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European Regional Development Fund

SEACAMS2 :

Sensitivity of tidal stream resource to flow direction and magnitude asymmetry

AIMS: To reduce uncertainty in the calculation of U_∞ in resource assessments

$$Power = \frac{1}{2}\rho A_D U_\infty^3 C_P$$

Where ρ is water density, A_D is the area of the turbine, C_P is the power coefficient calculated using turbine diameters and U_∞ is the unconstrained tidal current.

RATIONALE:

SEACAMS2 is working in close collaboration with Nova Innovation Ltd to develop techniques for deploying moorings in complex energetic tidal environments. The data collected from the deployed ADCP will help inform our understanding of complex flow environments when used in conjunction with a high resolution 3-D ocean model

Fig.1 – Bardsey nested model domain and bathymetric grid made using SEACAMS multibeam data and EMODNET bathymetry.

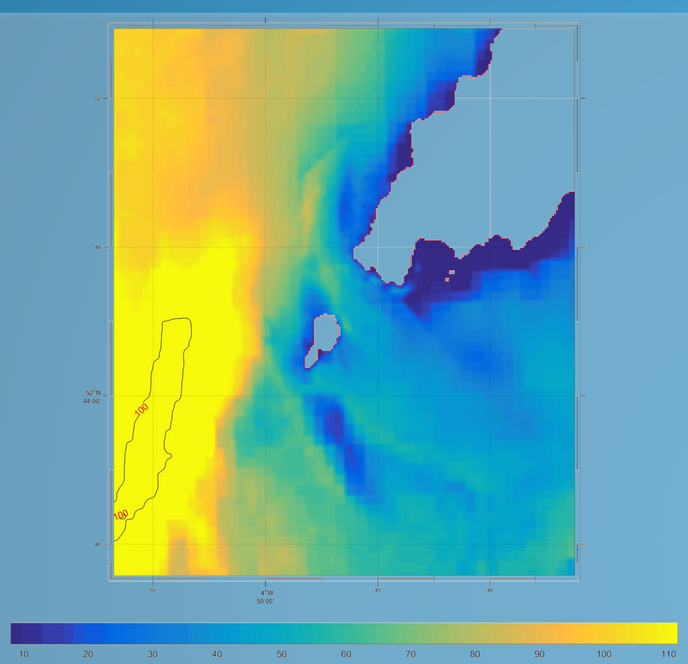
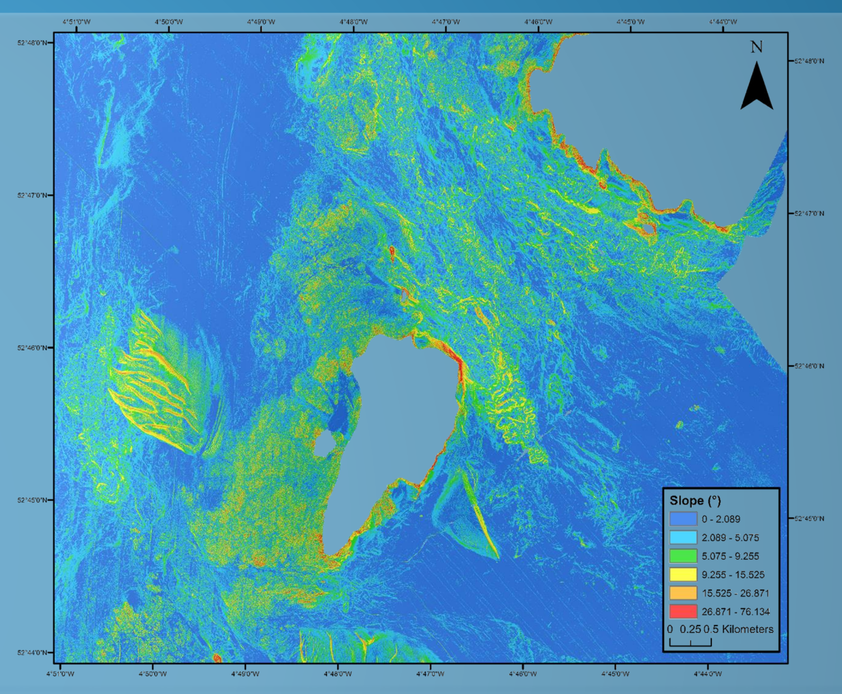


Fig.2 – Slope map of Bardsey Sound, the highly sloped and rocky seabed adds to the challenge of mooring deployment.



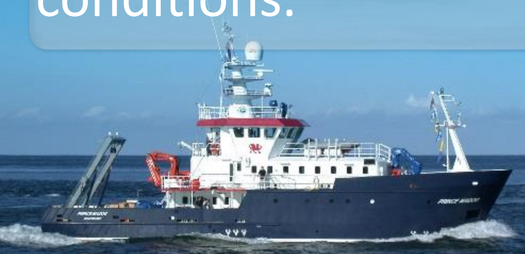
METHODS:

The Bardsey Sound is a notorious stretch of water which separates Ynys Enlli from the Llŷn Peninsula. The English translation of the Welsh name *Ynys Enlli* is *"Island in the currents',* which is apt, for Bardsey Sound is ~3km wide and experiences spring tidal currents in excess of 6 knots. The bathymetry of the sound is mostly bedrock with steep slopes and variated features (Fig 2). Within the sound are a number of rock outcrops (Skerries), which, along with the headland eddy systems, act to disturb the flow of water within the channel.

A two-way nesting methodology is being developed to resolve the Bardsey Sound at ~20m resolution within a wider Llŷn Peninsula model which has a resolution of ~95m x 150m. It uses a merged bathymetry set which is a combination of EMODNET and available SEACAMS multibeam data in the area, corrected to MSL. Tides are applied at the boundaries of the outer model for 10 tidal constituents, including M2, S2, N2, K1 & O1 harmonics from the TPXO dataset.

RESEARCH RATIONALE:

Tidal flow in complex environments like Bardsey will vary spatially and simple resource assessments will not be sufficient to account for changes to velocities on flood/ebb tides as a result of flow asymmetry and misalignment. The velocity structure will vary spatially both across the region and over the water column so the 3-D model, validated using the ADCP data is necessary to analyse flow conditions.



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