General comments

We are pleased to see that the remarks we made about the organization of the manuscript and the necessary explanations of all the aspects of the method have now been addressed. Most of the comments on this version are minor ones. The scientific points that still deserve an answer concern the computation of the turbulence integral length scales and the comments about these results (see detailed comments on Sec. 4.4 and App. B).

Detailed comments

Section 1. Introduction

Lines 98-100. “The contribution of the study…”: in this sentence, it would be better to remain more general, i.e. not mention OpenFAST and the Gothard Pass site, that have not yet been introduced, but rather numerical simulations and a mountainous site. The transition to the next sentence would remain natural.

Lines 101-104 and 105-107. As already said in the previous review, one-sentence paragraphs should be avoided.

Lines 112-114. “The results then compare…”: a reference to Sec. 4 should be added in this sentence.

Section 2. Background and theoretical framework

In our opinion, it would be more logical to present the two paragraphs of Sec. 2.2 in the reverse order. Also, subsections 2.1 and 2.2 could be merged: it is possible to introduce the rotor power very short subsections should be avoided).

Line 147. It is incorrect to say that “the instantaneous wind speed at height z” is given by Eq. 3. Actually, it gives the probability density function that models the distribution of instantaneous wind speed values at height z.

Line 182. Since this is the first time the authors mention an appendix in the text, it should be Appendix A instead of B, and the order of appearance should be reversed in the Appendix section.

Section 3. Methodology

Lines 184-197. Instead of using (i), (ii), etc., it would be clearer to refer to the actual subsection numbers.

Line 198. Same remark: point to the actual subsection number instead of a vague “below”.

Line 208 / Eq. 8. What does U denote here? Is it the hub-height wind speed or the equivalent wind speed? We get it that it comes from the turbine technical specifications, but it would be good to precise what it is.

Line 212. The website url should be included into a reference and not directly in the text.

Lines 223-224. “the mean wind-speed profile and the wind-speed standard-deviation profile are both represented [by a Taylor expansion] over the rotor layer. The words within [...] are missing for the sentence to actually bring some information. A colon is also missing at the end of line 224.

Line 226. Writing about the Taylor coefficient for the mean wind while the formula just above does not use them is confusing. It would probably be clearer to say that the the wind-speed standard-deviation profile is represented by a Taylor expansion in a similar way to the the mean wind-speed profile, using coefficient noted as c_{sigma_v,i} instead of c_{v,i}.

Lines 229 and 231 / Eq. 11 and 12. Are the <P_z> numerical values or analytical expressions? If they are numerical, then P_turb is a discretized integral and the z step should be precised.

Section 3.4 was better in the previous version, i.e. the cases description and formulas that have been moved to Section 4.1 should have stayed here. We understand that the authors wanted to give only the methodological framework in Sec. 3, and show the application cases in Sec. 4. However, for readability, it is better to give all the analytical formulas in the methodology section, so that Sec. 4.1 can focus on the results in terms of power.

Line 261. "cross-streamwise" is just "cross-stream"

Line 268. "its influence on the results is presented" -> "will be"

Line 269. "As shown later in Sec. 4.4, and relevant for the methodological choices made here," this makes an awkward transition from the previous sentence ending by "Sec. 4.4". Consider replacing by something more simple like "In particular, it will be shown that…"

Line 281-282. "the inflow advects over several kilometres": this sentence is awkward. The verb "to advect" should be used in passive form, e.g. "the air mass is advected over several kilometres".

Lines 292-293. The numerical values are given in Table 1 so there is no need to remind them here, nor give the numerical formula (Eq. 17). You can just say that h_E92 and h_WP3.0 are the hub heights and R_E92 and R_WP3.0 are the rotor diameters of the E92 and WP3.0 turbines, respectively, which values can be found in Table 1.

Figure 5. Please carefully check that the scheme is consistent with the formulas in the text and that all relevant parameters are mentioned. As for now, there are still small mismatches between the math notations above the arrows and the text: for the power curve fitter, v should be U and P(v) should be P_cp(U); for the wind profile scaling, the r should be R; for the outputs, P_AN should be P_an. Some of the parameters, like Δz_lidar or v_in / v_out, do not appear on the scheme so far.

Lines 307-310. A reference to Sec. 4.3 should be added in this paragraph.

Section 4. Results and discussion

Line 721. There must be a space to remove between the parenthesis and the dot.

Table 2. The minus sign differs from the dash symbol, please use a proper minus sign for the negative values (to pick up in the special characters in Word).

Lines 529-530. "the individual 10-minute estimates show large variability, ranging from a few metres to several hundred metres depending on height, component, and inflow period": this statement should be supported by (a) figure(s) (see the comment about App. B, line 759) as Table B1 does not give a full picture of the length scale variability.

Lines 541-543. "The tested configurations include the original short-scale USRVKM example profile, a modified component scaling of (1.0,0.8,0.6), a length-scale profile increased by a factor of ten, and a combined case in which both modifications are applied." So the length scales derived from the lidar observations were not used for the simulations? A comment would be needed, saying for instance that these values are covered by the ×10 case.

Lines 546-547. "from 1151 kW in the base case to 1151 kW for the modified component scaling, 1151 kW for the increased length scales, and 1150 kW when both modifications are applied." As the values are all the same (or almost), they are not useful. The results should be directly given in terms of difference to the base case, only reminding the base case power value at the end of the paragraph.

Lines 551-552. "This was done for the representative case in which the largest deviations in the velocity spectra were observed": does this sentence only refer to the seed test or to all the

turbulence sensitivity tests? If it is the latter case, then this information should be provided earlier, around line 541.

Line 552. “corresponding to wind profiles around 9 m/s” -> “speeds”, not “profiles”.

Appendix B

The references relative to the method described in this appendix must absolutely be provided.

The notations must be clarified, as the text oscillates between the zonal/meridional and the streamwise/cross-stream decomposition of the wind.

Lines 741-742. “the five beam azimuths” rather than “positions”. Also, “V” should be vertical, please avoid jargon.

Lines 743-744. The way you explain it, u and v do not appear to be the streamwise and a so-called “lateral” wind component, but the meridional and zonal wind components (and by the way, the usual notation are the reverse). If you did compute the streamwise and cross-stream components, it should be said more clearly. The formula do not need to be reminded, as this decomposition is common, but a reference should be provided.

Line 744. The “V” can be removed after “vertical beam”.

Line 749. The index i is not u, v or w, as we actually have u_1=u and not u_u, u_2=v and not u_v and u_3=w and not u_w. It would probably be easier to directly introduce the u_i’s in the previous paragraph.

Line 752 / Eq. B3. The autocovariance function computed from the radial wind speeds recorded in a single beam direction is impacted by the lidar instrumental noise at zero lag (Bonin et al., 2016; Lenschow et al., 2000). In this case, the autocovariance function must be extrapolated towards the zero lag instead of using the zero-lag value as it is. How is this point dealt with when computing autocovariance after combining several beams? Did you perform any kind of instrumental noise correction?

Line 758 / Eq. B5. This equation suggests that u an v are the streamwise and cross-stream components of the wind, which is in contradiction with lines 742-743. Please clarify.

Line 759. If we understand correctly, turbulence length scales derived for all the lidar positions within the Gotthard Pass, for all inflow directions and for all hours of the day have been used altogether to compute the median and percentiles. Did you investigate if the observed variability in length scales could be related to the lidar positions, the main inflow directions, or the night/day contrast? We would like to see figures allowing to see the variability and distinguish the different sites, inflow directions and hour of the day, for the streamwise length scale and the scaling factors, though this could be put in supplementary.

Lines 759-760. “uncertainty margins are calculated from the 16th–84th percentile range”, why was this peculiar percentile interval chosen?

Line 766. The notation α already refers to the veer angle. Using another letter would be clearer.

Typo

The font used for indices in math notations should be italic when it refers to a variable (c_v, K_m…) but regular when it is a precision in the variable name (P_an, v_in…).

Some references to equations still do not follow the WES guidelines (eg., “Eq.2” in line 126 that should written as “Equation 2”). The same holds for appendices, that should not be abbreviated (line 182 and further in the text).

Reference list

For conferences, “International Conference” is usually abbreviated as “Int. Conf.”, then you should try to build an abbreviated conference name based on similar journal names, for which you can check the normalized abbreviations e.g. from: https://woodward.library.ubc.ca/woodward/research-help/journal-abbreviations/

Letizia et al.: “Journal of Physics: Conference Series” should be abbreviated as “J. Phys.: Conf. Ser.” as for Clifton et al. or Niayifar et al.

Murphy et al. et Troldborg et al.: “WES” is not the proper abbreviation for Wind Energy Science, but “Wind Energy Sci.”

Redfern et al.: “Monthly Weather Review “ should be abbreviated as “Mon. Weather Rev.”

Stull: the title “An Introduction to Boundary Layer Meteorology” is repeated at the end of the reference, please correct.

References cited in this review

Bonin, T. A., Newman, J. F., Klein, P. M., Chilson, P. B., and Wharton, S.: Improvement of vertical velocity statistics measured by a Doppler lidar through comparison with sonic anemometer observations, Atmospheric Measurement Techniques, 9, 5833–5852, https://doi.org/10.5194/amt-9-5833-2016, 2016.

Lenschow, D. H., Wulfmeyer, V., and Senff, C.: Measuring Second- through Fourth-Order Moments in Noisy Data, J. Atmos. Oceanic Technol., 17, 1330–1347, https://doi.org/10.1175/1520-0426(2000)017%3C1330:MSTFOM%3E2.0.CO;2, 2000.