Report 1: (Referee 2)

I would like to thank the authors for their work on improving the manuscript. I have a few more comments. Note that the page and line numbers refer to the version with tracked changes

We thank the reviewer for the encouraging comments. The reviewer's comments are marked in blue. We provide below a point-by-point response to the reviewer's comments. The page numbers and line numbers refer to the version with tracked changes.

Specific comments:

1. P 17, line 9: I don't understand "change in cases", which "cases"? A, B and C?

   Vertical recovery increases with increasing momentum loss rate. The increase in vertical recovery is very sharp at the transition from case II to case I at momentum loss rate ~ $3.5X10^{-3}$ in Fig. 7a. We have added this explanation in the revised manuscript on P18, L22.

2. P 21, Figure 10: Why does this figure contain much fewer points than Figure 7? Is this due to the use of hourly values? Then this should be mentioned in the caption.
   It is a bit difficult to see whether there is no relationship, since the points are plotted on top of each other. Maybe, an x-axis with discrete stability classes could be used instead of wind speed (similar to figure 9).

   Figure 7 plots all the 50x50 points over the wind farm for 48 hours. Thus, the total number of data points in Fig. 7a are 9x50x50x48 and in Fig. 7b-d are 3x50x50x48 each. In contrast, Fig. 9j-l and Fig. 10j-l (updated) plots the vertical recovery spatially averaged over all the 50x50 points of the wind farm for 48 hours. Thus, the total number of data points in Fig 9j-l. and Fig. 10j-l (updated) are only 3x48 for each sub-plot. We have added this information to the captions of Fig. 7 and Fig. 9, and Fig. 10 to avoid all possible confusion.

   We agree with the reviewer that Figs 9 and 10 can cause confusion. We have remade Figs. 9 and 10. Fig. 9 a-i shows the relationship between vertical recovery and R_f for different wind speed bins. Fig. 9 j-l shows the relationship between vertical recovery and wind speed for the 3 stability bins. Here stability is estimated from R_f. The figure demonstrates that vertical recovery does not have a strong relationship with stability in our experiments but it does have a strong relationship with wind speed. Very similar patterns are visible in Fig.10 that is exactly the same as Fig. 9 but here stability is estimated using the non-local method instead of R_f. These two figures show that the variation in vertical recovery is dominated by wind speed and not by stability for these set of simulations. We have clarified this in the revised manuscript (P21, L9 to P22, L9). However, we understand that our simulations are not comprehensive enough to identify any definitive relationship between stability with vertical recovery. This limitation has been explained in Section 4.

3. P 21, line 6: I would call the effect of TKE on recovery not "minimal", since you estimated it to be 5 %. Maybe "small" would be more appropriate?

   We agree with the reviewer and have changed 'minimal' to 'small' (P23, L2; P24, L31).

4. P 21, line 11: I think for the horizontal recovery the spatial pattern looks different for B+C. With advection turned on, the pattern was more chaotic and decreasing downstream.

Having it turned off, these alternating patterns of positive and negative bands emerge more.

When discussing the spatial pattern of recovery, we meant to say that horizontal recovery is strong at the upwind edges and vertical recovery is strong in the interiors for both TKE advection ‘on’ and ‘off’ simulations. However, the reviewer is right in saying that the banded structure in horizontal recovery is more prominent in the TKE advection ‘off’ simulations. We have clarified this in the manuscript on P23, L5-7.

Technical comments:

1. p 10, line 2: approach → approaches; “,” → “.”
   Done. (P8 L15)

2. p 10, line 7: add “if”
   Done. (P9, L1)

3. p 15, figure 6/22, figure 11: I would suggest to use the same color scale in (b) for both figures, so they can be easier compared
   Done.

4. p 21, table 5 caption: consider to add “area depicted in Fig. 11” after “averaged over the wind farm, since it is only mentioned in figure 3b that this 50x50 km covers the entire wind farm
   We have modified the caption to:
   Table 5: Change (TKE advection ‘off’ – TKE advection ‘on’) in vertical recovery (x 10^{-3}), ms^{-2} and horizontal recovery (x 10^{-3}), ms^{-2}, averaged over the 50x50 km^2 area of the wind farm, the 48-hour simulation period, and cases A, B & C. The numbers in the parenthesis give the percentage change in recovery with respect to the corresponding momentum loss rate. * denotes that the values are significant at $p<0.01$.

Report 2: Referee 1

The authors have adequately answered all my questions and performed the needed changes in their manuscript. I therefore recommend the the study for publication with subject to some minor revisions.

We thank the reviewer for the encouraging comments. The reviewer’s comments are marked in blue. We provide below a point-by-point response to the reviewer’s comments. The page numbers and line numbers refer to the version with tracked changes.

1. L.13ff Instead of giving a distance in km I would express the distance in term of rotor diameter or add this information.
   We have modified the abstract as follows (P1, L14):
   Different inter-turbine spacings range from a densely packed wind farm (Case I: low inter-turbine distance of 0.5 km ~5 rotor diameter) to a sparsely packed wind farm (Case III: high inter-turbine distance of 2 km ~20 rotor diameter)

2. L.23 language!

Sorry, we corrected this in the text but missed it in abstract. We have now edited the abstract as follows (P1, L23):
"To the best of our knowledge, this is one of the first studies to look at wind farm replenishment processes …."

3. Fig. 3 I personally find the figures still too small and would prefer to split them. I leave this decision to the editor.
We have enlarged Fig. 3c.

4. Chapter 3.2. Please introduce the equation of the Flux Richardson Number. Over how many heights have you calculated the fluxes and averaged them?
I am not sure if it makes sense to show Rf=1 since it is very unlikely that the value gets exactly 0. Have you though of introducing bins instead of distinct number to have a smoother transition between the different regimes?
We have added section 2.4 in the revised manuscript with the equation of the Flux Richardson Number (R_f). R_f is averaged from the surface to the wind turbine rotor tip height of 140 m of the wind farm cases that comprises of around 7 eta levels. We have added this information in the revised manuscript (P11 L6)
We agree with the reviewer that instead of neutral, we should consider near-neutral stability. We have revised the Table 3 and Fig. 9 accordingly. We also added the description of the bins. We have rewritten the text in Section 2.4 (P8, L15-20) as follows:
"In the first approach, we calculate the Flux Richardson number (R_f, Stull, 2012) as per Eq. (11). As per Sorbjan and Grachev (2010), $R_f < -0.02$, $-0.02 < R_f < 0.02$, and $R_f > 0.02$ correspond to statically unstable, near-neutral and stable environments."

5. p.11 L1ff I am not sure if the method of the Wilcoxon Sign test is well-known in the wind eenrgy community. I personally suggest to give a broader description of the method as used with your data.
The test was chosen because the input data was not following the normal distribution. Wilcoxon sign rank test is a non-parametric test that does not require the data to follow a normal or other known distribution. Hence, this is a common alternative to other tests that need the data to follow a normal distribution. The results shown in Fig. 3c are for the points in the domain where we reject the null hypothesis and claim that the difference in the wind speeds (WF-CTRL) is not because of random chance at a confidence level of greater than 99%. We have added this information in the revised manuscript. (P12, L1-8)

6. Fig. 4 Why is the ABL top decreasing with downstream distance of the wind farm for case A?
No, the ABL top is increasing in case A with downstream distance of the wind farm. Please note that the direction of wind reverses in case A as compared to B & C.

7. p.14 L-23-31. Interesting! This would imply a subsidence of the whole air mass above the wind farm. Have you seen any "adiabatically" warming effect above the wind farm in your simulation ?
It will be very interesting to study if the subsidence causes any warming effect above the wind farm. However, we did not study the thermodynamic aspects of the wind farm-atmosphere interactions and limited the scope of this paper only to wind farm dynamics.

8. p.19 L 15. You can skip the reference here since it has already been introduced in the previous section.
Ok. We have removed the reference. (P20, L18)

9. Chapter 3.8 Have you checked for a relationship between recovery and lapse rate?

Yes we have checked the relationships between vertical recovery and lapse rate. We have added Fig. 10a-i to show the relationship between stability estimated based on non-local lapse rate and recovery. We did not find any evidence of a strong relationship.