

## General comments

This manuscript presents HAWC2Farm, an engineering tool that uses the Dynamic Wake Meandering framework to estimate the power outputs and loadings of a wind turbine in a farm, accounting for unsteady wake effects. The manuscript first presents the code and provides a description of the novelties introduced compared to other DWM implementations. An analysis of the performances is also proposed. In a second part, two scenarios from a real farm are reproduced and analysed.

This manuscript is consistent with the journal's editorial policy and tackles a major challenge of the wind energy field. I would thus advise to publish this paper, but some major modifications in the validation section must be made before, to improve the understandability and clarity of this work.

## Major comments

- Paragraph 5.1.1 and 5.2.1: more information on the turbulence intensity level is necessary to help the authors and readers to interpret the results.
  - $\alpha$  and  $\epsilon$  at L291 are not defined. Also, does it mean that there is 1% of turbulence intensity?
  - If available, the TI measured by the LIDAR should be displayed and compared to the one of the simulation.
  - A bad TI value could explain discrepancies between measurements and simulations for power and wind speeds of a turbine in waked conditions.
- The relevancy of the first scenario before 18:00 is questionable. Indeed, as shown in Fig 7, there are large variations of wind speed, directions and yaw that are not captured by HAWC2. Therefore, it is difficult to analyse the results between 16:00 and 18:00. Please remove this part of the simulation, or give more details on that matter.
- The choice of normalisation makes it impossible to measure systematic error and it propagates errors of the first turbine to the other ones. The authors should use another normalisation or give a more in-depth justification of their choice.
  - Due to the normalisation, the reader cannot estimate the discrepancy described Line 315.
  - The choice of normalisation makes the reader believe that the wind speed is correct. However, there are actually discrepancies that lead the turbine not to work at the proper thrust and power coefficients.
  - The same issue comes back Line 225 where the authors describe some differences in wind speed that are seen in Figure 8 but not in Figure 9. The error induced by the discrepancies in inflow cannot be quantified.  
On that matter, isn't it possible to apply a step in the inflow wind speed? There is about 1 m/s error after 22:00, which is not negligible.

## Minor comments

- Please make a reference to Figure 1 in the text.
- In the last paragraph of section 2.3.2, it is mentioned that "50 random axial induction profiles" are used to trigger potential instabilities. Are these profiles totally random or are they built to be realistic? If yes, how?
- Can we have an estimation of the additional cost of the implicit solver? Is it negligible compared to the global cost of HAWC2Farm?

- Please give the colorbars on Figure 3.
- Line 175: does this statement mean that the real cutoff frequency of DWM should be around  $U/(16D)$  instead of the classical value of  $U/(2D)$ ? If yes, do you have any explanation of this difference?
- Please make a reference to Figure 5 in the text.
- Eq. 24 : given the results in Figures 9, 10 and 13, I believe the correct equation should be  $\hat{x}_i = \frac{x_i - \bar{x}_0}{\bar{x}_0}$  ? If not, the unit of the y-axis should be given to avoid confusion.
- Fig 9: please define Active Power.
- L 301: I think the discussed delay could also come from the choice of the advection velocity in the DWM. Values between  $U_\infty$  and  $0.8 U_\infty$  have been debated in the literature, although it is not detailed here which is used in HAWC2.
- Paragraph 5.2.2: please cite the figure you are referring to.
- Figure 11: Please change the y-axis limits to help read the picture. A change between 8 and 11 m/s is barely visible whereas it is consequent for the simulation, in particular near the rated.

## Technical corrections

- To avoid double-parenthesis and inconsistencies when citing other works, I advise to use the `\citep` when out of text (e.g., *(Pederson et al. 2019)*, line 36) and `\cite` and inside the text (e.g., *Liew et al. (2022)*, line 57).
- L46: I am not sure it is correct to use “time-stepping” as a verb.
- L118: missing the word *under* between “expressed” and “the following”
- L 163: There is an error of citation here
- L 294: I think you are referring to Figure 7, and not 8.
- L306: I would replace “in a fixed frame of reference” with “always at the same position” in order to avoid confusion with the moving and fixed frame of reference framework used in the DWM.
- Line 353: “Case and Case 2” should be replaced with “Case 1 and Case 2”