - refers to quantity not discrete values.

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Interactive comment on Atmos. Meas. Tech. Discuss., 3, 5411, 2010.

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