Submission Date 2016-05-09
Date Due 2016-05-31
Title « An innovative method to calibrate a spinner anemometer without use of yaw position sensor »
Corresponding Author Giorgio Demurtas **Contributing Author** Nick Gerardus Cornelis Janssen

General comments:

This paper is about a new calibration method for spinner anemometers. A spinner anemometer is a combination of three sonic anemometer mounted on the spinner surface of a wind turbine's spinner to measure the horizontal wind speed, the yaw misalignment and the flow inclination angle. T.F. Pedesen, G. Demurtas and F. Zahal (2015) have already developed 5 methods to calibrated a spinner anemometer with however a need of a yaw measurement as a reference. The present calibration methods do not need a reference yaw position sensor, which is not always available in field measurements.

Therefore, the contribution of the authors is of interest for practical implementation of spinner anemometers. The new methods, which consist in keeping a linear relationship between the horizontal wind speed, U_{hor}, and the yaw misalignment angle ,γ , using adjustment of the calibration coefficient $F\alpha$, is relatively simple but certainly extracted from a long experience on spinner anemometers from authors. The validation was performed for a large field measurements data-set, on real wind turbines, which allows a sensibility analysis and demonstrates its feasibility.

Major issues:

However, there is no sufficient informations given by the authors to evaluate the method on the present paper. The introduction of the present work is particularly small and poor. Indeed, the main objective of the paper is to adjust the calibration coefficient $F\alpha$ using a linear "a priori" on the evolution of U_{hor} with γ.
However, the introduction is so short that we don't have the basic relationship between the calibration coefficient and the measured sonic velocity (and other useful definitions, see detailed questions).
Also, the example given to demonstrate the method is simplified (yaw misalignment equals the inflow angle), what is the influence of the tilt angle and the flow inclination ?
At last, equation 2 (p3, L8), which is the heart of the method, do not express what is written in L6 and L7 (where is $U_{hor,d}$?).

The global presentation quality of figures and especially notations of ordinates and abscissa are of poor quality (please match notation in the text).

For these above reasons I recommend the paper after major revisions.

See questions below for detailed:

- The introduction is too short for a person who is not familiar with spinner anemometers. Here is a list of missing informations that I suggest to add:
    1. the relation between wind speeds from sonic anemometer the spinner anemometer coefficients, with coefficients k1 and k2
    2. A figure that defines all angles: tilt angle, yaw angle, flow inclination angle, inflow angle

3. A definition of Kα relatively to k1 and k2
4. A definition of the correction factors F1 and F2
5. A definition of Fα using F1 and F2
6. Give a relation between the yaw misalignment and Fα
7. Explain why you need to have a first default value of Kα,d before adjusting it using Fα
8. Give that you used in your model (figure 1) or explain

- p1 L3: “default settings”: what are they ?

- p1 L17: replace Kα by Kα,d

- p2 L12: To test the new calibration methods, the authors have tested it on an “artificial data-set”. Please explain your data-set: is it CDF computation, wind tunnel measurements, field measurements … ?
- p2 L15: what is “the model” you are talking about ? Give equations of the model (in particular the relation between U*hor,d*/U*hor* and γ)

- p3 L5: in your example (figure 1), you cannot talk about “small inflow angles” but rather about “yaw misalignment angle” unless you have a linear relationship between them ?

- p8 L5: Authors analyze that QSC increase with the wind speed, while in figure 7 we see rather a spreading of QSC with the wind speed. How do you explain that ?

All figures should be improved to match notations in the article (for example figure 1: Uhord → $U_{hor,d}$)

Comment: It would be interesting to look at the boundary layer characteristics (stability...) during the calibration to see how it influences it. Have you looked at it ?

Minor Issues:

p1 L3: “measured” appears twice

p4 Figure 2D: you write that the yawing span is +/- 10 and +/- 90° but we don't see any measurements over +/- 70° … what is right, the curve or the text ?

P10 L10: Fa should be replaced by Fα