

Interactive comment on “3D Water Vapor Field in the Atmospheric Boundary Layer Observed with Scanning Differential Absorption Lidar” by F. Späth et al.

Anonymous Referee #1

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The paper discusses different sampling strategies conducted with a scanning water vapor (WV) DIAL (the University of Hohenheim DIAL) to derived 3D WV fields in the lower troposphere. Data from a recent campaign in Germany are used to illustrate the purpose as well as assess the uncertainties associated with the different strategies (RHIs, volume scans and horizontal scans) and the necessary trade-offs between scan speed, temporal and range resolution needed observed the small scale WV structures in the atmosphere. The selected case studies from the SABLE and HOPE campaigns nicely and convincingly illustrate the capability of the Hohenheim WV DIAL.

The paper is well written, well-structured and pleasant to read. My recommendation is that the be published provided that the authors clarify some points listed below (minor

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revision).

Abstract P1, lines 11-12: I do not think the sentence “HOPE was part of the project High Definition of Clouds and Precipitation for advancing Climate Prediction (HD(CP)2)” is useful in the abstract.

Introduction

P3, line 16: resulting IN P3, line 17: “Operating the WVRL in the UV but at larger wavelength [. . .]” not clear. Do you mean at 355 nm? P3, lines 17-19: to be complete on the subject, you should mention that daytime measurements are possible provided that narrow interferential filters are used which are effective to screen out the solar background. The Raman lidar at the ARM site in Oklahoma uses such a technique. P3, lines 24-25: I agree this is a first when using a unique instrument. However, others have combined measurements from different instruments to achieve the 3D documentation of WV in the troposphere.

Section 3 Section 3.2 P8, line 8: how is the background correction made? On a shot-by-shot basis? How do you measure the background light that needs to be subtracted from you backscatter signal? P8, line 11: a sentence starting with “as well as” is lame. Please rephrase. P8, line 21: “must apply” or “must be applied”, not “must applied”

Section 3.3 P8, line 25 “WV associated with scanning” or “from scanning”

Section 4 Section 4.1 P10, line 24: “This dataset” rather than “These results” P10, line 31: m s⁻¹ instead of ms⁻¹ P10, line 31: with a minimum of 5.5 m s⁻¹ at 1250 m above ground level (agl). In the following, please use m agl when referring to heights above the measurement sites or above ground. P11, line 5: there is a complex layering in the humidity observations. However, the virtual potential temperature profile shows that the residual layer top is around 800 m, while the developing mixed layer top is at 200 m. There is another temperature inversion around 1600 m that may be related to more synoptic meteorological conditions such as large scale subsidence, etc. . . P11, line 12:

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according to the following procedure differently for different ranges. P11, lines 16-17: "For all distances, the error profiles show a clear increase at the top of the ABL which rises from an altitude of around 0.9 km at 1.3 km distance to 1.1 km at 4km distance." I do not understand this sentence, please clarify. P12, lines 13-14: where are the clouds shown? On Fig. 6? Can you point to or specify in the text where the clouds are?

Section 5 Section 5.1 P13, line 12: use 'm agl' to make sentence less complicated.

Section 5.2 P13, line 22: above 400 km (m not km) P13, line 23: "...the noise increases stronger with..." this is not clear, please rephrase. P13, line 30: insight INto

Section 6 Section 6.1 P15, line 3: as close as possible TO the land surface P15, line 28: do you mean 800 m?

References Please check carefully: some references are listed which are not cited in the text.

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