

Wind Energ. Sci. Discuss., referee comment RC2  
<https://doi.org/10.5194/wes-2021-41-RC2>, 2021  
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## **Comment on wes-2021-41**

Anonymous Referee #2

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Referee comment on "Damping identification of offshore wind turbines using operational modal analysis: a review" by Aemilius A. W. van Vondelen et al., Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2021-41-RC2>, 2021

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Reviewer general comments:

The authors address damping as the most uncertain property resulting in conservative assumptions for the structural design of OWT- structures. The reviewer thinks that the uncertainty of the structural damping properties is not so much a random type property but a physics based variability mainly governed by the varying internal structural stress level generated by varying external loads during operation (wind, waves, rotor speed) together with the other six physical phenomena reported on page 3 of the manuscript.

In the initial design phase such variability has to be covered by conservative assumptions estimated from previous experience and/or from standards like those presented in table 1. Since experimental damping values are not available in that design phase such conservative assumptions are unavoidable so that the need for more accurate damping estimation by economical reasons as stated by the authors in their introduction can hardly be fulfilled in that phase.

The reviewer thinks that the effort the authors spent in their introduction to justify the need for more accurate damping estimation would better be directed to the damping estimation during the real lifetime of the structure. Continuous estimation of damping along with other structural properties would enable continuous updating of the lifetime predictions. If the initial conservative damping assumptions were replaced continuously by more realistic damping estimates longer lifetimes associated with economic benefits can be expected. However, it must be kept in mind that the accuracy of lifetime predictions depends on the length of prediction times and does not only depend on the estimated structural properties but, for example, also on the implemented inspection philosophy.

The experimental estimation of damping properties is aggravated by the fact that under operational conditions the external loads (input test data) are not measurable on OWTs in

detail so that Operational Modal Analysis (OMA) techniques ( Output test data only) have to be considered.

The authors set themselves a demanding task to find out the pros and cons of the techniques described in the 70 references cited in the paper. Table 2 represents the most valuable core of the paper. In this table the present authors referenced the papers of those authors who evaluated the OMA algorithms in detail. In practice vibration engineers do not have software available which covers all the techniques. In view of Table 2 they can get an idea of what kind of difficulty they could have to face using the software they have at hand.

Reviewer specific comments and questions:

- Is the suitability criterion fulfilment in table 2 reported from literature or is it derived from the authors' own judgement?

- Did the present authors evaluate one or more algorithms by their own software implementations?

- Looking on the notation used for the equations the authors should improve the definition for the indices. For example, in Eq.(1) the sample point  $k$  and indices  $t_1$  are not explained. Index  $t_1$  is not unique on the left hand and the right hand side of the equation. Other equations should be reviewed accordingly.

Final comment:

The paper can be recommended for publication. The reviewer appreciates if his comments could be addressed appropriately.