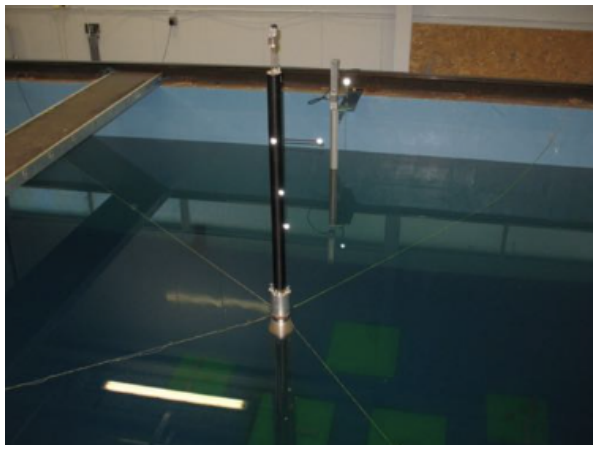
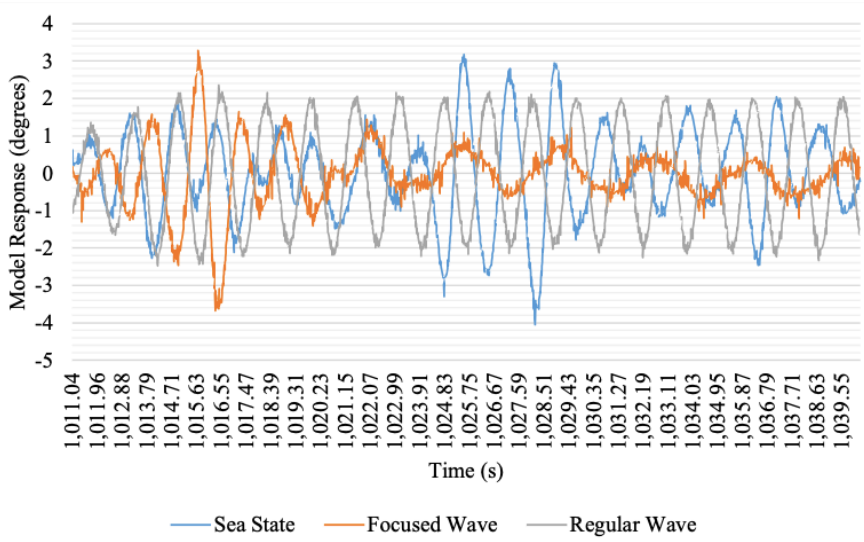
Impact of Extreme Waves on Spar-Type Floating Wind Turbine

The scope of this study was to determine whether regular and focused waves would be able to depict extreme wave conditions. In order to compare these two waveforms to the response obtained from sea states, all three waveforms were plotted in the time domain, in order to show the response from the floating spar model. The point in space and time where the focused wave meets the model has little effect on the response of the model itself, as was previously discussed. For this reason and for comparison with regular waves and sea states, the location where the response of the model was highest was selected. The reason for this was that for real-world industrial testing, the largest focused wave possible would be used, in order to ascertain the robustness of the tests.



OC3-Hywind scale model with Qualysis reflective balls for motion sensing.



Comparison of sea state, focused wave and regular wave pitch response for the spar model.
The peaks of each of these waveforms have very similar amplitudes.

In conclusion focused waves can be used effectively in place of random sea states to analyse the response on the OC3-Hywind spar. Tests using focused waves were much quicker and offered the same response. Another outcome of this study was the observation that the focused wave-structure interaction is affected only slightly by the location in space and time at which it occurs, therefore allowing for ease of repeatability.

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