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WIND ENERGY SCIENCE DISCUSSIONS

Interactive comment on "Two-dimensional numerical simulations of vortex-induced vibrations for wind turbine towers" *by* Axelle Viré et al.

Anonymous Referee #1

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*****Summary*****

The authors present a set of numerical simulations of a 2D-cylinder, which is mounted to an elastic system an allowed to oscillate transversely. This problem has been widely studied in the literature by means of both numerical methods and experiments, and it constitutes the canonic problem of Vortex Induced Vibrations (VIV).

The followed methodology is properly documented, as well as the choices made while building the different FSI set-ups. As a preliminary step, the authors also compare the results of their numerical methods with those issue from other simulations and experiments. The analysis of the results is very detailed and didactic.

The set-up of the carried out simulations is representative of the structural properties and inflow conditions of wind turbine towers. This is indeed the added value of this work, since no previous experiences in these lines were performed.

The paper is very well organized and clearly written.

Below some remarks in order to improve the manuscript.

*****Requested modifications*****

++ General ++

Some of the variables used in the text are not properly introduced. I suggest to include an acronym section in the manuscript, or alternatively to make sure that all the symbols are properly described.

++ Title ++

The title could be misleading, since no wind turbine tower is modeled in this work. I would suggest to make it more explicit, stating that a 2-D cylinder was simulated (in conditions that are representative of wind turbine towers). It should be mentioned that the content of the paper is very clear regarding this point later on.

++ Abstract ++

Change "verified by considering" by "validated by considering". It is a more appropriate word in this context.

++ Introduction ++

Line #28: I think you should be more cautious with the statement "Although wind turbines towers are tapered, they resemble a circular cylinder". The tapering of the tower may indeed have non-negligible consequences on the VIV phenomenon, and in addition wind shear can be also present. This will introduce more frequencies into play, making the VIV phenomenon much more complex [Balasubramanian et. al (1998), Balasubramanian et. Al (2001), Bourguet et .al (2011), Bourguet et .al (2013) , Hover et. al (1998)]. So someone might think that the proper way to simulate the VIV of towers could be to perform “a series of 2D simulations” corresponding to the inflow conditions at different heights (as presented in WESC 2019). In addition, the spring-based structural model employed in this work may also present some limitations when compared to the 3D structure.

Line #20: It is interesting to emphasize if the four works mentioned here were based on computational studies and/or experiments.

++ Section 2.2 ++

More details about the “modal condensation” of the tower should be provided. - What model of tower is being represented?. Could you provide some dimensions and structural properties?. Will the conclusions of this work hold for other towers? - More details about how the modal analysis is performed and the passage to a 2D geometry are necessary.

*****Recommendations*****

I missed a Figure showing the mesh, even if it is described in the document. It could be useful to understand how it expands from the wall surfaces to the inner CFD domain. Eventually you could show how the mesh is deformed for the cases with important cylinder displacements.

There is not comment regarding the wakes. This could be interesting, probably in combination with the discussion of the freely oscillating cylinder.

*****Comments*****

The discussion concerning the “St” vs. “cylinder natural frequency” competition (page #15) reminded me of the study of Bourguet and Triantafyllou (2016), that is also a very relevant work.

*****References*****

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