

Supergen



Offshore
Renewable
Energy



UNIVERSITY OF PLYMOUTH

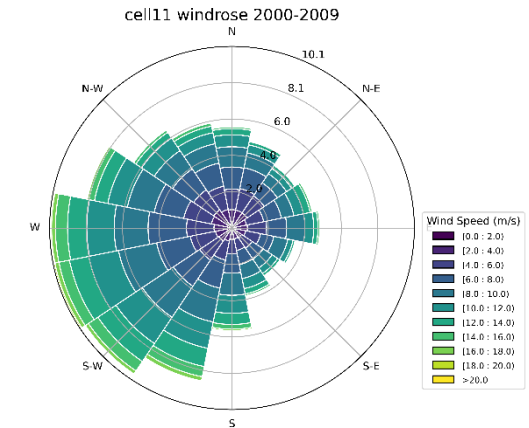
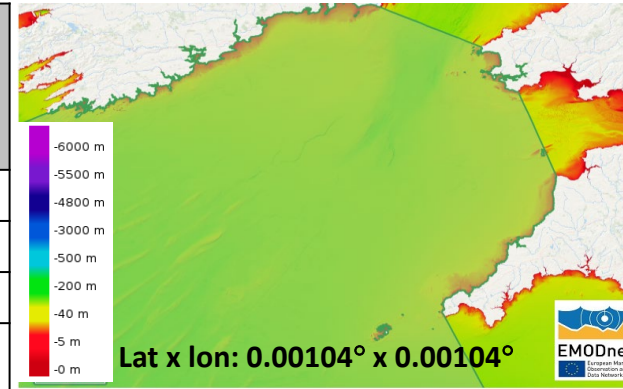
UoP Core Research Update **Scott Brown**



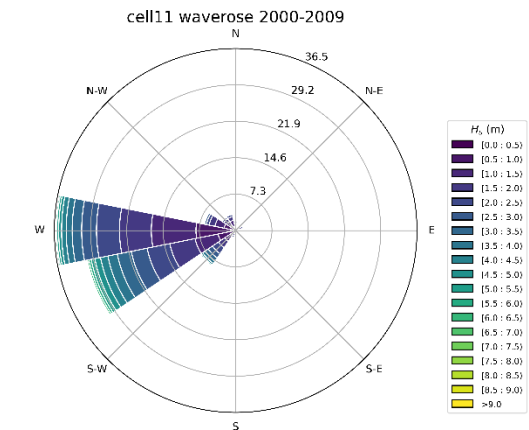
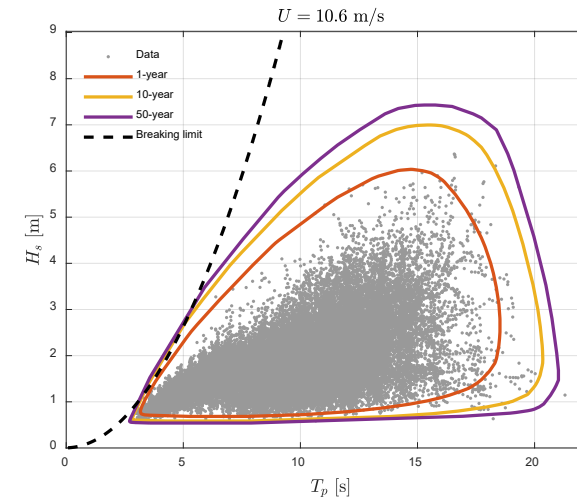
Engineering and
Physical Sciences
Research Council

Data Collection for the Celtic Sea

Hindcast Data	Resolution		Temporal Resolution	Time Span
	Latitude [degree]	Longitude [degree]		
Wave (ERA5)	0.5	0.5	Hourly	1940-2024
Wave (UKMO)	0.014	0.03	3-Hourly	1980-2024
Wind (ERA5)	0.25	0.25	Hourly	1940-2024
Current (UKMO)	0.06667	0.11111	2D: Hourly	1993-2024
			3D: Daily (12:00)	



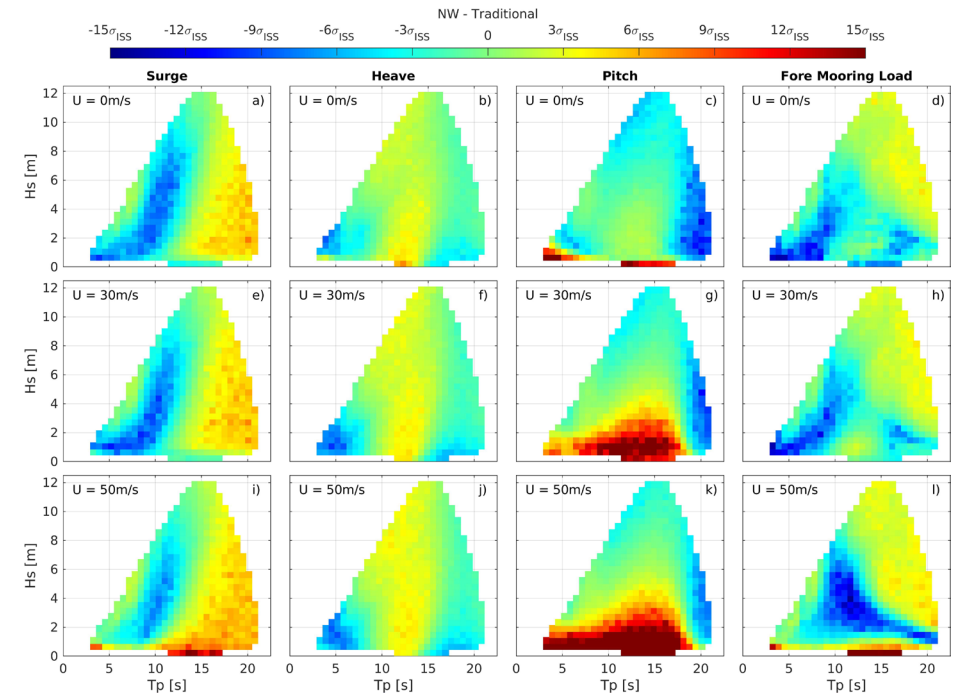
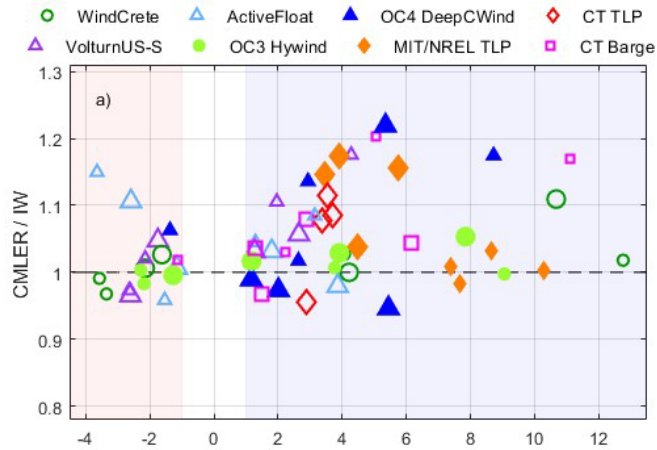
Measured Data	Device	No. of measurement	Temporal Resolution	Time Span	Variables
Wave	Waverider Buoys	17	Half hour	From 2005	2D spectra, raw displacement, bulk parameters
Wind	LiDAR	2	10 min	2022-2023	Speed (horizon, z), dispersion (horizon, z), direction



- Gathered met-ocean data to characterise met-ocean conditions for design.
- Explore more detailed met-ocean parameter impact on floating structures response.
- Generate a ML-based met-ocean prediction model in Celtic Sea for offshore decision-making.

Design Waves

- What is the typical variability in traditional approach?
- Can design waves provide reliable estimate for any sea state?
- Is 99th percentile scaling appropriate for all sea states?
- Are there regions of the parameter space where each method works best?



- Impact acceleration award
- Response-conditioning extended to combined wind and wave
- Are previous results transferable to other concepts?
- Constrained MLER: -5 to +20% of traditional approach.
- Single MLER:
 - Good for Pitch and nacelle acceleration
 - Use with caution for the tower base response
 - Not suitable for semi-sub or barge mooring loads.

University of Plymouth Future Work

WS2 – Data:

- Generate comprehensive dataset share to community
- Representative design conditions and load cases
- Data-driven opportunities to improve offshore operations

WS4 – Design:

- Extend design wave approaches for ORE floating structures:
 - Further FOWT and WEC concepts
 - Hybrid platforms
 - Future ORE concepts:
 - Flexible elastomer-based wave energy converters
 - Direct embedded energy generation.
- Comparison with blown wind simulations using the COAST Laboratory's new wind generation system
- FOWT fully coupled numerical model and representative design conditions in the Celtic Sea, feeding into SRS3 and 5

