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Interactive comment on "Controls-Oriented Model for Secondary Effects of Wake Steering" *by* Jennifer King et al.

Anonymous Referee #2

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This manuscript presents an improved wake model, denoted as Gauss-Curl Hybrid (GCH) model, which is obtained by coupling the existing Gaussian wake model and the curl model. The main objective of the proposed wake model is to improve accuracy in predictions of wakes and turbine power capture in presence of yaw steering and more importantly, the secondary steering on downstream turbines induced by upstream yawed rotors. From field experiments, the secondary wake steering seems beneficial to enhance power capture for wind farms.

After a comprehensive introduction, the Gaussian model and the curl model are reviewed in Sect. 2. Subsequently, the GCH model is intruded by coupling the two previous models. In Sect 3, the first analysis consists of the case with two turbines. Sects. 4 and 5 show the results for a three and 5 turbine cases, respectively. Finally, a

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wind farm case is analyzed in Sect. 6.

Comments:

1. How much of the physics is preserved through this model, such as mass conservation, momentum budgets? In other words, should this model be considered an analytical or empirical model? 2. Sect. 4 (Figs. 3 and 4) - An initial comparison is done visually between the wake velocity fields obtained from SOFWA and the models. I recommend visualizing the error between the models and the reference SOFWA data. You can also provide some global parameters, such as mean absolute percentage error. 3. Figs. 5, 6 – While for positive yaw angles, the GCH model performs very well, for negative angles besides the large error, even the trend is completely missed. You should comment, if I did not miss it, how this under-performance affects applications for control or wind farm design.

Minor comments: 1. Eq 1 – cross-check it, I guess brackets are missing in the exponential. 2. P3 L22, there is a typo at sigma_z. 3. P8 L8 – “Published in literature”; add some references.

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