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Wind Energy Science

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Manuscript title: Dynamic Response of Offshore Wind Turbine Structure under Multi-load Coupling Based on DEM and FEM Joint Analysis

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Dear Editor,

Thank you for your letter dated [2024.9.5]. We are pleased to know that our manuscript has been rated as potentially acceptable for publication in *Wind Energy Science*, subject to adequate revision and response to the comments raised by the reviewers.

Based on the instructions provided in the decision letter and comments provided by the reviewers, we have revised the manuscript, as shown below.

Comment 1:

It is not obvious to the reviewer how this work relates to the existing literature as well as where the incremental innovation comes out of this work. It is also not clear if the authors are developing mathematical models to analyse the coupled loading (wind, wave, ice) or if they are using the already established models to analyse their impact on accumulated fatigue damage.

Response:

Because there are few literatures on the dynamic response of offshore wind turbines under the coupling of wind load, wave load and floating ice load, and the analysis of single load is the main one. In discussing the existing literature achievements, we only explain the main contents of the scholars' research, and use some of the research contents as the research basis of this research. This paper is mainly an engineering method to explore the dynamic response of offshore wind turbines under multiple loads (wind, wave, ice), and study the established load model for the cumulative fatigue damage analysis of offshore wind turbines.

Comment 2:

Is Figure 3 produced by the authors? If not, please provide a ref.

Response:

In this paper, the published random wind speed data and the calculation results of formula 3 were used as data sources to form wind load spectrum through OpenFAST simulation (Figure 3).

Comment 3:

There is no detailed explanation of the ice load calculation. How can one evaluate the validity considering that there is a reference to the explicit nonlinear structural response analysis?

Response:

By referring to the relevant literature of Marine science, the floating ice types that appear more frequently in the freezing period in the cold area are obtained and taken as the object of analysis. This study only discusses the analysis method of the dynamic response of offshore wind turbines under multi-load coupling. If it is widely recognized by the wind power engineering, it can be applied to the actual offshore wind power projects. The specific floating ice analysis model can be adjusted by DEM according to the actual ice type data to make it conform to the specific actual characteristics of offshore wind power projects.

Comment 4:

The reviewer is having a difficult time understanding why the authors are illustrating Figure 8 if there is no contribution from the authors to get this 3D figure.

Response:

FIG. 8 is not an illustration of 3D diagram 3, but the load diagram of offshore wind turbines after multi-load (wind, wave, ice) coupling is used as the boundary condition for subsequent multi-load coupling analysis.

Comment 5:

Any references from Table 2?

Response:

Tab. 2 shows the analysis results of multi-load coupled offshore wind turbines calculated by OpenFAST, instead of referring to other literature.

We would like to take this opportunity to express our sincere thanks to the reviewers who identified areas of the manuscript that needed corrections or modification. We would like also to thank you for allowing us to resubmit a revised copy of the manuscript.

We hope that the revised manuscript is accepted for publication in *Wind Energy Science*.

Sincerely Yours,

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