Review of "Influences of lidar scanning parameters on wind turbine wake retrievals in complex terrain"

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This manuscript employs large-eddy simulation to simulate the scanning Doppler LiDAR-based measurements of wind turbine wakes. The study considers three LiDAR system installed in a complex terrain of Perdigão field measurement site and investigate how scanning parameters influence the wake observation. Since LiDAR-based wind field measurements is receiving a lot of attention in wind energy, from early planning stage for wind resource assessments to turbine control during the operation phase, studies like the one presented in the current manuscript is important to understand the accuracy of LiDAR technology. However, the authors need to revise and improve the manuscript significantly before it can be accepted for publication. Discussions are confusing and at many places incomplete. It is not always possible to understand which figure you are explaining in the particular paragraph. The authors are asked to address the following comments in the revised submission.

Specific comments:

1. Pg1, line 18: "Scanning lidars . . . "
   Reference(s) is required
2. In the Introduction (1st and 2nd paragraphs), you have mentioned about many earlier studies, but have not provided any information about their findings and contributions. Furthermore, you also need to mention what was missing in those studies so that you can link them with the objectives of the current manuscript.
3. Pg. 2, line 27 through 31: The name of Perdigão field campaign site appears abruptly over here. Since you are performing LES for this site you may move this part to the last or the 2nd last paragraph.
4. Description of figures in general is confusing. It is not clear whether you are describing the results presented in specific figure or simply providing general discussion. Please start with more soecific statement like "Figure . . . shows...", and then describe the figure
5. Figure 1: It will be helpful if you can add a table summarizing instruments and turbine.
6. Pg. 3, line 62: ". . . from the upwnd ridge . . . "
   If you wan to add upwind ridge over here, you should add and arrow indicating dominant wind direction in Fig. 1.
7. Fig. 2: Why do you have only one data per hour in this figure? Please show 10-minute or 5-minute mean wind and stability data.
8. Eq. (1): Please describe how do you obtain u_*, Θ_0 and $\overline{w'\theta'}$.
9. Pg. 4, line 75 and Fig. 2: "The selected cases . . . neutral to stable"
   Is there a reason for selecting neutral to stable case? You also need to discuss why stability differs significantly with height in Fig. 2.
10. Pg. 5, line 81 through 83:
    This sentence is not clear. What do you mean by "instrument 85 to 89"?
11. Pg. 7: Table 3: I do not think readers will understand parameters in this table and what do they stand for. You need to provide more information either in the text of in the same table.
12. Pg. 7, line 106 through 116: You need to provide more information about the LES setup. Are you using periodic boundary conditions in the horizontal direction? If so, do you have any special way of generating inflow fields? How have you implemented stability? Do you define initial potential temperature profile?
13. Pg. 8, line 133: "linear barycentric interpolation"
    You can describe this for your case in an appendix.
14. Pg. 8, Eq. (3): What are s and ds?
15. Pg. 9, line 179 to 186: I am not sure if elevation angle of $\phi = 20°$ is sufficiently small to exclude vertical velocity component. This is particularly the case for complex terrain. You should discuss the challenges of including w while computing velocities from v_r. Furthermore, in the result section you should show the error incurred due to this assumption. That should be possible, since you have access to 3D LES data.

16. Pg. 10, line 195: "... any sweep with time stamps inside the window are included."
What does this phrase mean? Please make this statement clear.

17. Pg. 10, line 211: "Maximum drag on ... the blade tip, ..."
From Fig. 4(a), it seems maximum velocity deficit occurs around the middle of the blade. This does not agree with your statement.

18. Pg 13, line 271 through 281: Are you trying to discuss the results in Fig. 5 over here?

19. Pg. 13, line 292: "By design, ..."
You cannot make such a statement about elevation angle, until you compare results from two or more elevation angles?

20. Figure 6 (a): The wake width drops significantly downstream from 3D. This seems unnatural to me. Also, two lobes disappear too early ($\leq$1.5D) compared to 4 to 5D in many wind tunnel studies. Is it solely due to "insufficient resolution of retrieval points" as stated by the author OR complex terrain is also a contributing factor? This should be clarified in the manuscript.

21. Pg. 16, line 319: What is "peak velocity deficit magnitude" in Fig. 7? Please define it...if necessary using an equation.

22. Fig. 7: What is the definition of the "magnitude of the wake deficit". Please add its mathematical definition (or description) in the text.

23. How can you relate simulation results (Fig. 7, 8, 9) against the observations in Fig. 10? This is not clear from the discussion in section 5.1 and 5.2.

24. Pg. 21, line 439 through 441: I do not think you have verified these statements regarding elevation angle. For example, you could have done scan at higher elevation angle and compared the results against 20° elevation limit you have set.

25. Pg. 22, line 445 through 448: You can move the literature review to Introduction. I do not see the point in putting this paragraph over here.

Minor comments and corrections:

1. Pg2, line 48: Section 3 is missing.

2. Table 1: Date format ins the 1st and the 2nd rows should be same. Also, add standard deviation of wind direction for all three cases.

3. Pg. 4, line 67: "three towers ..."
I can only see two towers in Fig. 1. Where is the third tower.

4. Pg. 5, line 92: Do you mean CNR > -24dB?

5. Pg. 15, line 305 through 314: Should be a single paragraph.

6. Pg. 20, line 403: "... at near..."
Remove at