High resolution assessment of Pembrokeshire wave energy resources

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Rationale

The objective of this project is to provide detailed model and measurement data of wave conditions in the proximity of the Pembrokeshire demonstration zone (PDZ). This will enable Wave hub to be better informed about prime deployment locations in the area and to better understand conditions. This data can be passed on to interested wave energy developers to make the Pembrokeshire demonstration zone more attractive.

Methods

A nested wave model was set up using Swan covering areas from the North Atlantic down to the Pembrokeshire resource area and validated against a range of wave buoys.

A Datawell Waverider mkIII buoy was deployed at the PDZ to allow analysis of measured conditions.

Results

Analysis of modelled wave data at a point showed most waves are incident from the WSW (Fig. 1). Consideration of the impact of tides showed averaged over time; tides had little impact on wave conditions in the PDZ, but over a tidal cycle there was a tidal induced modulation of wave heights that was at most ±8%. The magnitude of modulation was related to incident wave direction (Fig. 2). Spatial variaton in resource was linked to the influence of local bathymetry.

Measured wave data supported the modelling and allowed better consideration of spectral shape (Fig. 3). Spectra was unimodal 74% of the time.

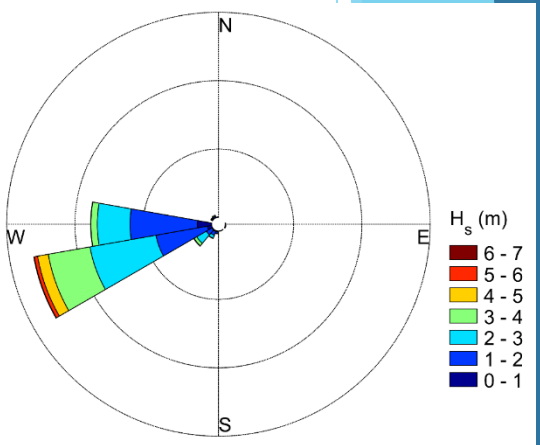

Fig. 1: A wave rose showing the proportion of waves incident from different directions.

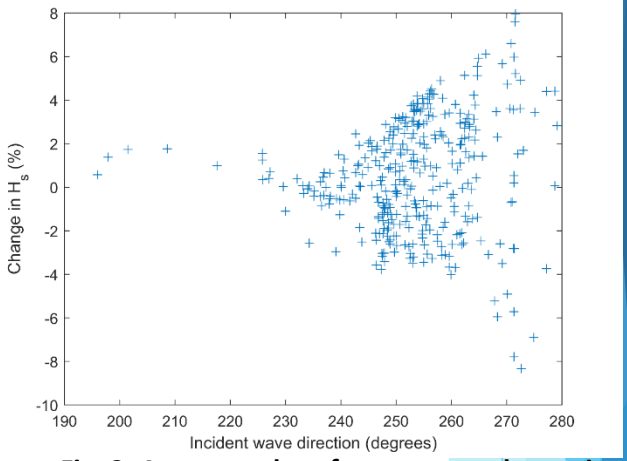

Fig. 2: A scatter plot of percentage change in Hs against incident wave direction.

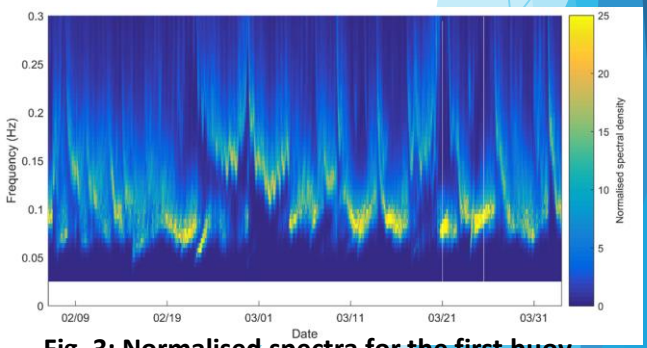

Fig. 3: Normalised spectra for the first buoy deployment

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