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Interactive comment

Interactive comment on "Development of a comprehensive data basis of scattering environmental conditions and simulation constraints for offshore wind turbines" *by* Clemens Hübler et al.

Anonymous Referee #2

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The manuscript analyzes the measured wind/wave records at three offshore sites Fino 1, 2, 3 to characterize the variation in environmental parameters and then proceeds to examine the implications on the fatigue damage equivalent loads on a 5 MW offshore wind turbine. Analysis of the impact of load simulation time and initial start-up transience on the fatigue computations are examined. While the subject matter of the manuscript is important, there are a number of shortcomings in the content and explanations that need to be corrected as in:

1) A number of environmental variables including air and water density, currents etc.

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Discussion paper

are captured in section 2 for the 3 offshore sites. However section 3 on the analysis of load simulations essentially investigates simulation length time and initial transience. As it stands, section 2 and section 3 are not well connected and there needs to be a clear explanation made as to how the varying environmental conditions modeled in section 2 are used in the load simulations. Without this connectivity, the paper cannot be published.

2) Similarly to point 1 above, about 2 pages of the manuscript are devoted to analysis of ocean currents, but ocean currents are not used in fatigue load simulations as per the IEC 61400-3 and may have only limited influence on extreme loads. So this analysis on pg. 6-7 can be deleted, unless shown in section 3 to be relevant.

3) Figure 7 on the probability of the wind shear exponent is not clear and it is not evident why the probability of a higher wind shear exponent is greater for higher mean wind speed bins. It would be more appropriate, if the shear exponent probability is plotted for different atmospheric stability classes.

4) In Section 3.1, it is not at all clear how the fatigue damage in welded joints of the monopile and jacket are computed. How are the stress concentration factors at the welded joint computed? How is the circumferential variation of the wind direction over a year modeled especially for the simulation on jackets? What type of jacket joints are considered - K joint, Y joint etc? Without these details, the analysis of fatigue on sub structures is inadequate and incomplete.

5) What load case is analyzed in section 3.2 to compute fatigue damage? Is it only DLC 1.2? What about DLC 6.4, DLC 7.2, 4.1 etc?

6) In Figure 10 and 11, is it the fatigue damage that is plotted or the damage equivalent load?

7) It is not clear how the half-cycles are merged in Fig. 11 and why the variation in fatigue damage suddenly disappears above 1-hour of simulation.

8)Explain what load cases are simulated for ULS loads in Fig 12 and 13 and What is the annual return probability of the ULS loads computed?

9) The start-up time for load simulations depends on the time constants of the aeroelastic models, the frequencies of the turbine and the numerical solver used, besides the damping that is referred to in the paper. So table 3 is highly aeroelastic code and turbine model dependent and cannot be used as a general recommendation.

Overall the paper is presenting results without appropriate explanation of the load cases used, the limitations of the analysis, the justification of the methods used and the underlying assumptions. It needs to be re-written to provide clear and relevant justification of the results and methods.

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