

**RC1.01)** Please specify in Section 4.3 the finite element (FE) program used for setting up the prediction FE model. This will aid in the reproducibility of your work.

**RC1.01)** Thank you for this comment. The authors agree, however, the FE model is created in a non-commercial Python-based FE program, not commercial software. To aid reproducibility, this has been stated (line 315-316):

“The FE model is created using a non-commercial Python-based FE software.”

Furthermore, it is stated that the software is available upon request (line).

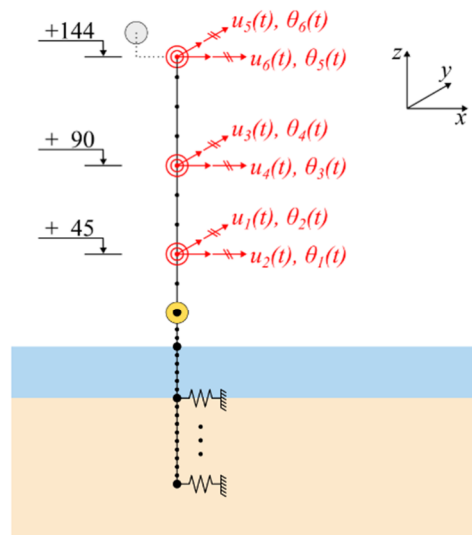
“Code availability. Python code for reading data is available at <https://github.com/madg-DTU/IEA-15MW-RWT-HAWC2-Monopile-Response-Database>. [Python-based FE software can be shared upon request.](#)”

**RC1.02)** The naming convention in Table 3 is unclear and not intuitively understandable. Consider adding a column with explanations for the symbols to improve clarity.

**RC1.02)** Thank you for this comment. The authors have introduced a column with explanations of the symbols and elaborated the caption with reference to relevant equations and figures. Furthermore, the subscript convention in Figure 10 has been corrected to reflect the measured DOFs in Table 3. See corrections below (line 459 and 439):

**Table 3.** Configuration used for the multi-band MDE in (14) in the band frequency ranges  $B_1$ ,  $B_2$ ,  $B_3$ , and  $B_4$ . The configuration is defined in terms of measured DOFs  $u_{i,m}(t)$  (Figure 10), Ritz vectors (Figure 9), and mode shapes (Figure 7) applied within the individual bands.

Band id	$i$	1	2	3	4
Frequency ranges	$B_i$	[0.00 – 0.05] Hz	[0.05 – 0.13] Hz	[0.13 – 0.45] Hz	[0.45 – 50] Hz
Measured DOFs	$\tilde{u}_{i,m}(t)$	$[\theta_1 \theta_2 \theta_3 \theta_4 \theta_5 \theta_6]$	$[u_1 u_2 u_3 u_4 u_5 u_6]$	$[u_1 u_2 u_3 u_4 u_5 u_6]$	$[u_1 u_2 u_3 u_4 u_5 u_6]$
Ritz vectors	$\tilde{\Phi}_{i,s}$	$[\phi_1 \phi_2 \phi_3 \phi_4]$	$[\phi_1 \phi_2 \phi_3 \phi_4 \phi_5 \phi_6]$	$[\phi_3 \phi_4 \phi_5 \phi_6]$	-
Mode shapes	$\tilde{\Phi}_{i,d}$	$[\varphi_1 \varphi_2]$	-	$[\varphi_1 \varphi_2]$	$[\varphi_1 \varphi_2 \varphi_4 \varphi_5 \varphi_6 \varphi_7]$



**Figure 10.** Measurement locations i.e. HAWC2 output channels in red in terms of displacements  $u_*(t)$  included in MDE in dynamic frequency range and rotations  $\theta_*(t)$  included in MDE in quasi-static frequency range

**RC1.03)** In Section 5.4, it is stated that the MDE performs poorly within the  $\pm 15$  m range around MSL. However, this statement is not supported by Figures C6-C8. While Figure 14 does show significant errors, especially at the tower top, achieving an error below 5% poses a challenge due to modelling uncertainties. Please consider rephrasing this sentence for clarity.

**RC1.03)** Thank you for this comment. The authors agree that the introduction to Section 5.4 does not reflect the actual magnitude of the error. The section has been changed as below (line 627-631):

“When combining the conclusions from the above discussion, it is assessed that the MDE used in the present work generally performs well, except at the tower top, where it performs inconsistently across the different considered DLCs. Furthermore, in the  $\pm 15$  m range around the MSL, the MDE consistently underestimates the DES, resulting in an error of up to 6%. This may be improved by further enhancing the MDE as described below, although, in practice, a 5-6% error level may be overshadowed by other uncertainties. Hereby, the main challenges associated with the present use of MDE are:”

**RC1.04)** The main finding—that the error in strain prediction depends on load case and elevation—could be more prominently emphasized in the conclusion and abstract. This would underscore the key contributions of your study and its implications.

**RC1.04)** Thank you for this comment. The authors agree that the influence of the elevation and the DLC can be more clearly emphasized. Corrections have been made to the abstract and conclusion as shown below:

**Abstract (line 8-10)**

The present paper quantifies these errors using HAWC2 simulations of the IEA 15-MW Reference Wind Turbine (RWT). Multi-band MDE estimates of section moments are compared to true responses in terms of Damage Equivalent Load (DEL) and Stress (DES). **Long-term estimates show that MDE accuracy depends on both the design load case and the elevation considered on the RWT support structure, with the MDE exhibiting notable errors near the tower top and at  $\pm 15$  m around the Mean Sea Level (MSL).** Furthermore, the error of the MDE estimates exhibits wind speed dependency, which underlines the inherent limitation of the MDE, assuming a linear and time-invariant response.

**Conclusion (line 665 -670)**

The MDE generally performs well in estimating the combined DELs and DESs for the individual DLCs. **However, its accuracy strongly depends on the elevation considered on the IEA 15 MW RWT support structure.** Thus, notable errors occur around the tower top, specifically from 120 - 144 m above the Mean Sea Level (MSL), and at the MSL  $\pm 15$  m.

**The error magnitude is also influenced by the operational and environmental conditions of the OWT, as highlighted by the dependency of the MDE error on the DLC considered.** This is directly related to the external forces and structural modes dominant in each DLC.