Date December 3, 2021
Our reference n/a
Your reference n/a
Contact person S.T. Navalkar
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Subject Response to referee

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Anonymous Referee #3
Referee, Wind Energy Science

Dear Referee,

First of all, the authors would like to thank the referee for his positive and constructive feedback. We believe that the comments have helped us to improve the quality of the paper. In our attempt to account for the comments, we have thoroughly revised different aspects of the paper. The objective of this document is to respond to the points raised by the referee and to provide a detailed overview of the changes made to the paper. The document consists of one section where we will respond to the review report provided by the referee.

Yours sincerely,

Sachin Navalkar
Mees van Vondelen
Alexandros Iliopoulos
Daan van der Hoek
Jan-Willem van Wingerden

Enclosure(s): Response to comments of Anonymous Referee #3

Response to comments of Anonymous Referee #3

- To motivate the problem statement in this publication, I suggest that the authors add a small paragraph indicating the sensitivity of turbines structural fatigue damage to damping. e.g. reducing structural damping by 5% results in xx reduction in turbine useful life time. You might need to do this for various components and materials, e.g. welded steel vs composites.
  The authors agree that such an explanation would emphasize the motivation. A figure indicating the total fatigue life of the turbine versus the damping has been included in the introduction.
- The authors discuss OMA for time-varying structures. However, OMA for non-linear and non-stationary time variant systems is not fully elaborated upon; e.g. use-case where such a dedicated treatment is needed: large deflections resulting in geometric non-linearity in long slender modern blades
  The authors agree that such an elaboration would enhance the explanation. A reference to a study as described by the referee and a small paragraph was included to shed light on this topic.
- I suggest that the authors further sub-group and elaborated on the OMA methods based on whether they require additional physics model representations and those that do not require it (e.g. model reduction techniques in OMA algorithms).
  Although the authors acknowledge the relevance of grey box methods, none of the investigated OMA algorithms in this study require additional physics model representations. The authors believe it is thus not an improvement to subgroup the methods in this study based on this principle. A short paragraph clarifying the focus on black-box methods and noting the existence of these grey-box methods is added.
- Controllers are crucial for modern wind turbines design. I suggest that the authors expand on the topic of OMA for system identification of structures with controller in the loop (closed loop identification).
  The authors agree with the statement. Next to the explanation about control damping already made in the paper, a paragraph was added to the introduction that explains that the application of OMA is valid for controlled systems such as operational OWTs, as that the ambient input is uncorrelated with the output. Furthermore, it was mentioned that the separation of the different damping sources is non-trivial and outside of the scope of this study.

- Page 8: OMA for structural modes above 5Hz and their corresponding damping might be in fact necessary when dealing with identifying a damaged structure. Expanding on this idea in this review would be a nice to have.
  The authors agree that OMA above 5 Hz might create opportunities for damage detection. However, this can most likely not be achieved in regular operating conditions, as suffucient strong excitation and sophisticated sensing equipment would be required to capture these modes. This explanation was added to the paper .