Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2017-35-RC1, 2017

Atmospheric Measurement Techniques Discussions
Open Access
EGU

Interactive comment on "Evaluation of Turbulence Measurement Techniques from a Single Doppler Lidar" *by* Timothy A. Bonin et al.

Anonymous Referee #1

Received and published: 8 March 2017

General comments The paper presents observations from the eXperimental Planetary boundary layer Instrumentation Assessment (XPIA). The observations were used to verify Doppler lidar turbulence profiles through comparison with sonic anemometer measurements. During a 17-days period, a single scanning Doppler lidar continuously cycled through different turbulence measurement strategies: velocity azimuth display, six-beam, and range height indicators with a vertical stare. The investigation focused on turbulence kinetic energy, turbulence intensity, and shear velocity data. For evaluation, sonic anemometer measurements at six heights on a 300-m tower were available. The paper is well written and of general interest for the lidar community (scientists and users alike). I therefore recommend the paper to be published with minor revisions.

specific comments Section 1: the introduction is quite general and could be more concise on the topic tackled (more focused) in this investigation. Page 5, line 2: Specify

Printer-friendly version

Discussion paper

which of the methods mentioned in Lenschow et al. (2000) is used to remove noise. Page 5, line 17: could you make a statement concerning the time window for detrending (15, 20, 30, 60 min?) on the turbulence results. Applying a 20-min window could filter out large convective cells. Page 9, line 14: '. . . 50-m pulse width . . . ': does that mean that physically independent measurements are (physical resolution of the lidar) 50 m? Page 12, line 5: y = bx: Transformation of equation (9) gives y = x 10b Figure 5 and 9: a zero line would be helpful. Page 13, line 22 (" . . .. . . may be due to the inability to capture all the scales of turbulence"): Spectra should be included in order to see which scales are not captured (to prove the statement would be good) Page 15, line 18: (negative u-variance values). Is this the same effect as for TKE mentioned on page 11, line 5? Page 16, line 7: "the bias becomes small as most of the turbulence scales are resolved". Once again, please prove that by providing a spectrum! Section 4.3, Figure 9: As the comparison of u-star shows a huge scatter, sample time/spatial series and spectra from periods when the sonic and lidar data agree and disagree, respectively could provide more insight into the differences. Have you looked at the data in more detail? Any additional information would be good? Page 15, line 8: 'the largest scales of turbulence are observed if the time window length exceeds the integral time scale . . . ': Although this is correct a discussion about the error should be added, i.e. what is the error due to poor statistics if the time window is 5 or 10 min only. Page 19, line 13: examples that turbulence can significantly vary spatially is shown in Maurer et al. (2016) doi:10.5194/acp-16-1377-2016. Page 20, line 1: examples for spatial variations in the mean wind due to local flow (valley wind) is also demonstrated in Adler et al. (2014) doi: 10.1007/s10546-014-9957-8. Page 20, line 9: (spatial resolution): what is the physical resolution? See comment above. Page 21, line 28: Please rewrite the sentence "Although the sonic anemometer observations agreed most poorly with RHI-measured TKE and TI" into "Although the RHI-measured TKE and TI agreed most poorly with sonic anemometer observations" because sonic observations are considered to be the "truth".

Typing errors Figure caption Figure 2: '. . .. shown (c)': delete âĂŽshown' Figure 7: 'u

integral scale' should be 'l integral scale' Page 15, line 9: '10 - –100 s' should be '10 – 100 s' Page 20, line 4: "e.g., Mann et al. . . " instead of " . . . i.e."

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2017-35, 2017.

Printer-friendly version

Discussion paper