

## ***Interactive comment on “Modal Properties and Stability of Bend-Twist Coupled Wind Turbine Blades” by Alexander R. Stäblein et al.***

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Dear reviewer,

Thank you for your comments and constructive feedback. Please find our responses below:

1.) Section 2- is any of this repeated in Stablein 2016a/b? If so, does it need to be repeated?

- No, the previous publications are based on a different beam formulation.

2.) Sec 2.5.1 any explanation for the differences in the higher modes?

- The three beam elements are based on different formulations. How those formulations effect the eigenmodes of coupled beams has not been investigated.

3.) Sec 2.5.4 define  $\gamma_y$ - is done later but should be here.

- We will consider this in the revision of the paper.

4.) Sec 4.1 can you explain the sudden slope change in the tips for Fig 5/6

- The slope change is probably related to the double curvature of the blade at the tip. We can observe the same behaviour using another code (HAWC2). We are currently investigating this and will address the issue in the revision of the article.

5.) Sec 4.1.3 I am having difficulty understanding the phase angle relationships, the work of the lift force, and the damping. Can this probably be described in more detail?

- The relationship of phase, lift and damping has been treated extensively in Ståblein 2016a. However, for better readability we will include a section on aerodynamic damping analysis of blade modes in the revision.

6.) Sec 4.3 not clear how sensitivity to pitch is shown in Fig 12.

- The correct reference is Fig. 9. This will be corrected in the revision.

7.) Sec 4.3 can you comment on the dip in Figure 18?

- The dip around 0.25 Hz is caused by antiresonance due to the interference with the tower fore-aft mode. We will add an explanation in the revision.

8.) Sec 5 not clear how damping is shown in Fig 4.

- The correct reference is (cf. Figure 9 and 4). This will be corrected in the revision.

Technical corrections:

1.) Eq 3 and elsewhere- define length  $L$ - for the element or the entire blade. Eq 6 implies that that polynomial coefficients do not vary along  $L$ .

-  $L$  is the length of the element. We will clarify this in the revision.

2.) Fig 12/13/14/16 caption- should be amplitude (left column) phase (right column)

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- Yes. We will correct this in the revision.

3.) Sec 4.3 line 17- change camping to damping. No fun being dampened while camping.

- Yes. Will be corrected.

4.) Sec 5 "An observation that has also..." this sentence is not clear.

- We will change the sentence to: An effect of blade deflection on the edgewise mode shape has also been observed by Kallesøe and Hansen (2009).

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