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Interactive comment on "Set-point optimization in wind farms to mitigate effects of flow blockage induced by gravity waves" *by* Luca Lanzilao and Johan Meyers

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The paper is interesting. The authors investigated the problems of the mesoscale interaction between a wind farm and atmospheric boundary-layer. A three-layer model is proposed for modelling the wind-farm induced gravity wave. Based on the simplified model, optimisation is then proposed to find the optimal thrust coefficient distributions that maximise the wind farm power output. The concept is appealing and the topic is definitely relevant to the wind energy community. However, I found the paper is a bit too long (30 pages) and written for audiences with a strong background in fluid dynamics. As a disclaimer, my background is not in fluid dynamics. Please find my comments as

follows.

Comments: pg1: Some claims by the authors were not clear. For example, the optimal thrust coefficient distributions are spatially stationary rather than time-periodic. Did the authors consider turbulent wind inflow and turbine-to-turbine interactions? Does the claim imply that stationary spatial distributions of thrust coefficients are better than dynamically changing the thrust set-points for maximising the wind farm power? This claim disagreed with some of the other works (e.g. [1]). In [1], the benefit of periodic dynamic induction control was shown, where the thrust coefficient of the upstream turbine was periodically adjusted to improve the downstream wind flow. How is this work related to [1]?

pg2 l59: "asses" -> asks.

pg4 l116: Ct is a function of Ct(x,y,t)? What is x and y in B(x,y)?

pg5 l123: What is the dimension of Ct? Is Ct a vector where the number of elements in that vector is equal to the number of turbines? How is Ct of each turbine related the aggregate wind farm drag f?

p5 l124: " the thrust-coefficient distribution Ct has to be interpreted as a perturbation." Is Ct the thrust coefficient or the perturbation to the thrust coefficient?

p5 l151: " The goal of the optimization framework is to find a time-periodic optimal thrust-coefficient distribution". Why did the authors assume that the optimal thrust distribution would be time-periodic in the beginning?

p6: Equation (13), what is \varphi and J in (13) is not a function of Ct. I suggest the authors swap equation (13) and (14) for clarity.

p7 l183: \mathcal{N}(\varphi(C_t), C_t) = 0. Is this only valid around the neighbourhood of the solution? What is \mathcal{N}?

p11 l268: what is P_N?

References:

[1] J. Frederik et al., “Periodic dynamic induction control of wind farms: proving the potential in simulations and wind tunnel experiments,” Wind Energy Sci., no. August, pp. 1–18, 2019.

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