Wind Energ. Sci. Discuss.,
https://doi.org/10.5194/wes-2018-21-RC1, 2018

eawe european academy of wind energy
Open Access WIND ENERGY SCIENCE DISCUSSIONS

Interactive comment on "Does the wind turbine wake follow the topography? – A multi-lidar study in complex terrain" *by* Robert Menke et al.

M. Guala (Referee)

mguala@umn.edu

Received and published: 15 April 2018

The manuscript is interesting and poses a relevant question for wind power plant layout in complex terrain. Authors employed state of the art field measuring technology, which makes the dataset unique and valuable.

There are however a few issues that I would like to point out, which could lead to an improvement of this work and perhaps a broader impact in the community.

1) I have some reservation on the atmospheric stability assessment: |z/L| <0.01 is a very strict condition for the neutral regime, rarely observed from micrometeorological data from sonic anemometers. Based on Fig 6 it seems that it occurs quite frequently. I am wondering how accurate is the estimate of the turbulent heat flux and how far from

the surface (the actual z) is the estimate referring to.

2) More importantly the Monin Obukhov similarity assumes a logarithmic region where the mean velocity profile is distorted by the thermal stability effect. In complex terrain the contributions to mechanical production of turbulent kinetic energy may be more complicated as compared to the u*^3/kz term that is likely employed here. The authors should provide the definition of L and discuss how they account for the non-flat topography and for the orientation of the reference system with respect to the mean incoming wind (likely non flat and to some extent following the terrain).

3) Fig 7: the wake deficit depends on the turbine operating conditions: it would be relevant to provide the tip speed ratio and the power coefficient for the wake plotted in Fig 7b (at least the 10min corresponding averaged value).

4) Despite of many hours of measurements, the most interesting figures show results from quasi-instantaneous measurements. I wonder if it is possible to use conditional averages or two point correlation to support the conclusion with statistics instead of single realization. Perhaps, the wind tunnel work by KB Howard, LP Chamorro, and M Guala "comparative analysis on the response of a wind-turbine model to atmospheric and terrain effects" Boundary-layer meteorology 158 (2), 229-255, 2015 may offer some ideas.

5) Fig 10b: how is the wake deflection angle estimated? within a range of x/D? based on the velocity contour, a velocity minima envelope? Please clarify

6) For non LiDAR experts, perhaps the definition of radial velocity should be provided. Some of the velocity contour distribution with height presented in fig 9b are prone to be misinterpreted without a proper definition.

Best, Michele Guala

Interactive comment on Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2018-21, 2018.