Author’s response to Reviewer #2

We thank all referees for their comments which have helped us to clarify the text.

It is a thorough investigation dealing with the ability of DWL to detect wakes from high-rise buildings in an urban environment. I have just a few comments that I ask the authors to consider. Considering the manuscript in the introduction is partly focused on atmospheric dispersion in an urban area with high-rise buildings, I suggest adding a reference to “the Salt Lake City URBAN 2000 Tracer Experiment” which deals with the problems from a dispersion point of view of urban area with several high-rise buildings. A reference could be Allwine, K. J., J. H. Shinn, G. E. Streit, K. L.Clawson, and M. J. Brown, 2002: Overview of URBAN 2000: A Multi-Scale Field Study ofDispersion Through an Urban Environment, Bull.Amer. Meteor. Soc. 83(4), 521-536. Or Hanna Steven, Britter RFEX and Franzese (2003) Baseline urban dispersion model evaluated with Salt Lake City and Los Angeles data.Atmospheric Environment 37(36):5069-5082 DOI: 10.1016/j.atmosenv.2003.08.014

We have added a reference to the overview paper of URBAN 2000, since here also doppler lidar measurements are described

Line 114: Do you have a reference for the 30% lower threshold value for the number of data points available? I find the value rather low.

The sampling frequency was rather high throughout the period (1 Hz and 0.3 Hz later on). However, especially during the 1Hz period we had problems with sufficient SNR at the top of the boundary layer. When using 30% of data availability, we still use 180 or 540 data points to calculate the variance per 30 minute period. For higher order statistics this may not be sufficient. However, we do not use skewness and kurtosis to derive the mixing height.

Line 117: what is the spread of the 21 values of the mixing height? Did you consider the effect of clouds and rain?

Half hour periods with rain are filtered out. Clouds are only implicitly excluded, since the signal dramatically reduces inside the clouds. After taking this into consideration, in the convective and in the stable boundary layers the spread in these 21 values is not large and usually around zero (i.e., all 21 threshold values result in the mixing height being at the same range gate at 18 m gate resolution). However, in the transitions (morning and evening) there could be some spread. There is an example of the spread in figure 7 of Barlow et al., 2015. We’ve added these details in section 2.2 (last paragraph).

Line 152 How was the threshold values for the stability classes obtained?

The classes were defined so that each class would contain more than 15% of the available data and the data would be somewhat evenly distributed. This is now added in the text

Line 162. Same as in l152 but for the stability based on the mixing height.

This classification was really meant to relate the depth of mixing to the building height and the roughness sublayer and on the other hand the deep convective boundary layer. Twice the building height is generally considered the minimum roughness sublayer depth. We have added some text here and there in this paragraph to make this clearer.

Line 191 Check Eq. (1). Units on left hand side is m/s and on the right hand side s m2/s2. Additionally I am not sure that V has been defined.

We apologise, this was an error introduced in redrafting - the V was extraneous and has been removed.