Nearshore Wave Modelling Research to Commercialisable AI

AI Enhanced Offshore Vessel Coordination and other ongoing projects

jstella@neuwave.co.uk

The NeuWave Team

Jana Stella

CEO

PhD Environmental Engineering
Machine Learning and AI specialist

Chris Wright

Lead Data Engineer

PhD Computer Science
Quantum Computing Specialist

Lucas Martin

Lead Software Engineer

5 Years Experience in Full Stack Web Development
BSc Geography

Emmanouil Skordalakis

Software Engineer

10+ years experience in back end systems engineering
PhD Computer Science

Ranjodh Rai

Senior R&D Engineer

PhD Computational and Applied Mathematics
CFD Modelling Specialist

Masood Entrepreneurship Centre

EPSRC
Engineering and Physical Sciences Research Council

RESEARCHER to INNOVATOR

National Oceanography Centre

CATAPULT Offshore Renewable Energy

MANCHESTER 1824

N8

ClimateLaunchpad

conceptionx

NeuWave Innovation Pathway

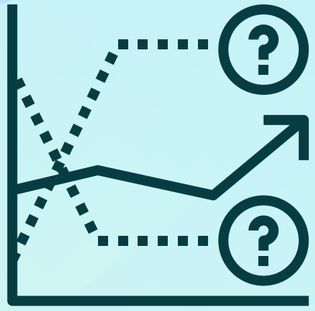
Numerical Wave Action Modelling

Industry Collaborations (ongoing surface cable interactions)

Current tools

Upcoming Innovation Challenges

MetOcean is currently inaccessible



Past trends are neglected

Current forecasts are untrustworthy

Future conditions are not understood

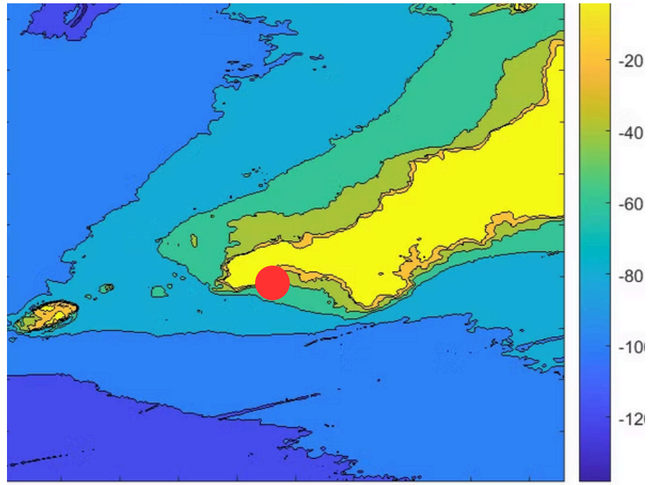
NeuWave Demo Project 2024/2025: The Great South West, UK

Here we present the preliminary results for our project in the Great South West with the Vekta Group, endorsed by Celtic Sea Power.
Our project involves populating our internal data-set with 30 years of hindcast data to launch our services in the GSW. Alongside data share with the Vekta Group for external modelling on the longevity of offshore subsea cables.

Full Simulated Area

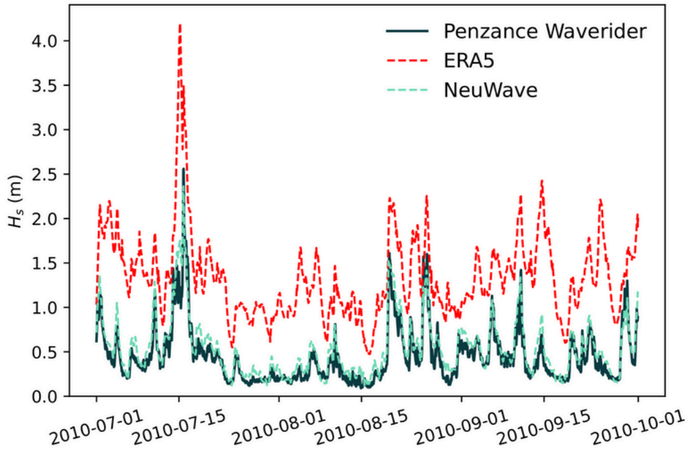
Statistic Hsig	Value
Standard Error	0.004
Regression Coefficient	1.1073
Adjusted R^2	0.967

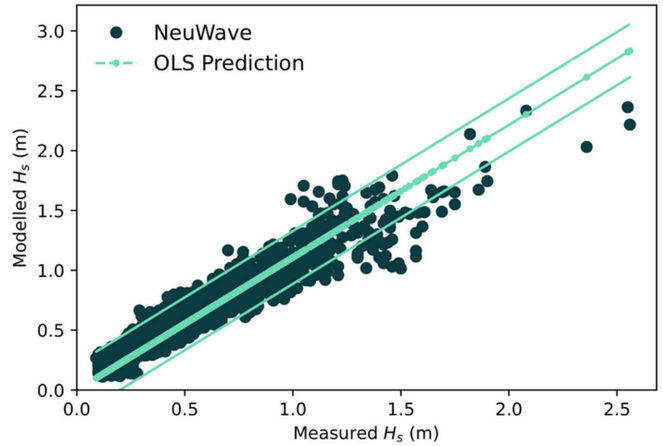
Initial Test Area



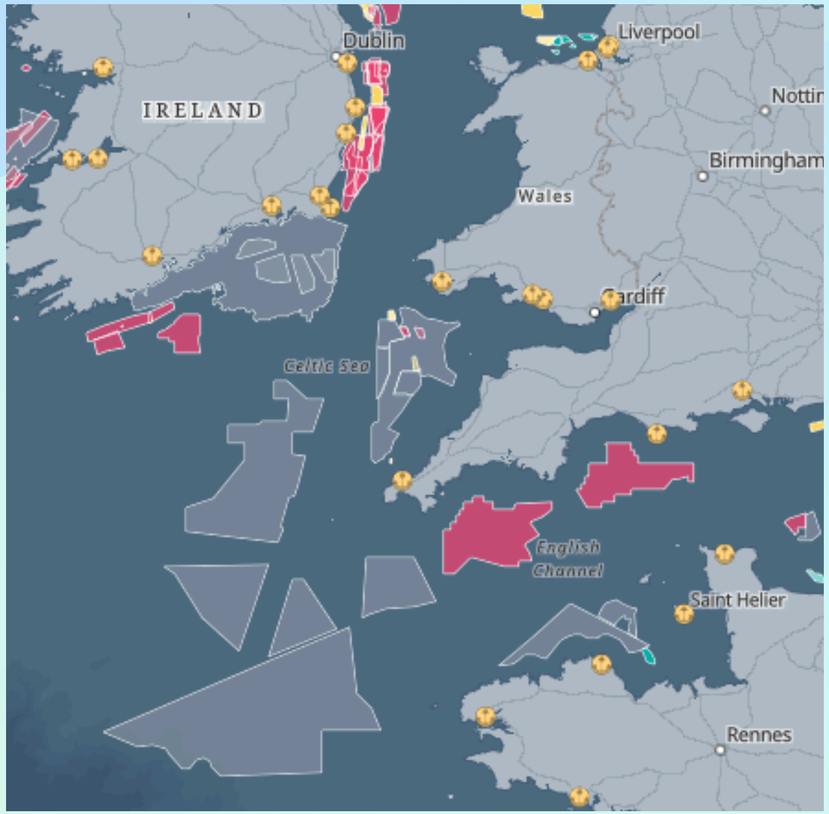
Model Verification

Our models perform well even in storm scenarios compared to measured wave buoy data





Current NeuWave Collaborations



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ACOUSTIC SOUND PROFILING

Aim: Modelling acoustic resonance drilling mooring lines for floating offshore wind farms

Challenges: Weighted scoring, model optimisation for more buoy inputs

Methods:

- Numerical acoustic deformation models

VEKTA GROUP

CABLE FATIGUE MODELLING

Aim: Comparing MetOcean data sources to characterise modelling cable longevity in floating offshore wind

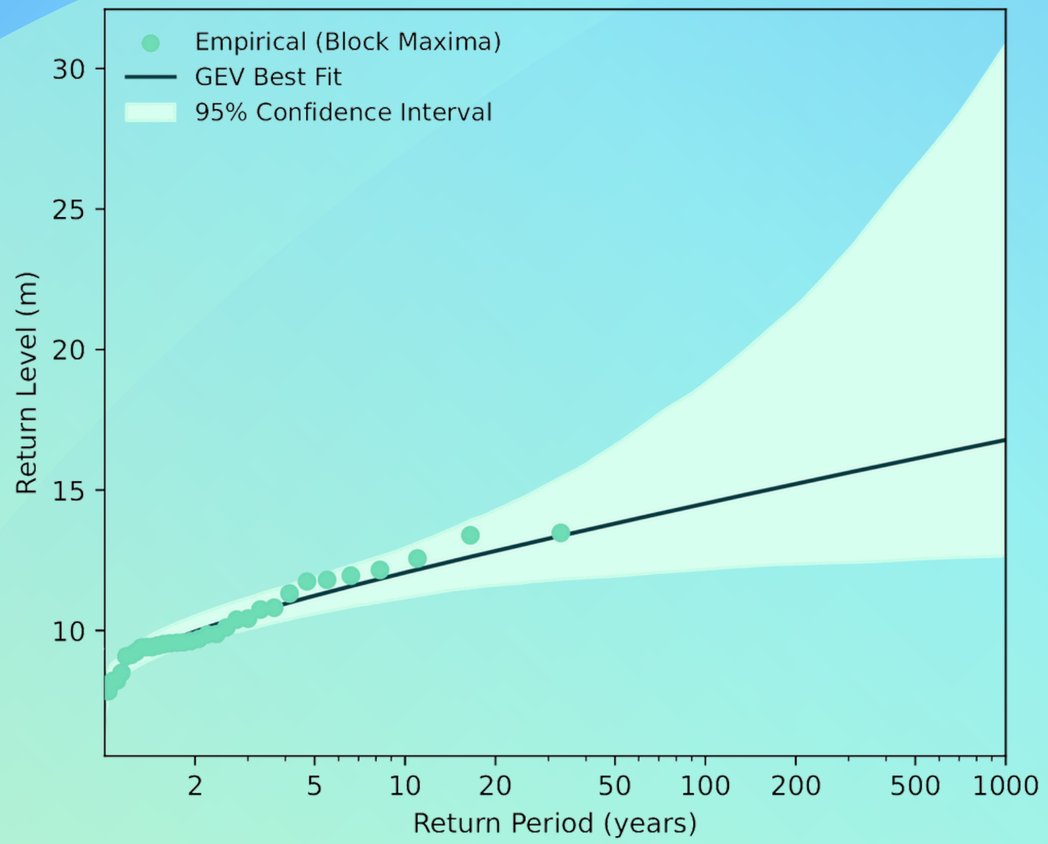
Challenges: Comparing multiple “best case”, “worst case” and ”average case” scenarios, and projecting 50 year forecasts based on historical results.

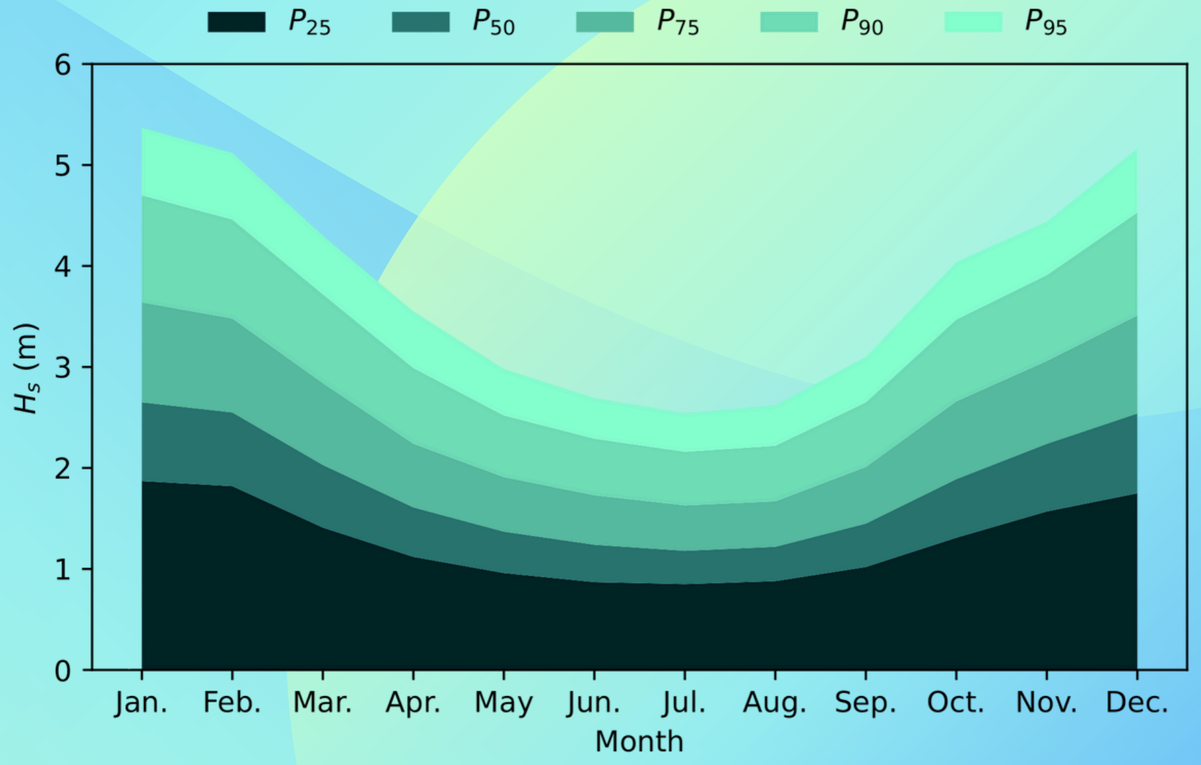
Methods:

- CFD modelling

We do more than make data

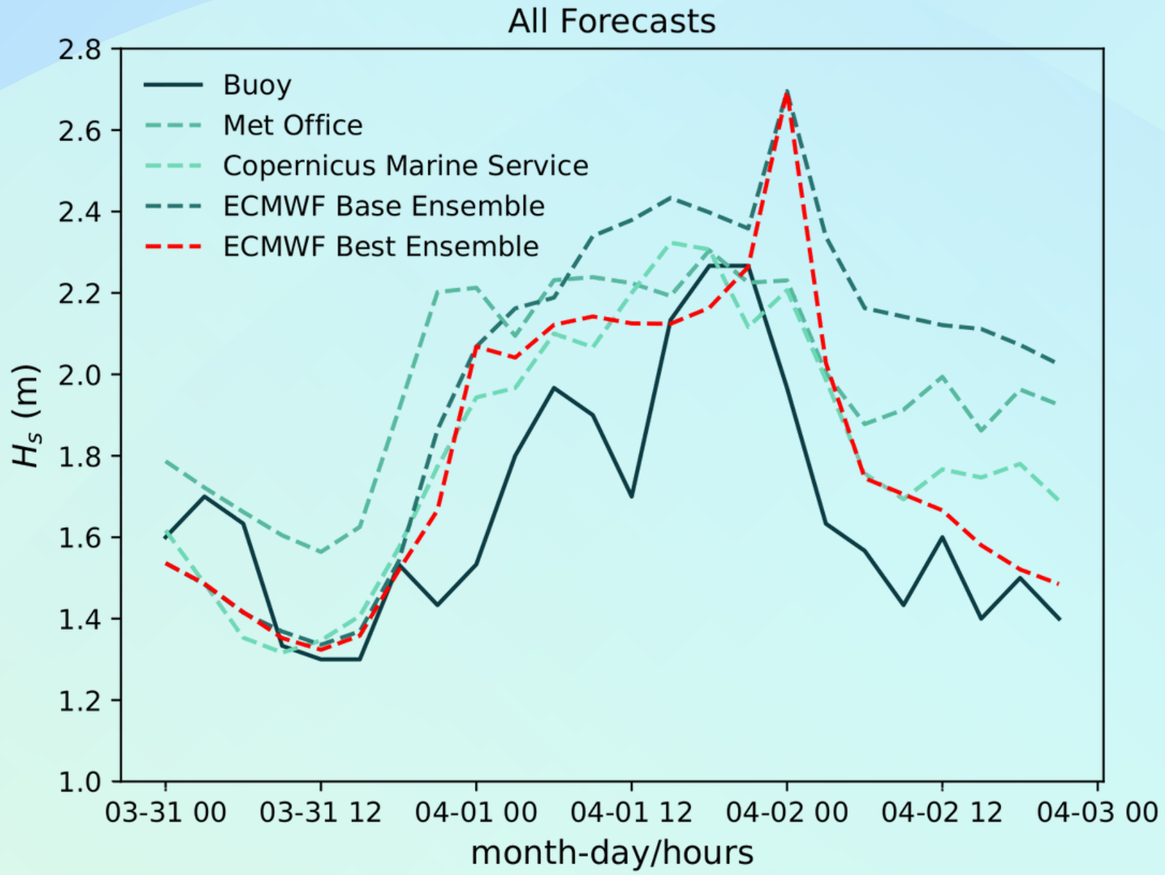
Automated site assessment
(offshore wind and wave energy compliant)

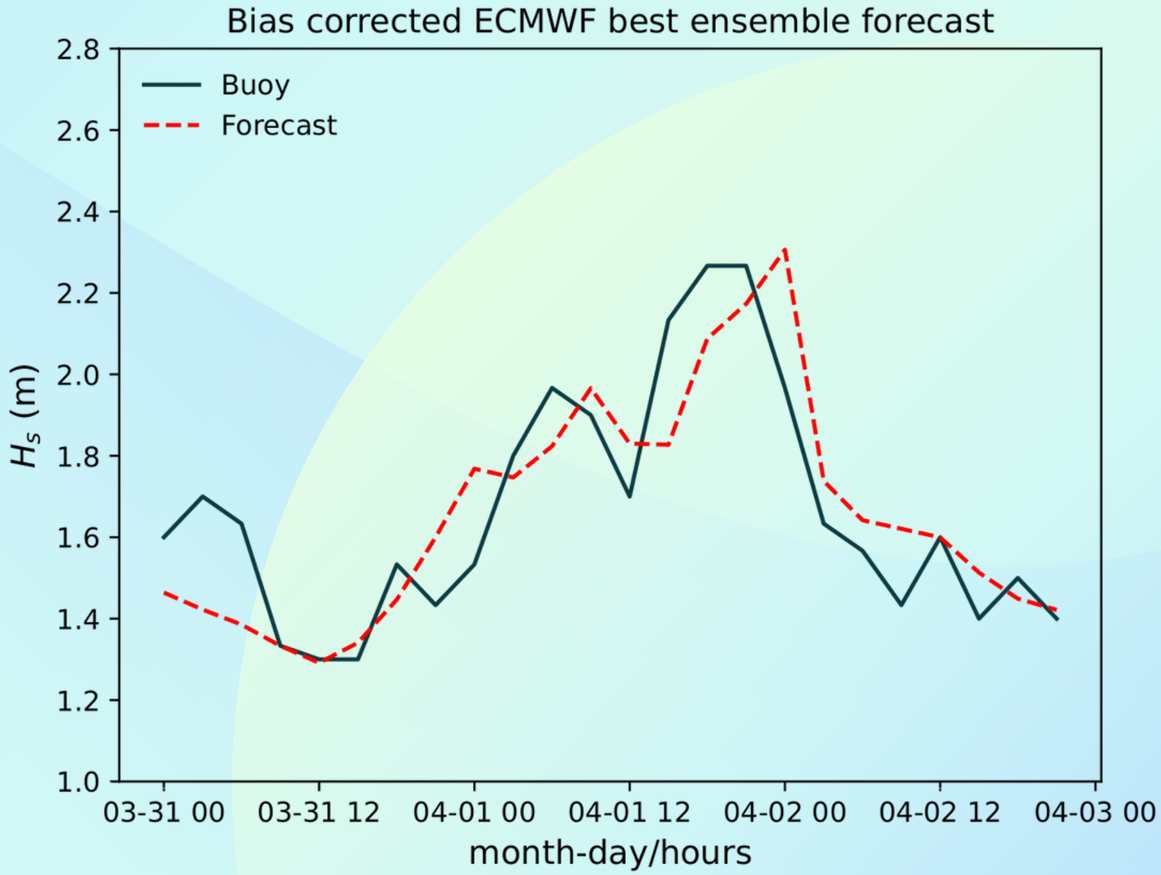




We do more than make data

full navigation and route planning suite for offshore vessels





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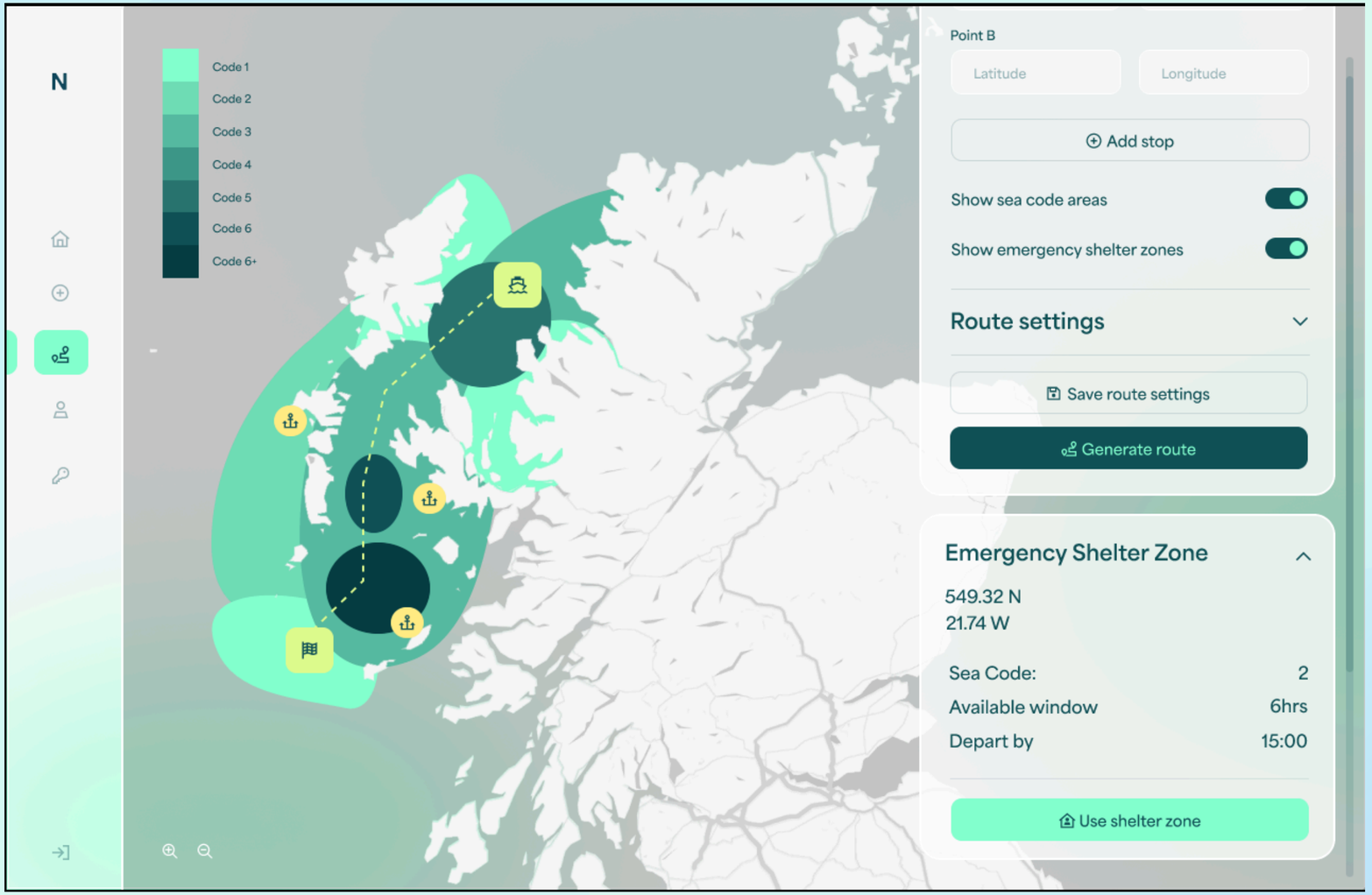
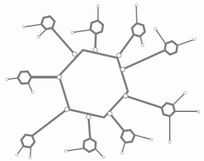


Upcoming innovation challenges



AUTOMATED BIAS CORRECTION OF METOCEAN FORECASTS

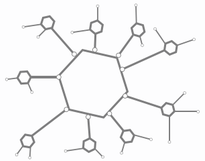
Aim: Extend NeuWave's bias correction at a single point to a dynamic model that tracks and consequently predicts how the forecasts change over space and in time.

Methods: Track the inherent bias in different forecasts and record how it changes in time at different locations. Machine learning with random forests.

TIDAL SURGE CORRECTION MODEL

Aim: Develop an automated model that corrects NeuWave's astronomical tidal data to tidal surge data.

Methods: Use multiple forms of media such as satellite altimetry, high-frequency radar signals, and acoustic Doppler current profiles (ADCP). Residual between observed and astronomical data will be tracked in time and predicted via a machine learning and statistical framework.



PREDICTION OF VESSEL MOTIONS IN 6DOF

Aim: Develop a new surrogate model that can predict motions in 6DOF for small-to-medium sized vessels.

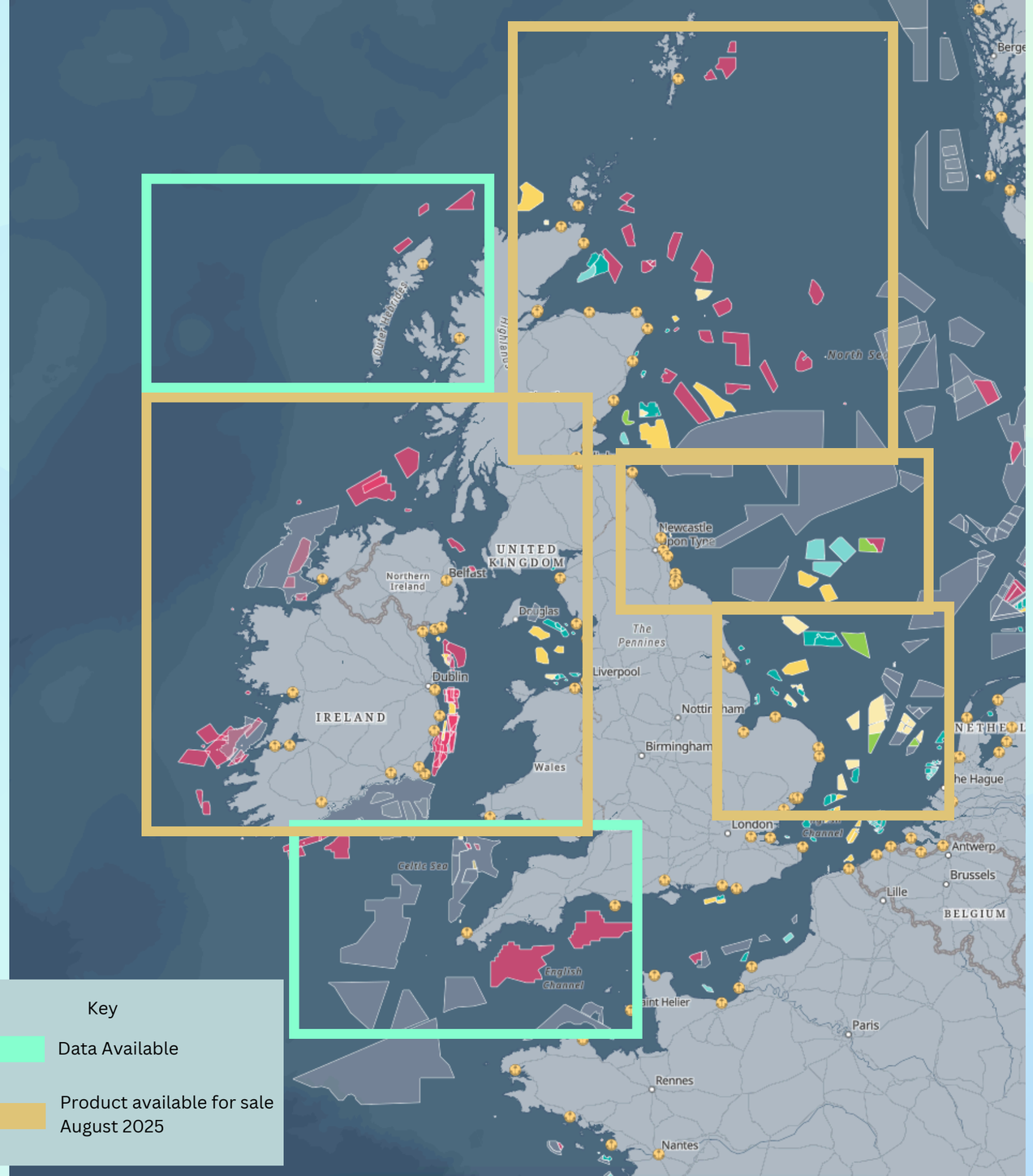
Methods: Train the surrogate model using motion logs from past journeys (along with key geometric descriptors of the vessel) and present journey logs from partner companies. Physics informed neural networks.

Data Availability for Academic Use

- 32 year historical data set (1990-2021)
- 500m-1km resolution
- Atmospherical tidal model (surface tides)

Variables included:

- Significant Wave Height
- Swell Wave Height
- Mean Wave Direction
- Peak Wave Period
- Zero-Crossing Period
- Directional Spreading
- 10m winds (u, v direction)
- Wave peakedness
- Wave randomness
- Energy Propagation
- Energy Generation
- Tidal range, u,v tidal velocity



NeuWave Data Available

Looking to collaborate! Free use of our data for academics for pure research applications
(NDA and publication co-authorship/ references required)

Check our website!

Get in touch at: jstella@neuwave.co.uk, rrai@neuwave.co.uk