

Authors' response to Referee #1:

We would like to thank the referee for reviewing this manuscript, the valuable feedback and the very constructive comments. At this stage of the review process, we respond to the referee #1's comments and propose improvements for the final manuscript. The referee's original comments are printed in **bold** followed by the corresponding answers. Passages from the manuscript are printed in *italic writing*, in which proposed additions are indicated in blue and deleted parts in red. Thank you very much for your efforts,

Jan Bartl on behalf of all authors

Overall comment (1a)

Symmetry: Sometimes I became a little confused about discussions on symmetry. At some points (page 12 for example) the focus was on the shape of curl, but on bottom page 14, I had the impression symmetry here meant a difference in the effectiveness of positive versus negative yaw. Maybe this could be further clarified.

Thank you for this very constructive comment. Indeed, the term 'symmetry' refers to two different parameters in those cases, which should be further clarified. On the top of page 12 the symmetry of the shape of wake curl is analyzed, while further down (bottom of page 12 to bottom of page 14) the symmetry in effective wake deflection is compared. In both cases, however, the symmetry is analyzed with respect to positive versus negative yaw angles. In the comparison on page 12, the three-dimensional wake scans behind a positively and negatively yawed turbine are parametrized to two-dimensional curves showing local velocity minima. In the comparison on page 14, however, the three-dimensional wake scans are parametrized to a single value quantifying the overall wake deflection. For clarification, the following changes are suggested for the manuscript:

p.12, l.1 ff:

Wake curl symmetry

In order to compare the three-dimensional wake shapes behind a positively versus negatively yawed turbine more quantitatively, the curled shapes of the velocity deficit area are parametrized to a two-dimensional line. For this purpose, the minimum values in streamwise velocity \bar{u}/u_{ref} are extracted from the fitted wake contours for each vertical position ranging from $y/D=[-0.5, \dots, 0.5]$. The detailed method is described in Section 3.1.

p.12, l.20 ff:

Overall wake ~~center~~ deflection

The ~~3D~~-three-dimensional Available power method ~~introduced in Section 3.2~~ is used to quantify the overall deflection of the kinetic energy contained in the wake. As

explained in Section 3.2 the minimum available power in a circular area in the wake is located, which is reducing the full wake flow field to a single parameter representing the overall wake deflection. A comparison of the minimum available power in the wakes behind a positively versus negatively yawed turbine enables a comparison of symmetry in the deflection of the energy contained in the wake with respect to the yaw angle. Additionally, a 2D-two-dimensional Gaussian fit method ~~are used for the quantification of wake deflection.~~ for the wake center detection at the turbine's hub-height is used to demonstrate systematic differences in the deflection quantification methods

p.14, l.5 f:

A systematic asymmetry in the wake deflection represented by the minimum available power behind a turbine yawed $\gamma = -30^\circ$ and $\gamma = +30^\circ$ is observed.

Overall comment (1b)

Further, if I understand, both asymmetries are explained as being explained by interaction with the tower. This made sense to me in the discussion of the symmetry of the wake itself, but I had some doubts if it could fully explain the asymmetry in +/- effectiveness. For example, some LES codes show this asymmetry while not including any tower model in the flow (for example ALM, or ADM codes which have essentially only the rotor modeled). Wouldn't this imply some other mechanisms could also be responsible?

Thank you for this very good comment. This is one of the very substantial questions that require to be clarified when discussing possible causes for deflection asymmetries during wake steering. Yes, we deem the interaction of the rotor wake and tower wake to be the main reason for the slight asymmetries in both the wake curl and also the resulting overall wake deflection. The tower structure and its wake introduce an asymmetry to the otherwise perfectly symmetrical setup. However, other mechanisms can potentially affect the wake deflection symmetry, especially in the case of full-scale turbines. These are discussed in the following:

Mechanisms that generally can introduce asymmetry to a yawed turbine setup:

- (1) non-uniform inflow to the rotor, e.g. shear or veer
- (2) ground effects/wall blockage effects
- (3) systematic errors in turbine yaw alignment
- (4) tower wake interaction

(1) The effects of a vertical sheared inflow on wake steering through yaw was recently investigated in an experiment by Schottler et al. (2017a). They found an asymmetric power distribution of an aligned downstream turbine with respect to the upstream turbine yaw angle, when a strong vertically sheared profile was present in the inflow. By inverting the vertical shear in the inflow, the power distribution of the downstream turbine was again asymmetric, however towards the opposite sign of the upstream

turbine yaw angle.

Asymmetries in the deflection of the yawed wake are simulated in a LES by Vollmer et al. (2016), in which a combination of inflow shear and veer are deemed to be responsible for the asymmetric wake shapes especially in stable atmospheric conditions. An asymmetric combined power distribution is also observed in another LES study on full-scale turbines by Fleming et al. (2015), where the turbines are exposed to a LES-generated atmospheric boundary layer. Therein, Coriolis forces and wind veer are discussed as a reason for differences in wake deflection. In a recent follow-up study by Fleming et al. (2017) veer is kept to a minimum and no deflection of the non-yawed baseline case is observed. The deflection asymmetries of the yawed wake are explained with a difference in vortex interaction with the shear in the neutral atmospheric boundary layer.

In the test cases A and B of this study, however, neither shear or veer are present in the inflow. Nevertheless, a slight asymmetry in overall wake deflection is present, implying that other mechanisms might be the main reasons in these cases.

(2) Secondly, possible ground or side wall blockage effects are discussed. The experimental setup is perfectly symmetrical, i.e. the rotor is located in the center of the wind tunnel meaning that it has the same distance to wind tunnel floor and roof respectively the right and left sidewall. The boundary layer on floor, roof and both sidewalls is measured to be $d_{BL,3D} \approx 20cm$ respectively $d_{BL,6D} \approx 25cm$. The rotor swept area blocks 12.8% of the wind tunnel cross sectional area, which affects the wake development. A LES study by Sarlak et al. (2016) showed, however, that the wake expansion is only insignificantly affected by blockage ratios smaller than 20%. For a deflected wake behind a yawed turbine, however, interactions with the sidewalls cannot be excluded anymore, especially for the higher downstream distance $x/D = 6$. Although the distance to each sidewall is equal, it is possible that the wake deflection is blocked to a higher degree by right sidewall (for $\gamma = +30^\circ$) than by the left sidewall (for $\gamma = -30^\circ$). This scenario is considered to be unlikely, however, only a high-fidelity simulation with and without wind tunnel walls could clarify this completely.

(3) As a third source for wake deflection asymmetries, systematic errors in the turbine yaw alignment should be discussed. The correct alignment at $\gamma = 0^\circ$ is ensured by installing horizontal laser sheets at the central points of the wind tunnel and adjusting the turbine yaw angle to it. The yaw angle itself is adjusted with a calibrated fully automatic turntable. Inaccuracies in the experimental setup can never be excluded, however, the accuracy of the yaw angle adjustment was estimated to be within $\pm 1^\circ$. Experiments with the model turbine by ForWind as reported in the companion paper by Schottler et al. (2018) show a very symmetric wake deflection with respect to positive and negative yaw angles in an otherwise identical setup. This indicates that the slight differences in wake deflection have to be dependent on the turbine geometry or wall blockage.

(4) The final possible source for asymmetries to be discussed is the rotor wake's interaction with the tower wake. On the same rotor as used in this study, Pierella and Sætran (2017) showed that the presence of the tower wake induced significant non-symmetries in the rotor wake caused by *"a different cross-stream momentum transport in the top-*

tip and bottom-tip region.” For a non-yawed turbine operated at its optimum tip speed ratio, they showed that the center of the wake vortex is slightly deflected downwards and to the left with increasing downstream distance. They are able to clearly attribute this effect to the interaction with the tower wake. As counter-evidence they managed the wake to recover its symmetric structure by installing a second mirrored turbine tower from the nacelle to the wind tunnel roof.

Pierella and Sætran’s experiment indicates both a lateral and vertical displacement of the wake vortex center through the interaction with the tower wake. For the yawed case, the interaction of the counter-rotating vortex pair with the slightly displaced wake vortex might lead to a slightly differently displaced wake behind a positively and negatively yawed turbine. At this stage we only can guess about the exact interaction mechanisms, but a tower-wake-induced displaced wake vortex in the non-yawed case supports the assumption of an asymmetrically displaced wake center for the yawed cases.

In comparison to Pierella and Sætran’s tower wake experiment, a slimmer tower was constructed for the new yaw experiments ($D_{tower,old} = 61mm$ vs $D_{tower,new} = 43mm$) in order to minimize tower wake effects and adjust the geometrical scaling to a full-scale setup. The geometrical scaling of the tower now fits very well with that of a full-scale turbine (e.g. NREL 5MW reference turbine, Jonkman et al., 2009):

$$\frac{D_{tower,exp}}{D_{rotor,exp}} = \frac{0.043m}{0.894m} \approx \frac{D_{tower,NREL-5MW-ref}}{D_{rotor,NREL-5MW-ref}} = \frac{6m}{126m}$$

However, a significantly larger tower drag coefficient is expected in the small-scale experiment than for a full-scale turbine. Assuming a tower diameter of

$$D_{tower,NREL-5MW-ref} = 6m$$

for a full-scale turbine, we can calculate a Reynolds number of

$$Re_{D,tower,NREL-5MW-ref} \approx 4 \times 10^6.$$

According to Schlichting (1968), this is in the transition region resulting in a drag coefficient of about

$$C_{D,tower,NREL-5MW-ref} \approx 0.3.$$

In our model scale experiment, however, the tower-based Reynolds number is as low as

$$Re_{D,tower,exp} \approx 3 \times 10^4,$$

resulting in a much higher drag coefficient of

$$C_{D,tower,exp} \approx 1.0.$$

Consequently, the effect of the tower wake on the rotor wake (and thus also deflected rotor wakes) is deemed to be significantly stronger in the Re-range of model-scale experiments than in full-scale situations

We share the opinion that this line of arguments for a significant influence of the tower wake on the wake deflection is not sufficiently explained in the manuscript yet. As this is a very critical issue, we suggest to add some more lines to the explanation on p.14:

p.14, l.5 ff:

The wake shows a higher deflection for negative yaw angles in all inflow cases. Also the wake behind the non-yawed turbine is seen to be slightly deflected in positive z-direction, which is assumed to stem from the interaction of the rotating wake with the turbine tower. As discussed by Pierella and Sætran (2017) who performed experiments on the same rotor with a slightly larger tower, the tower-wake interaction ~~can~~ ~~lead~~-leads to an uneven momentum entrainment in the wake. For the non-yawed case Pierella and Sætran (2017) observed both a lateral and vertical displacement of the wake vortex center, induced by an interaction with the tower wake. It can therefore be assumed that also the interaction of the counter-rotating vortex pair with the tower wake slightly displaced wake vortex in the yawed cases might be influence by an interaction with the tower wake, which is the only source of asymmetry in an otherwise perfectly symmetrical setup.

Overall comment (1c)

A final point on this discussion, could you include some discussion of the proximity of the rotor to the ceiling and the floor? I was thinking a source of discrepancy might be that LES/field data will have only a ground, and as a result only one of the vortices experiences ground effects. Is this a consideration?

This is indeed a very good thought. When discussing ground effects two different phenomena can be referred to:

- (1) the presence of the ground in an otherwise uniform flow
- (2) the formation of a boundary layer shear through ground friction

(1) The influence of ground effects on the interaction of a counter-rotating vortex pair (CVP) in the wake for an Actuator disc exposed to a uniform inflow has been discussed in a computational free-wake vortex filament study by Berdowski et al. (2018). In this study, ground effects could be isolated by running two different simulations, of which only one was including a symmetry plane on the ground. For this case they observed that *the bottom vortex of the CVP forms another CVP with its mirror vortex underground and in opposite direction.* (Berdowski et al., 2018)

As shown in Fig. 6 (c) in the manuscript, we did not observe this effect in our perfectly symmetrical experimental setup, in which both the ground and also the roof of a wind tunnel are present. Our model turbine ($D \approx 90\text{cm}$) is installed with a hub height ($h_{hub,exp} = 89\text{cm}$) adjusted to the center of the wind tunnel ($h_{tunnel} \approx 180\text{cm}$). That means that about half a rotor diameter (45cm) of space is left for the freestream flow

above and below the rotor. The proximity of the rotor to the floor roughly scales with that of a full-scale turbine ($h_{hub,NREL-5MW-ref} = 90m$). However, the same proximity to the ceiling is unrealistic, but was chosen to specifically to ensure the best possible symmetry in the setup and to avoid interactions with the wind tunnel boundary layers ($d_{BL} \approx 20 - 25cm$). Outside of these boundary layers the inflow is spatially uniform within $\pm 0.8\%$ (Inflow A) and $\pm 2.5\%$ (Inflow B).

(2) In contrast to most field data and also the referenced LES simulations, where a certain amount of shear (and sometimes also veer) is present, the inflow in the wind tunnel experiment is completely uniform (Inflows A and B). That means that apart from the previously discussed tower wake effects, the interaction of the different wake vortices should be "clean" and not biased by shear or veer in the inflow. However, one could argue that the two vortices of the counter-rotating vortex pair could expand differently in a full-scale situation as the expansion of the lower vortex is limited by the ground while the upper one can expand freely. The blocked expansion of the wake and its single structures is definitely an issue in wind tunnel experiments, which becomes more serious for increasing downstream distances. It cannot be excluded that the dimension and strength of the single vortices is also influenced by wall effects in this experiment. However, comparisons of the general wake structures with experiments behind smaller, unblocked rotors show a good agreement as shown in Schottler et al. (2018) and Bartl et al. (2018). In general, it must be kept in mind that the results of this wind tunnel campaign do not reflect realistic conditions at all. A number of discrepancies as the simplifications in the inflow and especially the wall blockage can be considered as strong disadvantages to full-scale measurements and simulations. However, the controlled boundary conditions of a wind tunnel experiment allow to isolate the influence of certain parameters, i.e. inflow shear and turbulence, in a controlled manner. This can be an advantage over full-scale measurement and additionally serve as well-defined reference data for the validation of CFD codes.

Overall comment (2)

A second overall comment, the authors point out that is difficult to reduce wake deflection to a single value, and can complicate interpretation of results such as Fig 8-9. Since you already employ the method of available power, I believe an interesting additional comparison between the collected data and the models would be to compare the power output of an imaginary turbine located at $x/D=6$ and $z/D=0$ (and perhaps $z/D = +/- 0.5$). This could represent an interesting assessment of do the models correctly predict the change in power obtained through wake steering for a given arrangement.

Thank you for this very good comment. This is indeed a very good idea as we actually have performed measurements available with an offset downstream turbine operated at $x/D = 3$. Seven different lateral offsets of the downstream turbine z/D have been chosen ranging from $z/D = [-0.50, -0.33, -0.16, 0, +0.16, +0.33, +0.50]$. Power measurement have been performed for the upstream turbine yaw angles $\gamma_{T1} = 0^\circ$ and $\gamma_{T1} = 30^\circ$. A comparison of the *Available Power* calculated from mean streamwise velocity distribution in the wake with the actually measured power coefficient $C_{P,T2}$ of

a downstream rotor traversed through the wake is presented in Fig. 1.

The comparison generally shows a good match between the measured downstream turbine power and the calculated *Available Power* in the wake flow for both upstream turbine yaw angles. These results show that the *Available Power Method* generally performs as it should for the purpose of reducing the wake deflection to a single value. However, the coarse grid of only seven z/D -positions does not enable us to validate the exact location of the calculated minimum *Available Power*. For the calculation of the *Available Power* we numerically traversed the imaginary downstream turbine through 50 different offset positions from $z/D = [-0.50, +0.50]$ allowing a location of the wake deflection with an accuracy of $\Delta z/D \approx 0.02$. An experimental validation with a comparable accuracy would be extremely elaborate or require an automatic traversing mechanism of the downstream turbine.

We therefore consider the presented comparison to serve as a general demonstration, but not as a sufficient validation of the *Available Power method*. We deem this demonstration not to add specific value to the discussion of our results and therefore suggest not to include this discussion in the manuscript.

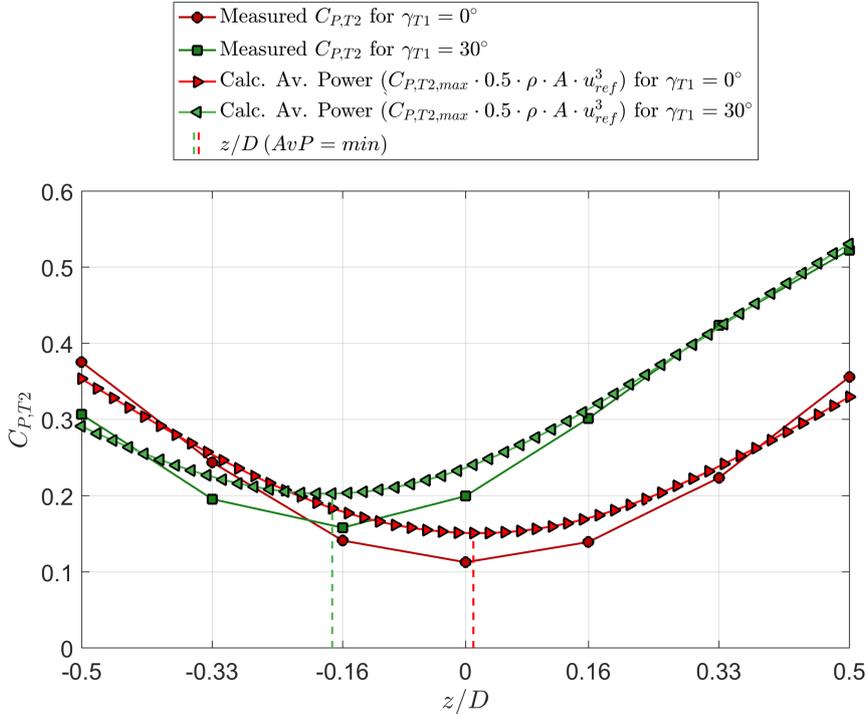


Figure 1: Comparison of the *Available Power* calculated from mean streamwise velocity distribution in the wake with the actually measured power of an identical downstream rotor traversed through the wake at $x/D = 3$ for inflow B. The *Available Power* in an imaginary rotor swept area A traversed through the wake is multiplied with the maximum downstream turbine power coefficient $C_{P,T2,max} = C_{P,T1,max} = 0.467$. Vertical dashed lines indicate z/D locations of the minimum calculated *Available Power*.

Specific comment (1)

The introduction is well done, with a good review of the literature to date. Useful to read it summarized in this way.

Thank you! We consider adding two new references by Fleming et al. (2017) and Berdowski et al. (2018) in the introduction of the final manuscript, as some interesting new research on this topic was published in the meanwhile.

p.2, l.29 ff:

The topic of utilizing yaw misalignment for improved wind farm control was thoroughly investigated by Fleming et al. (2015) and Gebraad et al. (2016). They analyzed wake mitigation strategies by using both a parametric wake model and the advanced computational fluid dynamics (CFD) tool SOWFA. [A recent follow-up study by Fleming et al. \(2017\) focused on large-scale flow structures in the wake behind one and multiple aligned turbines and addresses a wake deflection behind a non-yawed downstream impinged by a partial wake of a yawed upstream turbine.](#)

p.3, l.4 ff:

A combined experimental and computational wake study for a larger range of downstream distances was recently reported by Howland et al. (2016). The wake behind a yawed small drag disc of $D=0.03$ m was analyzed, describing the formation of a curled wake shape by a counter-rotating vortex pair. [The influence of wake swirl, ground effect and turbulent diffusion on the formation mechanisms of this counter-rotating vortex pair was recently systematically investigated by Berdowski et al. \(2018\) using a free-wake vortex filament method.](#)

Specific comment (2)

The selection of y as vertical and z as cross-wise was surprising to me, although since you provide a coordinate system in Fig 4., not too confusing. But is there a reason for this? FAST and Bladed for example both have z directed upward

This is a legitimate comment. Despite the unfortunate inconsistency of the coordinate system with most other publications and computational codes, we think that it is important to be consistent with our earlier publications (e.g. Bartl and Sætran (2017), Schottler et al. (2017b), Schottler et al. (2018)). We therefore carefully define the coordinate system in a clear sketch (Fig. 4 of the manuscript) before going into the results.

Specific comment (3)

Page 6, \cos^3 is found for power-loss function. Anecdotally, this would be high for a utility-scale turbine I believe (although it fits the theoretical value). Is this a function of the scaling?

Thank you for this very good comment. It seems that a number of different values for the exponent x in the power-loss function $P(\gamma) = P_{max} \times \cos^x$ have been found for different turbines of different sizes in different studies. This issue has amongst others been discussed in a thesis by Schepers (2012) as well as a review paper on yaw aerodynamics by Micallef and Sant (2016).

While earlier wind tunnel measurements at NTNU on the same rotor by Krogstad and Adaramola (2012) also find an exponent of $x = 3$, *"other measurements by Dahlberg and Montgomery (2005) found the exponent x to vary between 1.88 and 5.14"* (re-cited from Schepers, 2012). In 2001, Schepers further investigated this with another set of wind tunnel measurements and found an exponent of $x = 1.8$ (Schepers, 2001), which is significantly lower than the exponent found at NTNU.

It might be guessed that the exponent x could also be dependent on wind tunnel wall blockage, as blockage ($\sigma = 12.8\%$) significantly influences the power characteristics of the NTNU rotor. Measurements on a downscaled NTNU rotor ($D_{NTNU,small} = 0.45m$), however, confirm a power-loss-coefficient of about $x = 3$ (Bartl et al., 2018).

As stated by Micallef and Sant (2016), the exponent is deemed to be dependent on the induction distribution of the rotor. Therefore, a dependency of the exponent on the specific rotor design is assumed to be the main reason for the significant variations in the different experiments. A dedicated experiment on the power's yaw-dependency for different induction settings (e.g. through additional pitch or tip speed ratio variations) could help to further clarify this issue.

Specific comment (4)

Fig 11: I didn't understand why for the lower plots, two different methods of fitting are used. It had the impact on me, to reemphasize the difference in value of the points, since on the right the higher points are outliers to the fit.

Thank you for this good comment. We agree that the original version of Fig.11 was confusing. We assume that the values of the dotted lines in the lower left plot of the original version Fig. 11 in the manuscript might have been misunderstood. The single points shown in this subplot were the measured values of k/u_{ref}^2 for $\gamma = 0^\circ$. These values were then multiplied with $\cos(\gamma)^2$, which was found to be a good first order approximation for the turbulence levels for a yawed operation (shown as chain-dotted lines in the new plot). These locations of these reduced peak turbulence values are then scaled with a $\mu \pm \sigma_u$ approximation (derived from single Gaussian fits of the mean velocity profiles) and transferred to the lower right plot. There, the approximated values are again compared with measured values (for $\gamma = 30^\circ$). The whole procedure shall demonstrate that it is possible to approximate the turbulence profile in the wake of a yawed turbine, when the turbulence profile of a non-yawed turbine and mean velocity profile behind the yawed turbine are known.

For a clearer presentation of this procedure, a new version of Fig. 11 in the manuscript (Fig. 2 in this document) is suggested, only including a single Gaussian fit of the velocity profiles. All other multiple-fitted curves are omitted. Additionally, small changes in the caption and text are suggested to also make the description clearer:

p.17, l.18 ff:

~~Effects of yawing on~~ Approximation for turbulent kinetic energy distributions in yaw

The levels of peak turbulence are observed to decrease considerably when the rotor is yawed. For a direct case-to-case comparison, TKE-profiles at hub height $y=0$ at $x/D=6$ are presented for $\gamma = 0^\circ$ and $\gamma = -30^\circ$ in the lower plots of Figure 11.

For a yawed turbine, the rotor thrust reduces with approximately $\cos^2(\gamma)$ as previously shown in Figure 3. Multiplying also the TKE levels generated by the non-yawed rotor with $\cos^2(\gamma)$ is observed to result in a decent first order approximation of the turbulence levels behind the yawed rotor. The reduced TKE levels for $\gamma = -30^\circ$ are indicated by the chain-dotted lines in the lower left plot of Figure 11. ~~In order to also find~~ For an approximation of the lateral deflection of the turbulence peaks for yawed rotors, another first order approximation of their location can be estimated as proposed by Schottler et al. (2018) ~~is applied~~. In this approach the expected value and standard deviation of the fitted a Gaussian fit of the velocity profile behind a yawed rotor is calculated. Adding the standard deviation to the expected value $\mu \pm \sigma_u$ gives a rough estimate of the ~~corresponding TKE peak~~ locations of the corresponding TKE peaks, as shown by the vertical ~~dashed~~ lines in Figure 11. Thus, it is possible to ~~rescale the approximate both~~ TKE peak locations and levels by knowing TKE and mean velocity for the now-yawed case.

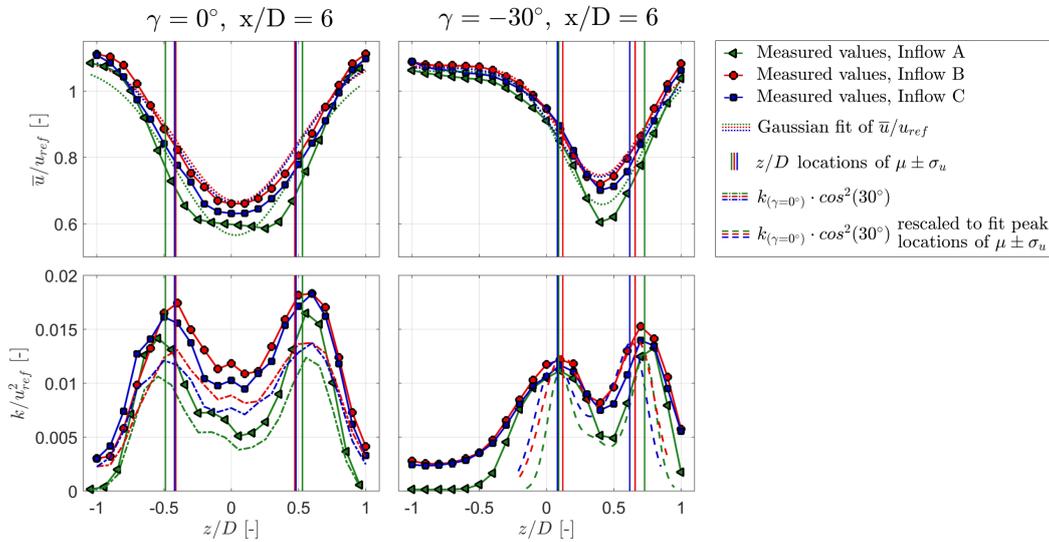


Figure 2: **Suggested simplified version of Figure 11:** Normalized mean velocity and turbulent kinetic energy k/u_{ref}^2 profiles at hub height $y = 0$ and $x/D=6$. The yaw angles are set to $\gamma = 0^\circ$ and $\gamma = -30^\circ$. Vertical lines indicate the borders of standard deviations of Gaussian-fitted velocity profiles $\mu \pm \sigma_u$. Chain-dotted lines indicate a TKE profiles at $\gamma = 0^\circ$ multiplied by $\cos^2(-30^\circ)$. Dashed lines in the lower right subplot have the same magnitude as the chain-dotted lines, but are linearly scaled in z to fit the peak locations of $\mu \pm \sigma_u$.

Comment on connection to the companion paper:

I also could use a little more explanation of which material has been put into which paper and why. For example, the companion paper is focused on changes in TKE, and wind speed variability. Does it make sense to also discuss TI in this paper? To be clear, I am fine with the current division, but it would be helpful to understand a little more the distinction between the papers, if they both include profiles of turbulence for example. Perhaps one additional paragraph more explicitly delineating the papers, to be added to both?

Thank you for pointing this out. Most of this answer has been addressed in the answers to referee 1's comments of the companion paper already, but we repeat some of the main thoughts here.

In general, we deem the discussion of the rotor-generated TKE to be important for both papers. The TKE is separately discussed in each paper dependent on the different parameter variations performed.

The companion paper by Schottler et al. (2018) compares the wake flow behind two different model turbines. Therefore, the rotor geometry is the main parameter varied and investigated. The discussion of the TKE in the companion paper is important as it shows that the definition of the wake-width is very much dependent on which flow-parameter it is referred to. Comparing the three investigated wake flow parameters (1) mean velocity deficit, (2) TKE and (3) intermittency parameter λ^2 the affected area becomes significantly larger from (1) to (2) to (3).

In contrast to that, the present paper focuses on the impact of different inflow conditions on the wake flow and also the rotor-generated TKE in the wake. As the rotor-generated TKE in the wake can cause increased fatigue loads on potential downstream turbines, this parameter's inflow dependency is deemed important to be investigated. As stated in the answer to the referees comments in the companion paper, we suggest to add another sentence to the introduction in order to make a more clear distinction between the papers:

p. 3, ll. 1 ff.

This work is part of a joint experimental campaign by the NTNU in Trondheim and ForWind in Oldenburg. ~~A~~ While this paper examines the influence of varying inflow conditions on the wake of one model wind turbine, a second paper by Schottler et al. (2018) compares the wake characteristics behind two different model wind turbines during exposed to one inflow only while also adding two-point statistics to the evaluation.

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