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Atmospheric Chemistry and Physics Discussions

Interactive comment on "First airborne water vapor lidar measurements in the tropical upper troposphere and mid-latitudes lower stratosphere: accuracy evaluation and intercomparisons with other instruments" *by* C. Kiemle et al.

Anonymous Referee #2

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The goal of the paper is to demonstrate the performances of the DLR water vapor DIAL lidar flown on the FALCON aircraft by comparison with in situ measurements performed at higher altitude above on a balloon and on the M-55 Geophysica aircraft. Additional comparison are provided with the MIPAS remote observations on the ENVISAT satellite.

General comments The objective is achieved. The DIAL bias $<$8% in worse case with the 3 in situ instruments is smaller than the sum of systematic errors.of the instruments. The relative difference does no show any altitude dependence also the water

vapor MR varies by a factor 10 in the altitude range of the comparisons in the tropics. The standard deviation of the difference is smaller than 20%, which is smaller than the cumulative random errors of each and the water vapour variability seen by each individual instrument. Overall it’s an excellent paper very carefully written especially the description of the DIAL accuracy. The reader is fully convinced.

Specific comments I have however two suggestions for minor corrections 1. MIPAS. Although the distance with the DIAL is on average larger than that with the Geophysica, the attribution to atmospheric variability of the 48% standard deviation of the difference with the DIAL between 10-16 km in the tropical UT seems to me too much easy. E.g. a difference of –70% is observed for the shorter distance of 150 km on 15 Fev at a distance not very different from the comparison with in situ instruments. The 5-25% given for the precision/accuracy of MIPAS applies to the stratosphere and the mid-latitude. It is likely that the precision of the retrieval degrades in the tropical UT where an altitude registration error of 500 m would result in a 50% change of retrieved water vapor concentrations.

2. The conclusion of the discussion of the DIAL profiles (p13) should be revised. It is unclear that there is a cold point tropopause at 17 km (the broad vertical resolution saturation ratio profiles shown in Fig 8 do not allow to say that). The altitude of the tropopause over the Sao Paulo state area in Feb-March 2004 was lower, between 15-16 km, surmounted by an almost isothermal 3-4 km layer (e.g.Pommereau et al. and Durry et al ACPD 2007). Humid layers could be observed sometimes above (eg red, orange and yellow DIAL water vapor profiles of Fig 8 or that of Durry et al.). It does not seems to me possible to conclude that the hygropause is about 1-2 km lower than the cold point tropopause.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 10353, 2008.

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Interactive Comment