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Wave Mapper: Validation and Evolution

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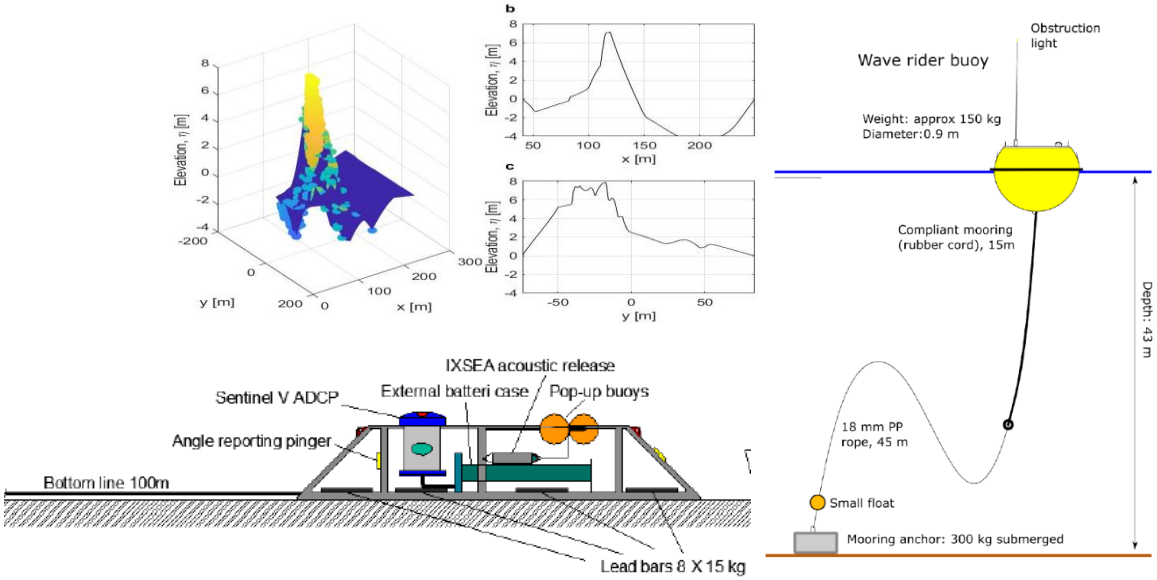
Currently, waves are measured using traditional wave buoys (Tucker and Pitt, 2001) and/or radar equipment (Ewans et al., 2014). With the existing industry-standard measurement techniques, both wave heights and frequency of occurrence can be measured with a fair degree of accuracy. They have two main deficiencies though. First, they cannot measure waves over an area, thus assuming that point measurements are sufficient for the establishment of area statistics. Fedele, Benetazzo, and Forristall showed that not to be the case (Fedele et al., 2011). Secondly, they are unable to distinguish wave types. Without the ability to distinguish types of waves, the probability of occurrence of wave loads associated with specific wave kinematics is undeterminable, i.e., we are unsure of the actual loads that our offshore structures are subjected to.

This research project aims to make a complete full-scale validation of the efficacy of open sea wave mapping using LIDAR. A six-month experimental campaign mapping the waves in the North Sea using a LIDAR, an ADCP and a Wave Buoy will enable a novel comparison of the equipment along with the validation.

Furthermore, it is proposed that work is done to modify general-purpose algorithms for improved resolution of the LIDAR. Finally, it is proposed that a wave database, coupled with software integration, is generated – for the broader benefit of the offshore engineering community.

The transition from traditional hydrocarbon energy production to green energy solutions is only increasing the demands for offshore structures. The wind turbine, wave energy, solar energy and carbon-storage industries all have designs for structures that are placed in waters in which extreme waves occur (NorthSEE, 2021). With this renewed focus it is even more important to understand the ocean waves, their distribution, their kinematics, and the underlying loads.



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