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Interactive comment on "Wind inflow observation from load harmonics: initial steps towards a field validation" *by* Marta Bertelè et al.

Anonymous Referee #1

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A good account of very careful, detailed work on a technique which could have useful applications, with a good attempt to account for the inevitable difficulties of a real field test.

Detailed comments (P=page, L=line):

P2 L4: the term "lower spectrum" is not clear - or is it a typo?

P3: in L2 "does not need to be trained with data" but in L7 "is tuned" - what sort of tuning (and isn't that a simple form of training with data)?

P4 L8: change "write" to "can be written as" or "are given by"

P4 Figure 1: top left figure (vertical shear) shows arrows originating from a non-vertical

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Discussion paper

line. Does this represent rotor tilt? It should be explicitly stated somewhere that rotational symmetry depends on the coordinate system being tilted to align with the shaft axis. Presumably, after estimation you would need a final step to transform the wind components back to the 'normal' (untilted) reference frame.

P5 L21: "horizontal shear does not (except in waked conditions)" - probably not very much on average, I agree, but still maybe a bit sometimes, at least onshore due to orographic / vegetation effects - but anyway there can be significant, though short-lived, stochastic changes in horizontal (and vertical) shear across the rotor due to spatial turbulence effects.

P6 L4: I think you should explain how Equation (8) is derived, and where Q comes from.

P7 L5: "fairly robust to changes" - maybe "fairly robust to typical changes"? Presumably can't be true in the case of large changes (hopefully unlikely).

P7 L27: Using phase-shifted measurements from blade 1 & 3 to estimate the load on blade 2: Presumably this actually means time-shifted using rotor speed? Probably needs an equation here, and a some justification for the absence of a blade 2 measurement not affecting the results. Can you say why there wasn't a measurement on blade 2?

P9 L12: presumably the reference explains in more detail, but can you give a justification for using 2/3 R? Wouldn't it depend on the turbine aerodynamic details?

P10 equations 16 & 17: Consistency of notation: is VPL(z) the same as V(z)PL?

P10 L10: why was a 50-degree sector chosen, and why is it not exactly centred on the direction separating mast and turbine?

P10 L13: "two measurements" - presumably these are actually estimates rather than measurements?

P10 L14: Since the shear is actually non-linear, and different parts of the blade contribute differently to loading, some sort of weighted mean shear gradient might be more appropriate than the slope between hub and blade tip?

P10 L16: different slopes in Figure 4: Might this be due to non-linearity of shear, and/or the use of 2/3 R, or do you have some other explanation?

P11 L14: What filter characteristic, and how was it chosen? Are you filtering the wind vane signal, or the wind direction obtained by combining the wind vane signal with the nacelle position signal?

P12 L8/9: Are you effectively assuming zero upflow, as you can't measure it?

P13 L6: "scheduled as functions of the rotor-effective wind speed" - Not clear how you did this - was it by binning results in wind speed bins according to 10-minute average rotor-effective wind speed estimate and fitting model parameters for each wind speed bin?

Conclusions: "Training with 10-min data improves the quality of the estimates" stated without providing evidence. Can this be substantiated a bit better?

General comments:

The importance of veer is becoming more apparent especially for large turbines and stable conditions. How easily could the model be extended to provide an estimate of veer?

Some comment on how the model should be adjusted in case of a turbine which is using individual pitch control?

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