Wind Energ. Sci. Discuss., referee comment RC2
https://doi.org/10.5194/wes-2021-96-RC2, 2021

Comment on wes-2021-96

Vasilis A. Riziotis (Referee)

Referee comment on "A computationally efficient engineering aerodynamic model for swept wind turbine blades" by Ang Li et al., Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2021-96-RC2, 2021

The paper presents a cost effective method for the modeling of swept rotor geometries, which can be used in routine aeroelastic certification simulations for wind turbines without penalizing overall computational cost. The model is based on previous developments by the authors, of a coupled near-far wake model, in which the near wake part modeling is based on a semi-analytical vortex filament representation while the far part is based on standard BEM. The authors provide a detailed description of the adaptations made to the original near wake model while they present improvements with respect to previous implementations.

They verify their model predictions by comparing load results of different swept blade shapes against a medium fidelity option (lifting line) and a high fidelity option (fully resolved CFD). They also convincingly demonstrate the improvement attained in the prediction of loads with respect to standard BEM implementations, which neglect wake induced effects due to wake filaments shifted position.

The paper is very well written. It is an original contribution, presenting a newly developed model, which can improve the fidelity of aeroelastic analyses. Along with some very few and minor comments which can be found in the accompanying pdf I would only recommend the authors to assess and present the overall effect on the predicted Cp by the new method in comparison to standard BEM. This is especially important given that, as well known and also highlighted in the results, standard BEM significantly underestimates the effect of the curved geometry on power output.

Otherwise, the paper can be published as is.

There is one last comment but relevant to the bound vortex effect in LL methods which is not directly linked to the present model (therefore the authors are not asked to answer). I

had to refer to the torque paper in order to understand the hybrid method you apply in order to calculate the bound vortex effect. In my opinion the application of a small core radius solves the problem and saves you from the complexity of the proposed idea. Our experience shows that in filament wake representations a very small core radius is needed in order to enhance the stability of the simulation. The same is good enough for filtering singularities due to the bound vortex.

Please also note the supplement to this comment:
https://wes.copernicus.org/preprints/wes-2021-96/wes-2021-96-RC2-supplement.pdf