Follow up on answer to Reviewer 1

March 17, 2017

In the previous answer to Reviewer 1, I have mentioned that we have no additional arguments that support our conclusion of the influence of the wind veer on the wind farm wake deflection. I would like to follow up on this by performing an additional study that rules out the influence of the local changing Coriolis force on the wake deflection due to the wake deficits. One could set the Coriolis force source terms to be constant in the horizontal directions (also at the wind farm) as an experiment:

$$S_{v,x} = \rho f_c \left(V_{\text{precursor}} - V_G\right), \qquad S_{v,y} = -\rho f_c \left(U_{\text{precursor}} - U_G\right), \tag{1}$$

where $U_{\text{precursor}}$ and $V_{\text{precursor}}$ are taken from the precursor simulation of the ABL profiles that are also used at the inlet boundary. (Without wind farm, the ABL profiles are maintained through out the domain.) The stream-wise velocity contours at hub height are plotted in Figures 1 and 2, for a wind farm represented by 25 ADs and a high roughness, respectively. In each figure, results with a variable (as used in the submitted article) and a constant Coriolis force (equation 1) are shown. Figure 1 show that there is hardly any difference between a constant and a variable Coriolis force, which means that only the wind veer can be causing the clockwise wind farm wake deflection. When the wind farm is modeled as a high roughness, as depicted in Figure 2, the difference between a constant and a variable Coriolis force is clearly visible. For a constant Coriolis force, the wake of the wind farm represented by the high roughness deflects more clockwise compared to the constant Coriolis case because a varying Coriolis force turns the wind farm wake counter clockwise, while the wind veer does the opposite. This shows that the locally changing Coriolis force is important in the simulation of the high roughness wind farm. I think it would be useful to include this extra study in the article because it is a proof that the interaction of the wind farm wake and the wind veer is the main mechanism why the wind farm wake deflects clockwise.

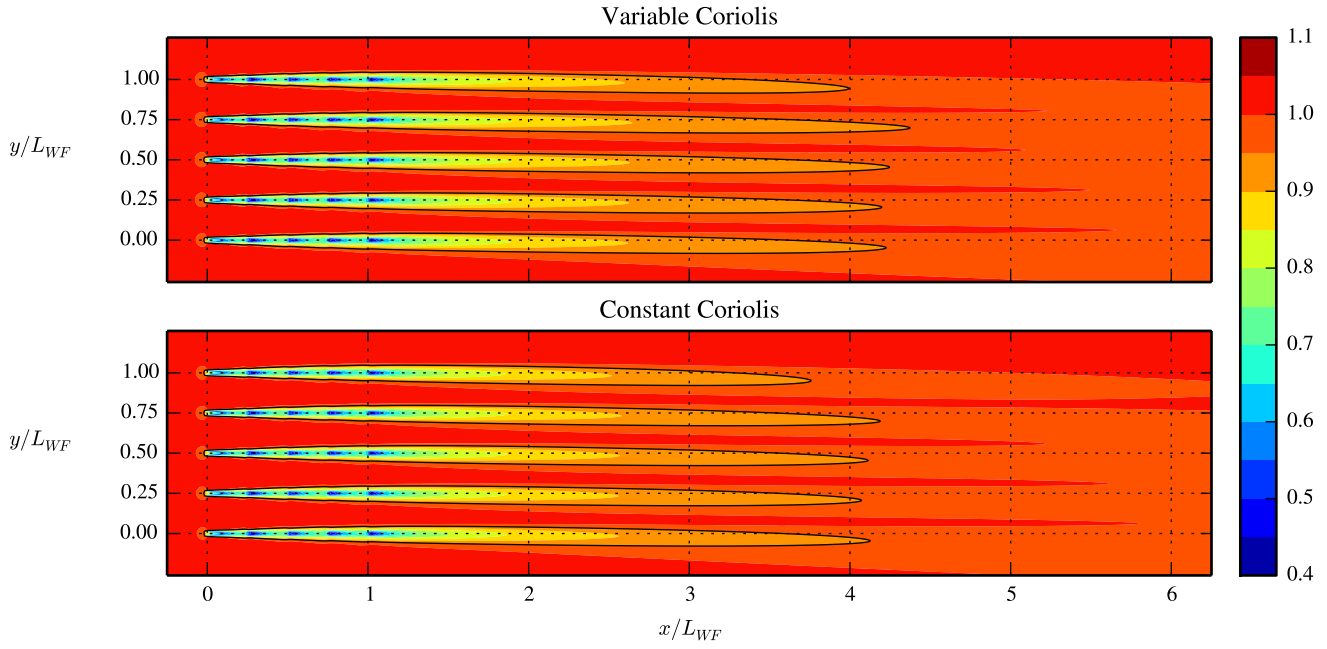

Figure 1: Stream-wise velocity at hub height, normalized by the free-stream. Wind farm modeled with 25 ADs.

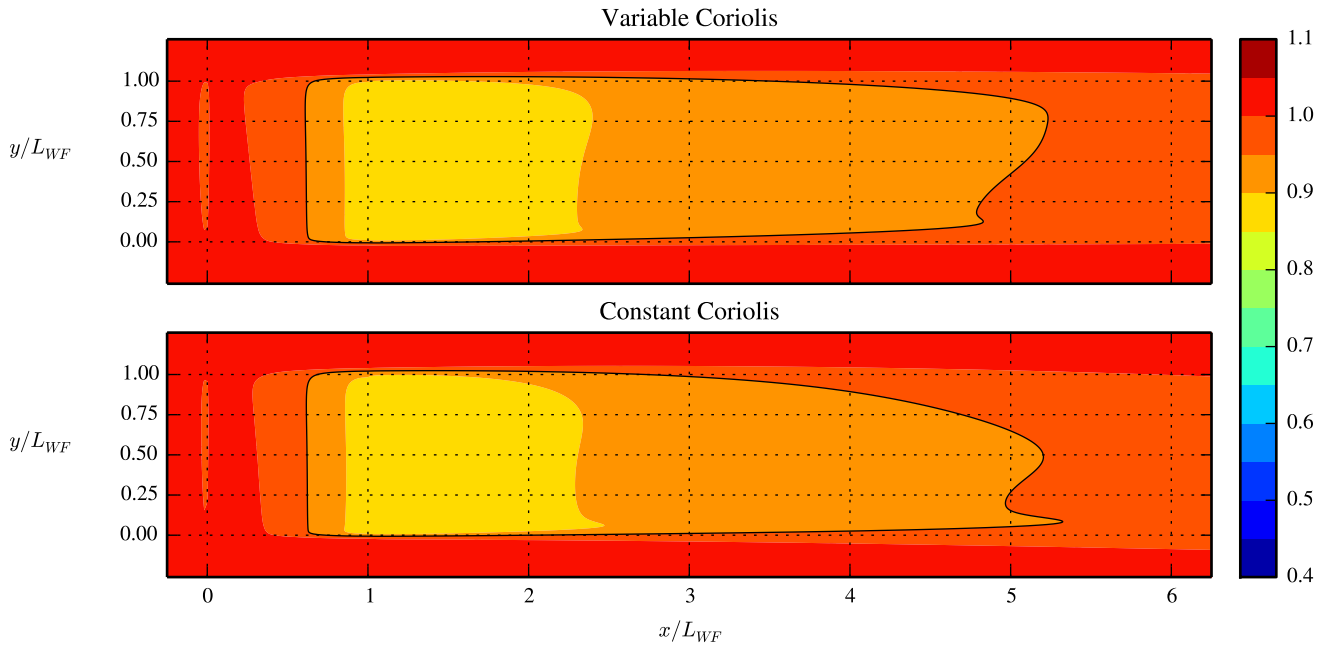

Figure 2: Stream-wise velocity at hub height, normalized by the free-stream. Wind farm modeled with a high roughness.