

Interactive comment on “Relevance of a kite-based calibration for a water vapour Raman lidar” by J. Totems and P. Chazette

Anonymous Referee #1

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General comments:

The authors discuss their efforts to use in-situ water vapor measurements performed on board a kite to determine the overlap function and to calibrate a water vapor Raman lidar system. The results of this procedure are then compared to other humidity data, namely profiles of radiosondes and from the ECMWF model as well as integrated water vapor data from satellite-based microwave remote sensing (MODIS) and ground-based sunphotometer measurements.

Rather astonishingly, there have been (to the best of my knowledge) no previous attempts to use kite-borne measurements for water vapor Raman lidar calibration. This may be explained by the fact that kites were quite commonly used for atmospheric research by the meteorological pioneers in the late 19th and early 20th century but carry

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so many disadvantages compared to modern platforms that they have been replaced meanwhile. But for the application discussed here, kites are clearly advantageous compared to, e.g., radiosondes, aircraft, or unmanned aerial vehicles as they allow for longer-lasting measurements close to the lidar beam and thus reduce sampling differences. In summary, this work is new and relevant. The paper is mostly well written. I suggest that the manuscript is accepted after minor revision.

Specific comments:

Title: “Relevance of” could be dropped. Of course, the contents of a scientific paper are relevant. . . Maybe “Calibration of water vapour Raman lidar with a kite-based humidity sensor”

Abstract, line 9: “below the full overlap range. . .” is unclear. Maybe “allowed to determine the overlap function and calibration factor simultaneously”.

Section 2.1, figure 1: I think it would be interesting to include a zoom to the experimental region which shows the lidar site and the sites of the other instruments with orography and a kilometer scale. For me, the large map could be deleted as the discussed comparisons are anyway not related to such a large region.

Page 10585: The details of how $\delta_{\tau}(z)$ was determined are unclear to me. Please provide additional details, e.g., on the assumptions. Are there references for this approach?

Section3: Can you tell/estimate how close the kite was to the lidar beam during the three flights?

Section 4.1, figure 4: I suggest showing also a profile of the mean difference between lidar and radiosonde data.

Section 4.2: 135 km distance is just much too far to allow for a comparison of water vapor in the lower troposphere, especially in heterogeneous terrain. This is no new message. So this part should just be deleted.

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Technical correction:

Table 1: I would prefer “WVMR uncertainty” because one does not know the “error”.

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