Reply to Anonymous Referee #1
Received and published: 2 March 2020

Dear Referee,

Thank you for the review and the helpful comments. They will all be included into the final version of the paper. The changes will improve the quality of the paper. In the following, I am responding to each of your remarks.

> *1) You often use the verb "provoke", but very often not with the proper meaning. I would suggest replacing it in several instances. Overall, a revision by a native English speaker is suggested.*

Reply: I cannot find the term “provoke” anywhere in the text. Yes, the final version will be corrected by a native speaker in order to improve the overall readability.

> *2) It would be useful to have a quantification of the experimental errors. Please also add error bars in Figure 11*

Reply: Agreed. The uncertainty quantifications will be included in the final version. In order to assure readability, the estimation of the experimental error as well as the subsequent error-propagation, might be added in the form of separate figures or tables.

Figure 11 is based on the different experimental results of the Clark-Y airfoil. No uncertainty estimation is provided in the external document (Kheir-Aldeen, 1996).

> *3) Figure 9 (and the corresponding ones in the appendix) are not very redable. Please made lines thicker and/or manage the axes scale*

Reply: Agreed. The figures will be adjusted.

> *4) The "1/2" in Eq. (9) is quite unusual. This formulation, however, is not coherent with the expression of Eq. 11. Please discuss and/or* correct

Reply: The definition of the axial induction directly inside the rotor wake would not include the “½” in the equation. However, based on the decelerated **wake-flow** downstream, the axial induction is defined according to Burton (2nd edition), p. 42:

$$U_W = (1 - 2a)U_\infty \qquad (3.8)$$

That is, half the axial speed loss in the stream-tube takes place upstream of the actuator disc and half downstream.

Hence, Eq.9 is coherent with Eq.11, i.e. calculating the AoA based on the induction factors, the undisturbed inflow-speed and the rotational speed. I will clarify the definition of Eq.9 in the text.

5) Please expand the comments about the blockage effects. Beyond the aggregate BF, do you believe that the massive blockage could induce spanwise variation of the AoA? In other words, could BF alter the relative effect of GF depending on the span location?
Reply: The relatively high blockage ratio is an inherent issue of the BeRT set-up. It has been investigated in previous studies based on both experiments (Bartholomay, 2017) and CFD

simulations (Klein, 2018). Apart from the mentioned turbulence intensity, the axial velocities of both the inflow and the wake are considered homogeneous inside the rotor area. Hence, no significant spanwise AoA-variation could be detected for different measurement methods (3-hole probes, Ultrasonic Anemometers, CFD) at least in the mid-span region for $0.45R < r < 0.85R$. Nonetheless, the blockage effects are more pronounced close to the tip due to the strong flow-acceleration between the tip and the wind tunnel walls.

For the purpose of this study, the AoA are only determined at a local span-wise position of $r = 0.56R$ by means of an Ultrasonic Anemometer, comparing the baseline to the GF configurations. The spanwise blockage effects will be discussed in more depth in the final version.

> *6) To add some impact to the work, it would be nice to re-calculate the AoA by simulating the airfoil with CFD and to try comparing the pressure distribution with the experimental one. Do you think this could be feasible?*

Reply: Previously, the BeRT set-up has been extensively investigated via URANS simulations, as published by Klein et al. (2018): https://www.wind-energ-sci.net/3/439/2018/.

This includes both the axial wake-velocity and the local AoA (Fig.16, Klein et. al) in the mid-span blade region, which are in agreement with the experimental results of this study. However, the cp-distribution has not been included in the mentioned paper of Klein et al..

A renewed CFD simulation of the BeRT rotor or the Clark-Y airfoil is beyond the scope of this study.