Wind Energ. Sci. Discuss., referee comment RC1
https://doi.org/10.5194/wes-2021-88-RC1, 2021

Comment on wes-2021-88

Anonymous Referee #1

Referee comment on "Computational fluid dynamics studies on wind turbine interactions with the turbulent local flow field influenced by complex topography and thermal stratification" by Patrick Letzgus et al., Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2021-88-RC1, 2021

The manuscript is well written and presented. The usefulness of all this work is questionable since all ends in general statements and no quantification.

Conclusions are a list of obvious and well-estabilihed facts, among the community:

1) The escarpment accelerates (HOW MUCH?) the flow field at the altitude of the rotor plane ....

2) At the test site, the forest has a large impact (WHAT IS A LARGE IMPACT?) on the flow field in ground proximity (HOW CLOSE TO THE GROUND?). Highly turbulent fluctuations of low wind speeds in the forest wake strongly mix with the high-velocity flow field above and result in highly complex and turbulent flow situations (HIGHLY, COMPLEX TURBULENT FLOW SITUATIONS?).

3) Thermal stratification also has a strong impact on the ambient turbulence and the forest wake. Stable conditions suppress turbulent mixing, especially downstream of the forested escarpment, whereas turbulence and dispersion are strongly amplified for convective conditions.

4) By considering the wind turbine in the flow field, it has been shown that the forested escarpment impacts the inflow of the turbine, as well as the mixing of the forest wake with the turbine wake. This affects wake decay further downstream. Unstable conditions amplify this effect (HOW MUCH), while in stable conditions the wake extends further downstream.

5) Taking all these effects into account when simulating real conditions of a five-minute period on 10 March 2021, decent agreements (WHAT IS A DECENT AGREEMENT?) with the mean velocity profile and the turbulent statistics measured by the met masts were shown.

6) The prevailing unstable conditions led to increased mixing of the ambient turbulent flow with the forest wake. This had an increased effect on the inflow of the rotor plane and on turbulence amplification in the forest wake.

7) To evaluate the performance output of a virtual turbine, all of these effects had to be considered. Topographic effects and convective conditions cause low shear at the rotor position on the plateau. However, vortex structures that detach from the forest occasionally cross the rotor plane and have a significant impact on performance in the lower half of the rotor. Inclined flows in the escarpment are intensified by convective conditions, resulting in increasing angles of attack and, therefore, more torque in the left rotor plane. The highly turbulent flow in the test field also impacts the turbine rotor strongly.