

Supergen



Offshore
Renewable
Energy

Early Career Researcher Posters and Abstracts Booklet

2026 Annual Assembly

Surnames C-G



Engineering and
Physical Sciences
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Early Career Researcher Posters 2026

Xiaosheng Chen, University of Oxford

Computational Modelling on Device Hydrodynamics: Work Stream 1

Danny Coles, University of Oxford

What is global electricity production potential from tidal stream energy?

William Coombs, University of Oxford

Offshore Cable Burial: How Deep is Deep Enough?

Yusril Fatahlimi, University of Edinburgh

Optimising Thermal Management of Modular Electrical Machines for Renewable Energy Systems

Piotr Fojcik, University of Strathclyde

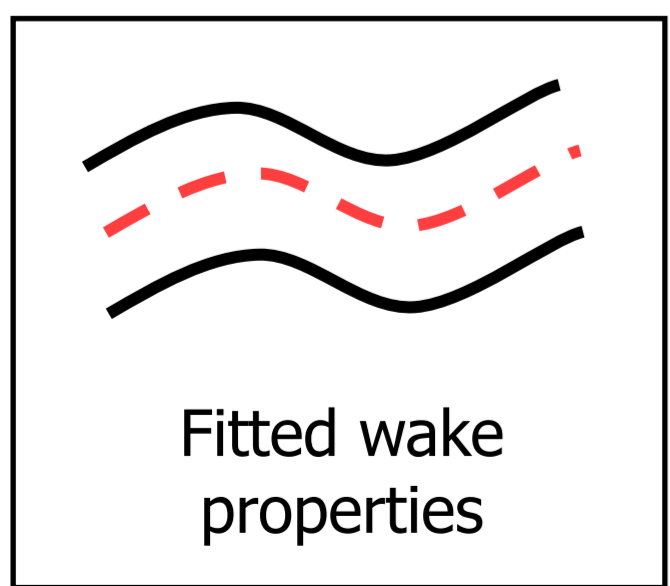
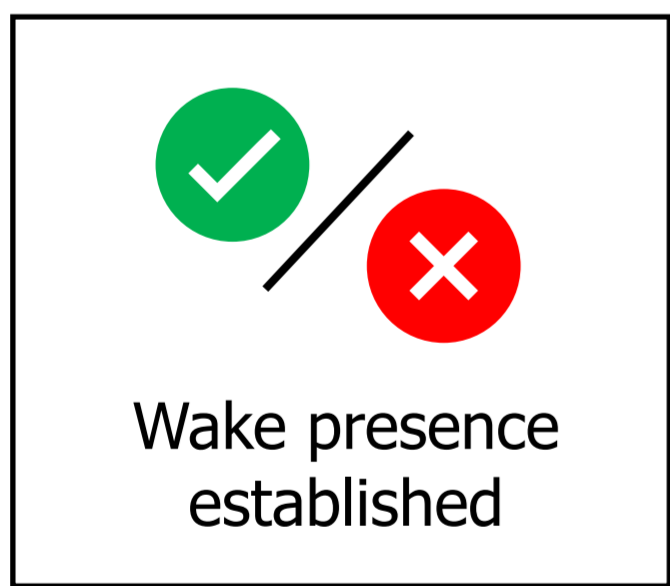
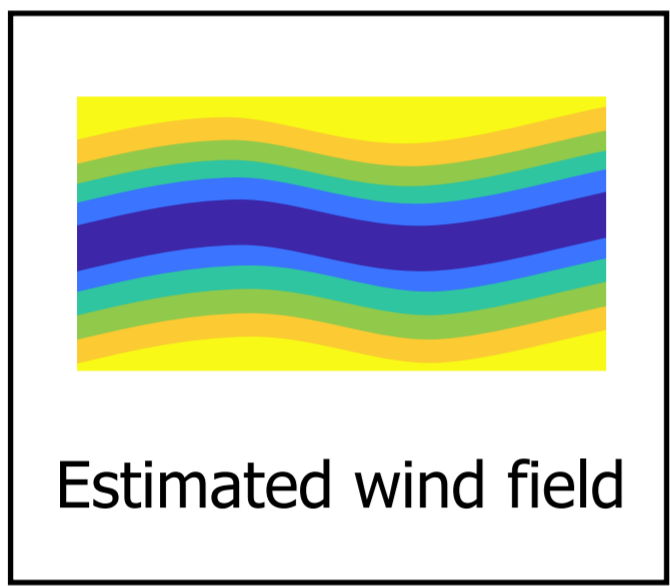
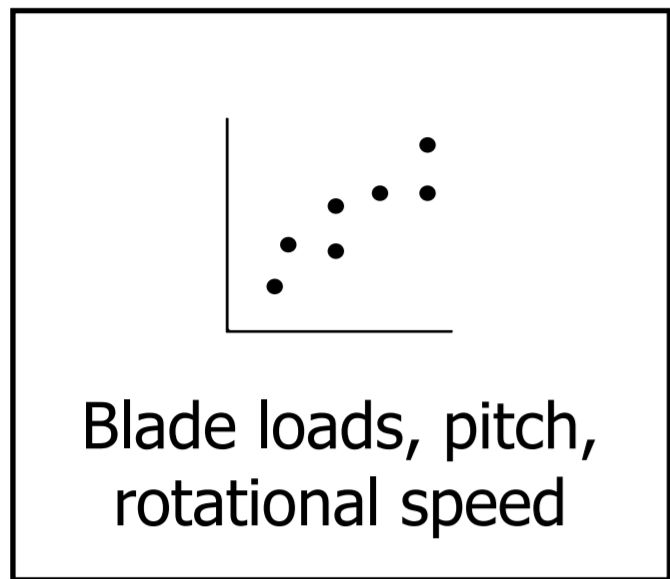
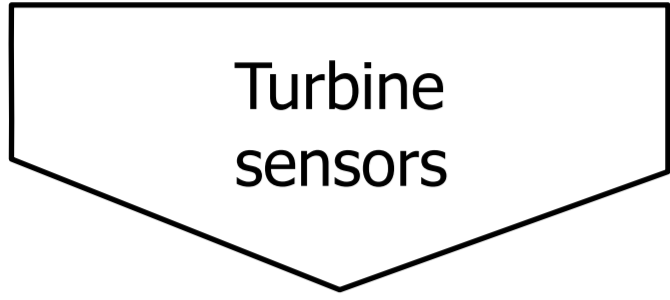
Wake Detection and Characterisation Utilising Blade Loads and SCADA: a Generalised Approach

Olga Ganilova, University of Strathclyde

Evaluation of erosion resistance of thermoplastic polyurethane coating for support structures in offshore renewable energy infrastructure

Jessica Guichard, University of Plymouth

Experimental investigation of flexible riser for hydrogen transport from FOWT platform to seabed



Motivation

- Operating a turbine affected by wake deficits from the upstream machines results in:



Decreased AEP



Increased fatigue

- Wind farm flow control can help, but it requires **instantaneous information on the affecting wake conditions** as the input.

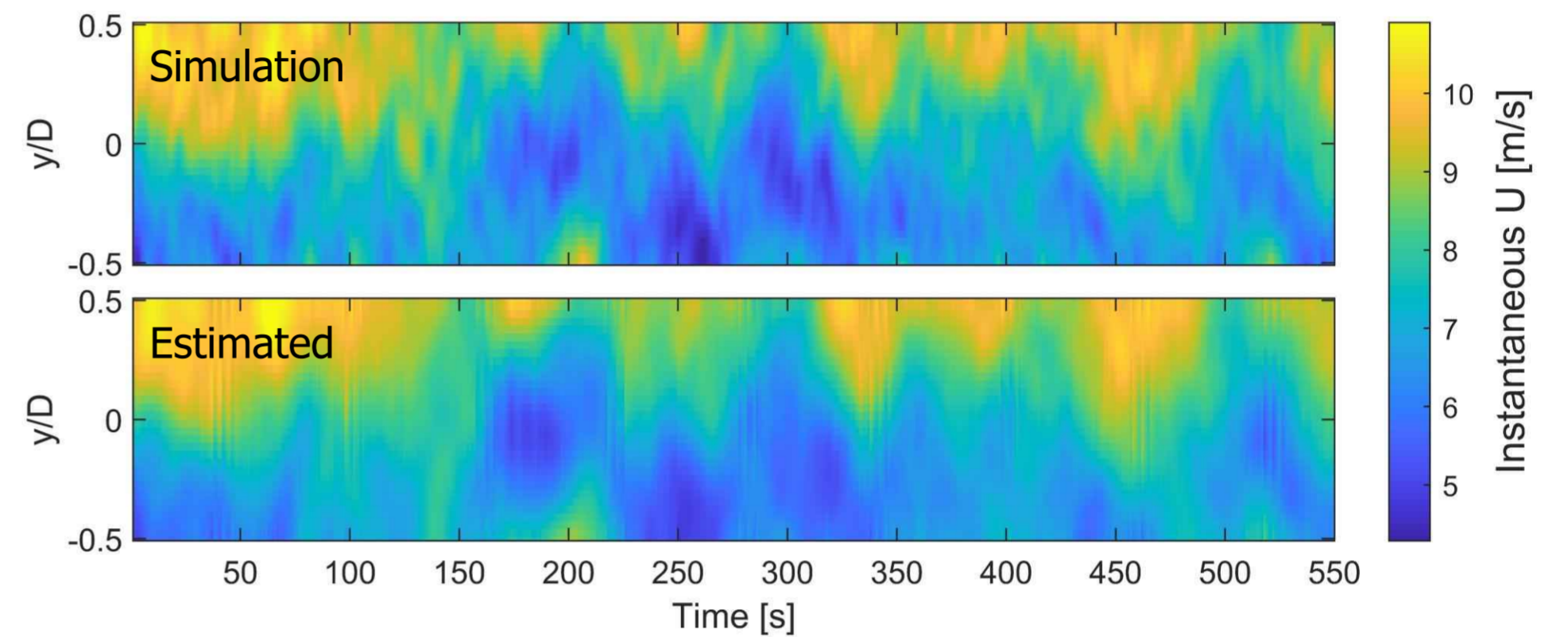
Framework Overview

- Aim: develop an estimation framework that robustly estimates impinging wake properties **from operational parameters of the turbine**.

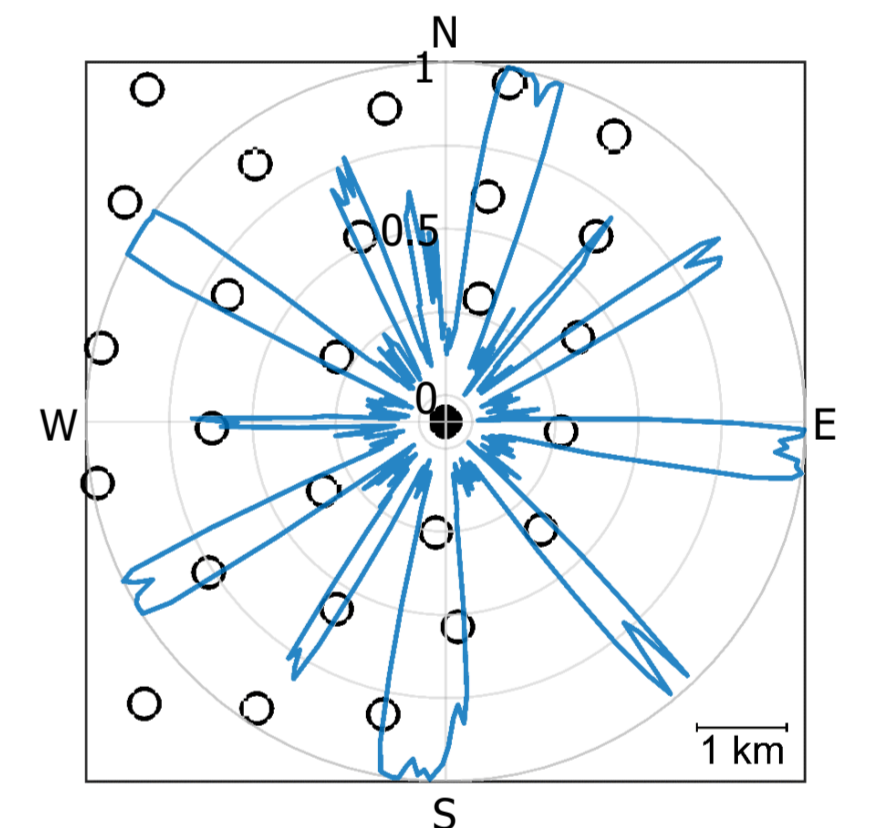
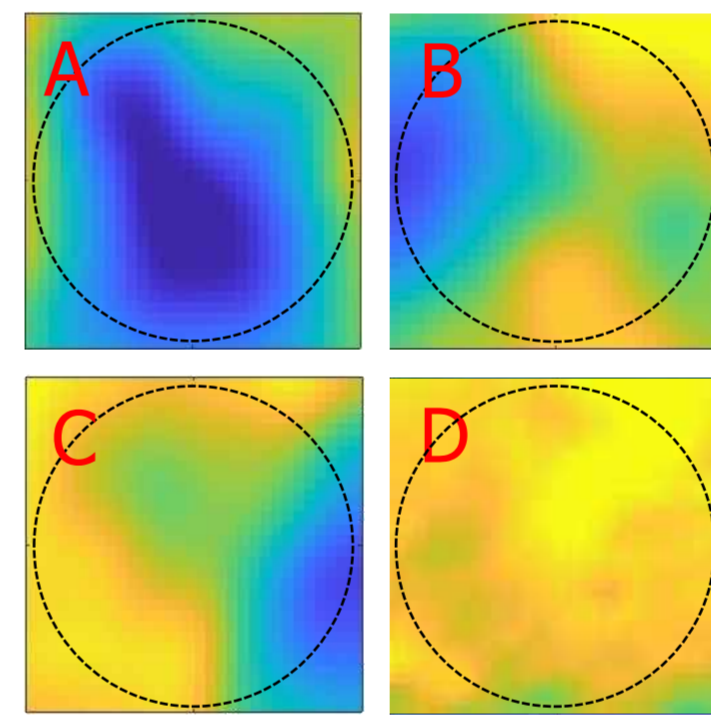
- How: currently, both training and validation carried out in a simulation environment.

- Key aspect: only fit the wake properties **if a clear wake presence was detected**.

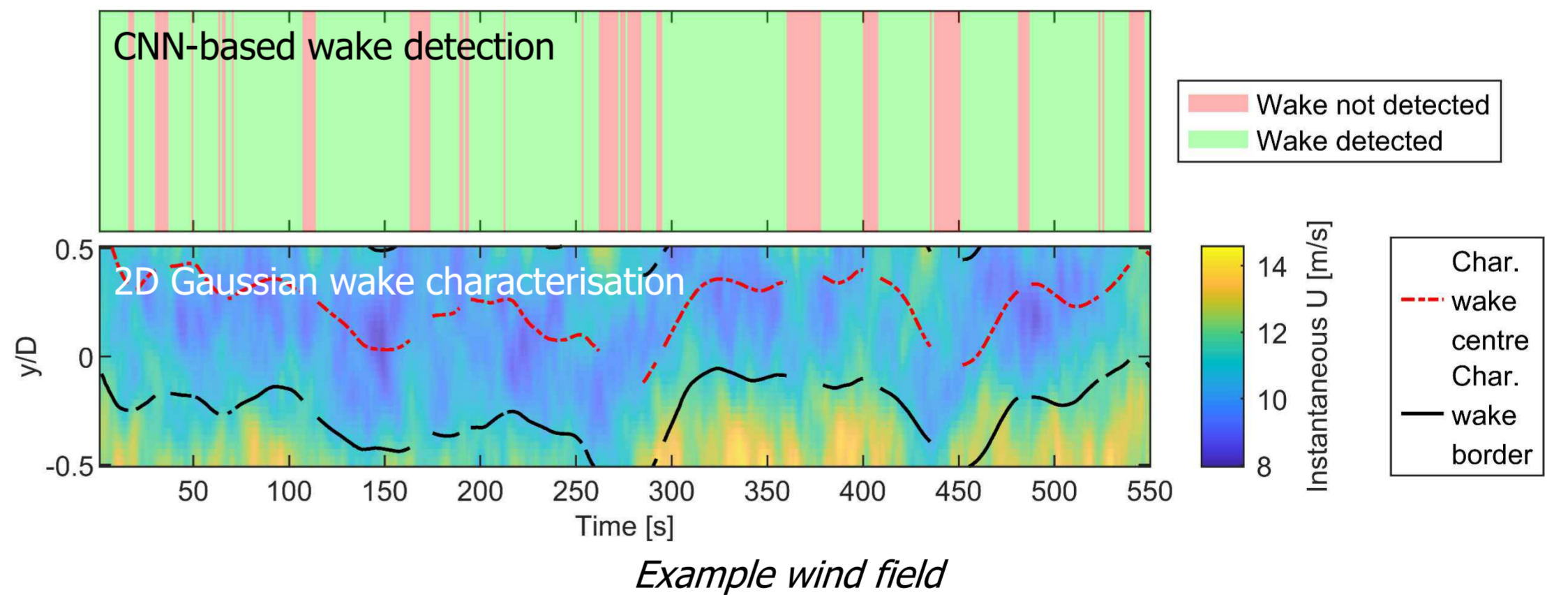
- Wind field reconstruction is based on a family of localised **linear regression** models.
- Average RMSE in U estimation: 0.35 m/s, or 5.23% when normalized with mean ambient wind speed value.
- Overall great estimation quality, with very limited discrepancies. Capable of producing wind field reconstructions with accuracy high enough **for the larger flow structures like wakes to be captured**.



- The classification used in wake detection is performed with a **Convolutional Neural Network (CNN)**.
- Sample by sample, a front view 'snapshot' is assigned to one of four classes:
 - Full wake impingement (A)
 - Partial wake impingement left (B)
 - Partial wake impingement right (C)
 - No wake impingement (D)
- The plot to the far right shows wake detection performance for full wind direction spectrum. Blue polar values indicate the proportion of samples identified as a wake for each wind direction – **higher where there are upstream turbines present**.



- A 2D Gaussian or energy centre function is fitted for every sample **where a wake deficit was detected**, allowing for flexible tracking of the wake deficit.
- Due to applied moving average filtering, characterised properties experience a minor lag.



Conclusion

Results show a great potential of the generalised wake estimation approach. Sub-optimal performance for more severe wind conditions. **Models can be trained with different data** to address varied flow scenarios.

Future Work

The models are trained on medium-fidelity simulations. Moving towards a real-life application requires a more optimal training dataset combining low computational cost and high-fidelity data. A solution implementing **Large Eddie Simulations** is currently under development.

Evaluation of erosion resistance of thermoplastic polyurethane coating for support structures in offshore renewable energy infrastructure

Olga Ganilova¹, Ashlee Espinoza², Feargal Brennan¹

¹University of Strathclyde, Department of Naval Architecture, Ocean & Marine Engineering,

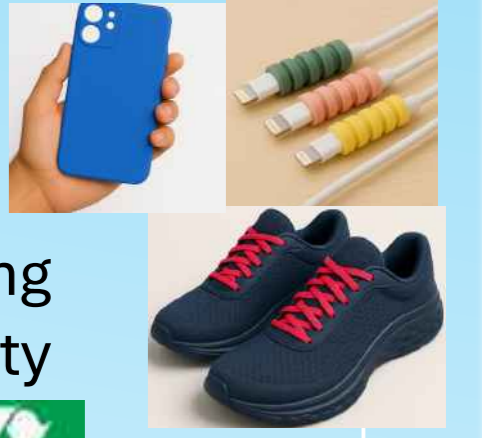
²University of Strathclyde, Department of Mechanical and Aerospace Engineering

Motivation

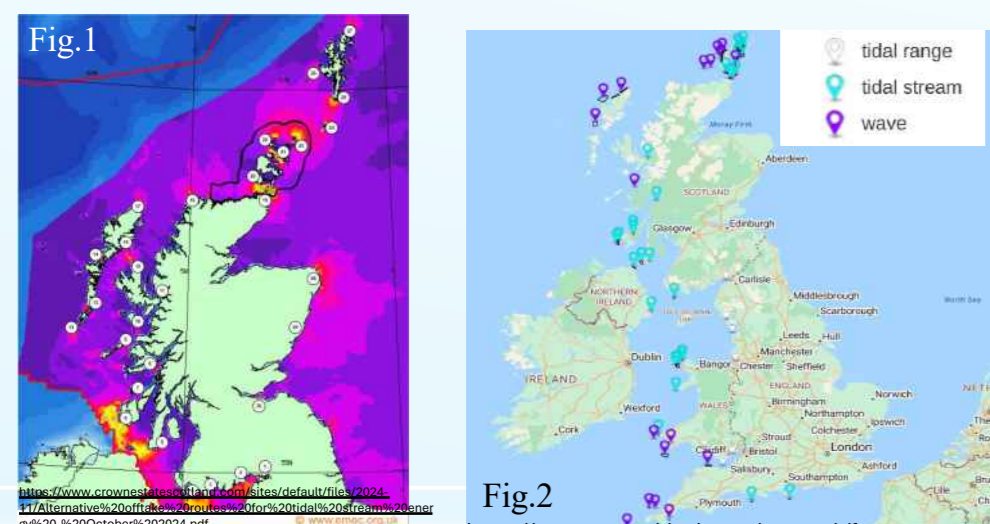
- The UK has a large number of the highest-energy tidal current resources in the world allowing it to lead in tidal stream technology development (Figs. 1,2);
- The predictability of tides and fully submerged design has an advantage - this technology is more predictable and resilient.
- The technology is fully submerged in tidal seawater currents containing sand and debris, and thus must operate in a harsh corrosive environment with tidal currents over 3m/s, turbulence, vertical and lateral unsteady loading;
- While structural integrity and load bearing capability of the turbine supports is achieved through steel implementation, its life extension with sustainable, non-toxic and recyclable solutions is required.



- Increasing development and market expansion for thermoplastic polyurethane (TPU) has resulted in the cost of the material going down and versatility increasing due to their superior wear resistance, strength, durability and recyclability.

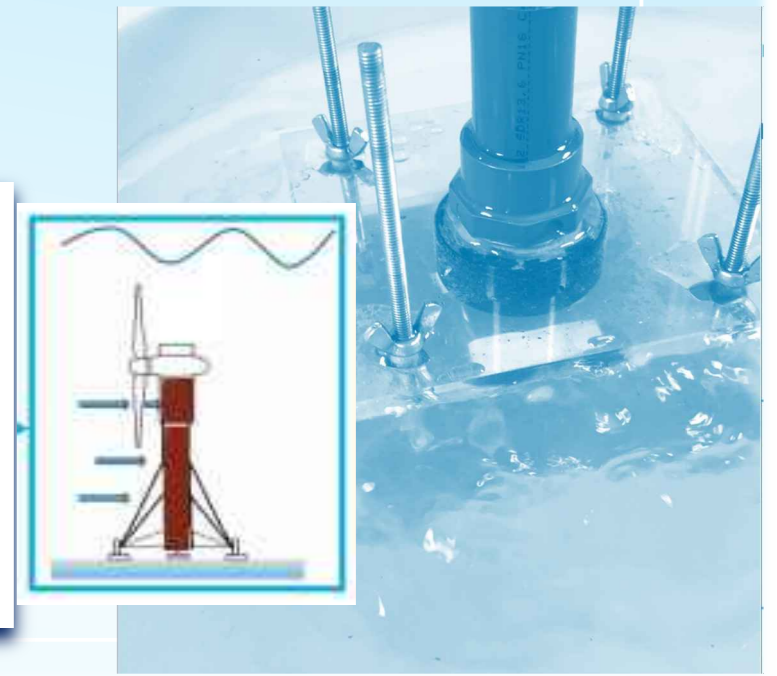


- TPU is easy to process and it is non-toxic.
- A range of biodegradable and self-healing TPU materials have been developed maintaining their high toughness and abrasion resistance.
- So far only the TPU aging in seawater has been studied but mechanical damage due to the wave, current and slurry erosion are still to be explored.



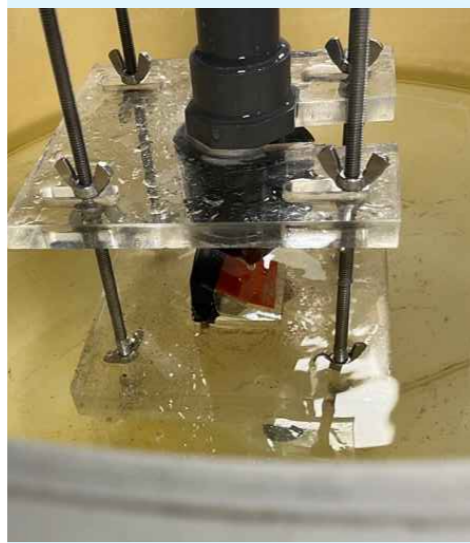
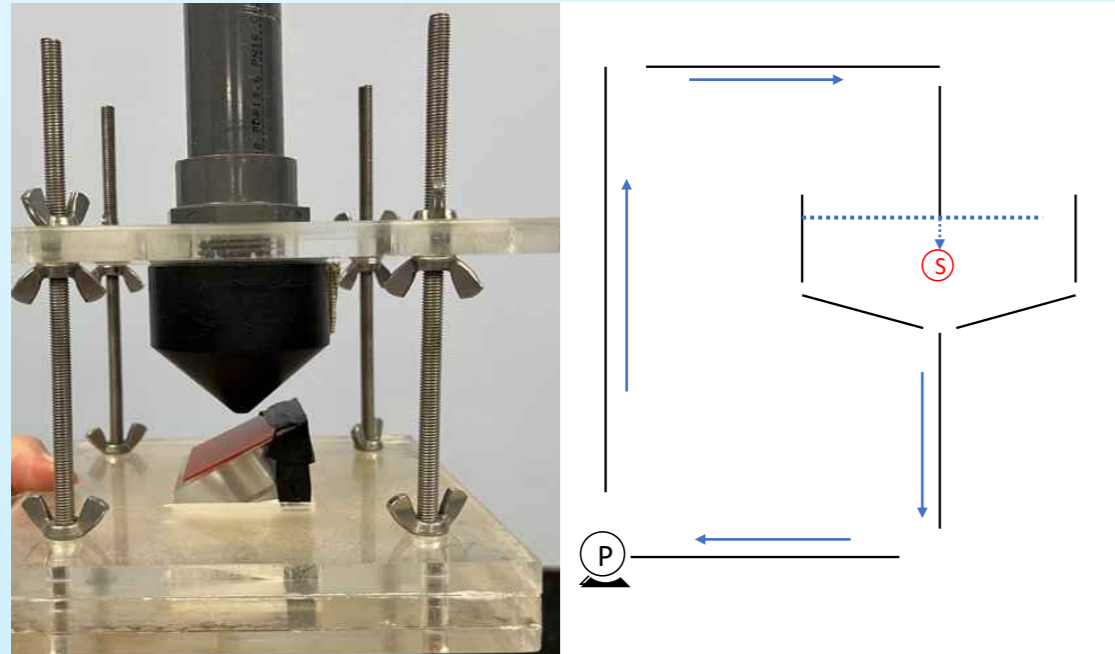
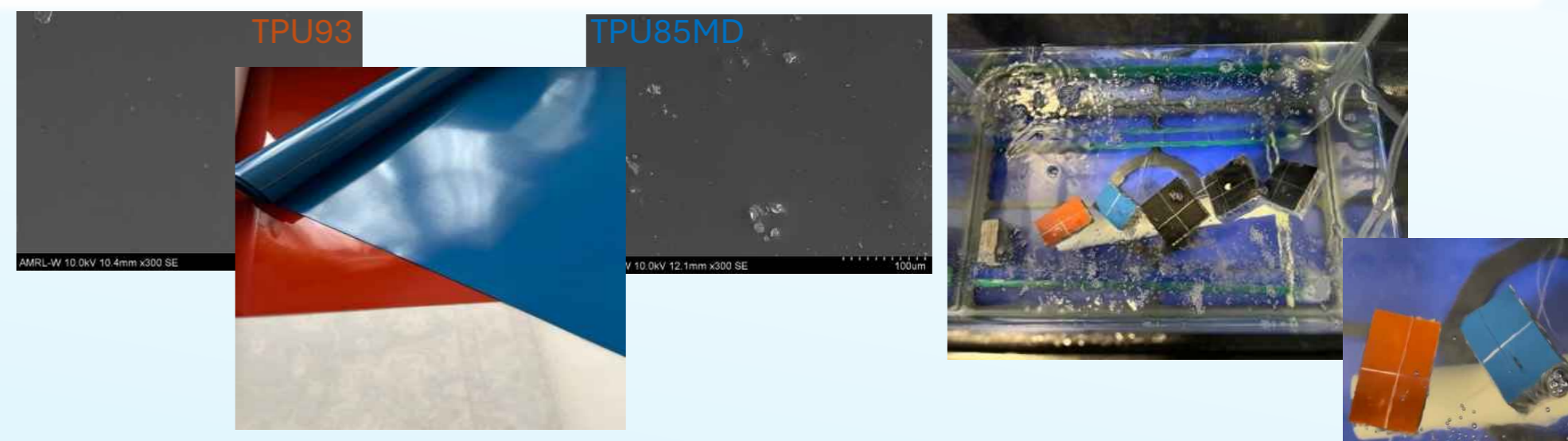
Aim

Investigate erosion resistance of TPU material in a simulated harsh environment through performance of experimental erosion in a saltwater slurry solution for potential application, and life extension, in tidal stream turbine support structures which are submerged in ocean water and exposed to tides and waves.



Methodology

- Corrosion and erosion experimental investigation of two types of TPU, TPU93 and TPU85MD, the latter containing stainless steel particles, have been performed.



- An impingement erosion rig was used to evaluate the material performance in 3.5% NaCl aqueous solution and 1g/L silica sand slurry at three impingement angles (15°, 30°, 90°) to simulate an erosive ocean environment.

- The materials' erosion resistance was assessed through measurement of mass loss and gain.
- To analyse the extent of damage, the depth of the wear scar was measured using a 2D profilometer.
- Surface morphology of the eroded area was performed using a scanning electron microscope.

Conclusions

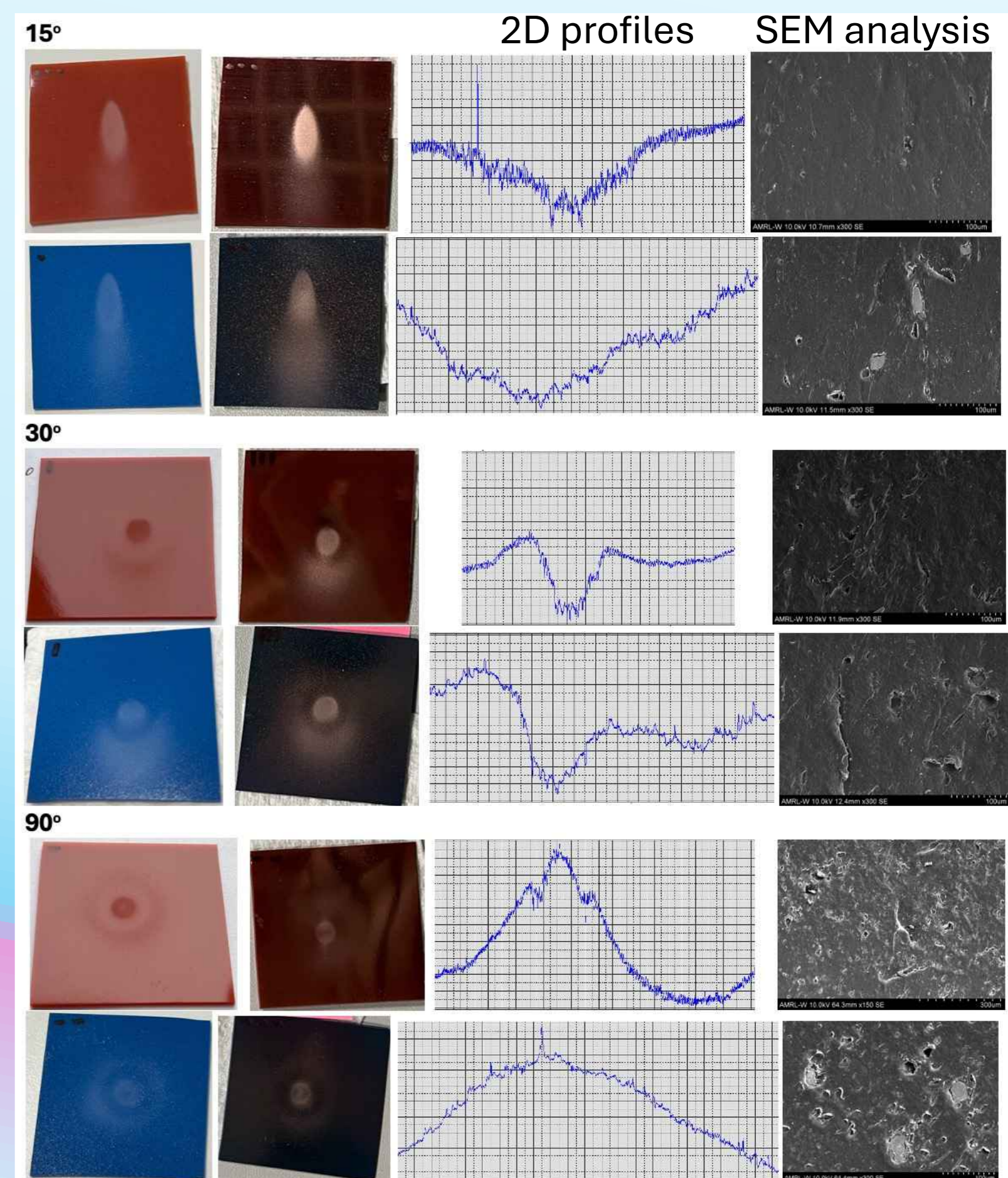
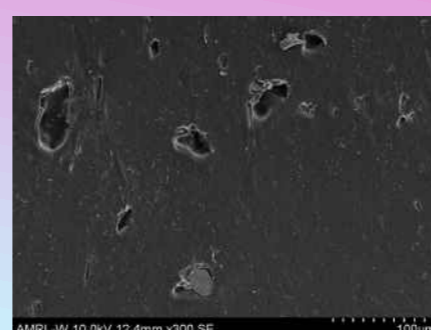
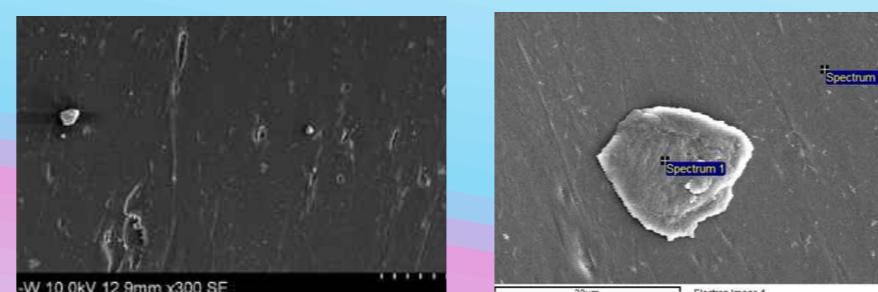
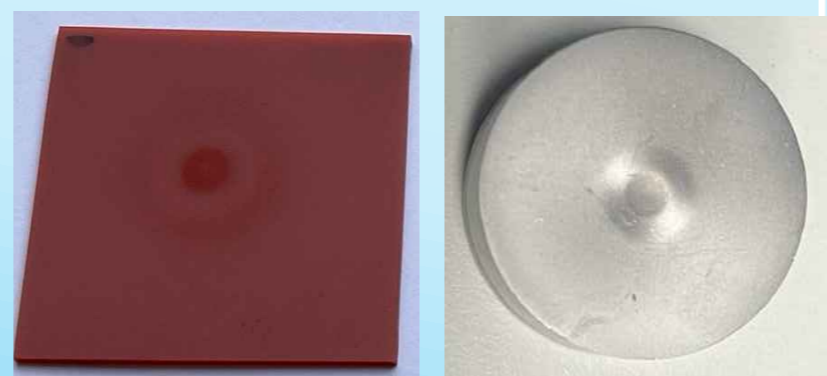
- Through all erosion tests TPU materials have maintained their high toughness and abrasion resistance, which would provide protection for the steel sample.

- Evidence was found that salt and sand particles could be embedded and deposited on the surface of both TPU materials.

- The performance of **TPU85MD** was dominated by deeper wear scars and void formation due to the loosening and removal of the particle reinforcement, accelerating damage propagation, and therefore, is not recommended for offshore applications.

- The evaluation of the wear resistance of **TPU93** confirmed the behaviour observed for other polyurethane materials investigated in the literature, demonstrating durability, and is a more appropriate option for application in offshore structures.

- Therefore TPU material can be successfully used to provide erosion resistance in submerged structures, potentially extending their life and reducing maintenance.



Future work

- Investigation of TPU layer effect on the dynamic properties of the support structure and detection of damage;
- Study of application of self-healing TPU materials in support systems;
- Application of TPU material in lightweight structures

Acknowledgement

The authors would like to acknowledge the financial support for this work through the CoTide Engineering and Physical Sciences Research Council grant EP/X03903X/1.





Experimental investigation of flexible riser for hydrogen transport from FOWT platform to seabed

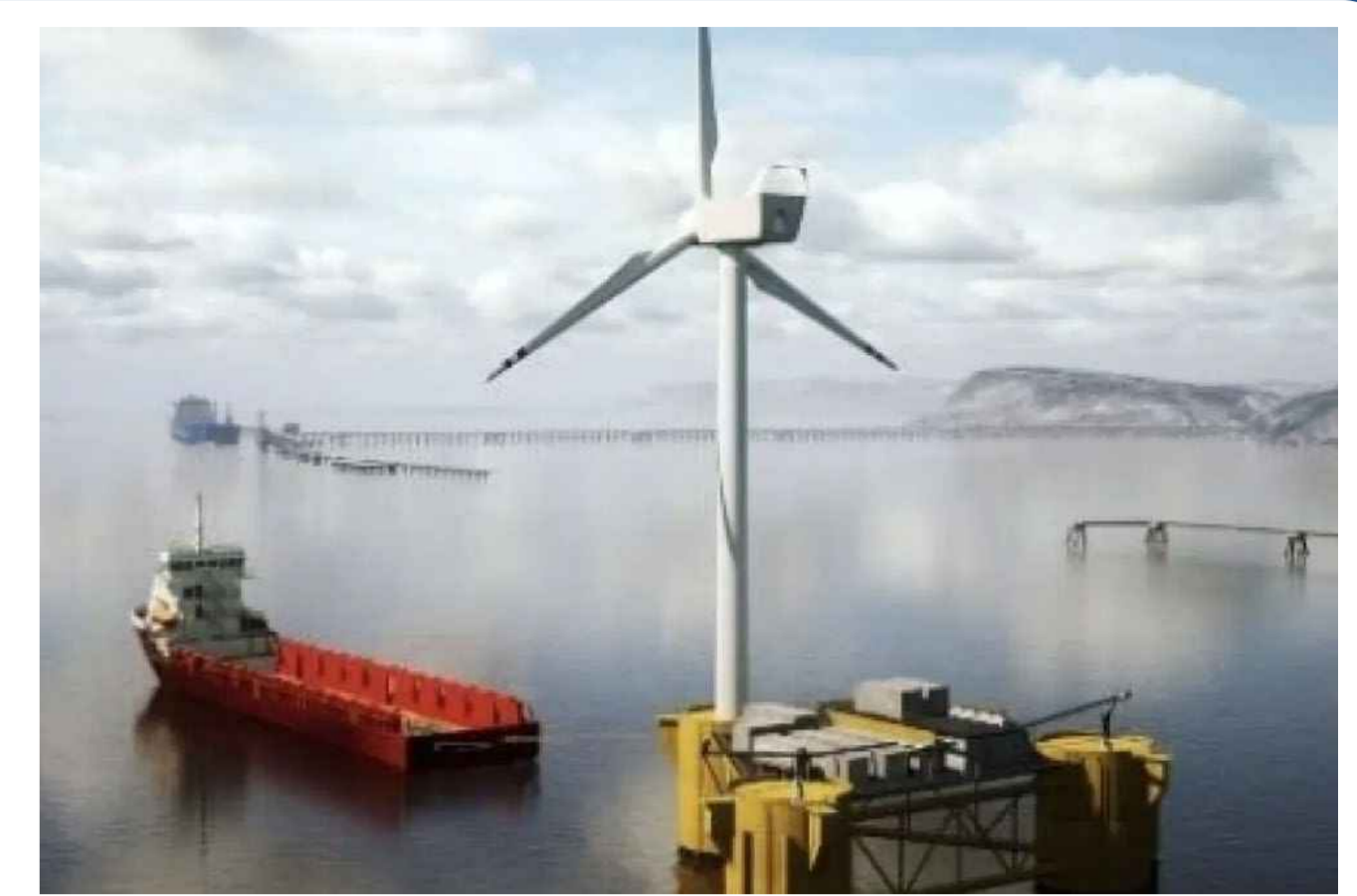


J. Guichard¹, M. Hann¹, T. Tosdevin², D. Greaves²,
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Background & Motivation

- Offshore green hydrogen is projected to reduce energy export costs compared to onshore production for far-from-shore wind farms.
- Dolphyn Hydrogen plans a 10–15 MW Commercial Scale Demonstrator (CSD) producing hydrogen directly offshore by 2030.
- Key challenge: ensuring safe performance of the flexible riser transporting hydrogen from a floating platform to the seabed.
- The riser must never bend below its minimum allowable radius (1.87 m). Laboratory testing at 1:62 scale is used to examine hydrodynamic behaviour under realistic sea conditions.

Virtual image of CSD



Objectives

- Reproduce the static and dynamic behaviour of a 6-inch (Inner diameter with 8.6-inch outer diameter) NOV* flexible riser at model scale, length 250 m
- Assess bending radius under:
 - Operational conditions
 - 1-in-50-year storm conditions in the Celtic Sea
 - Short Design Waves (MLER**) for Surge of the platform
- Determine whether short design waves for a riser could be determined which can replace long (3-hour) irregular storm runs for predicting extreme curvature

*formerly National Oilwell Varco **Most likely extreme response

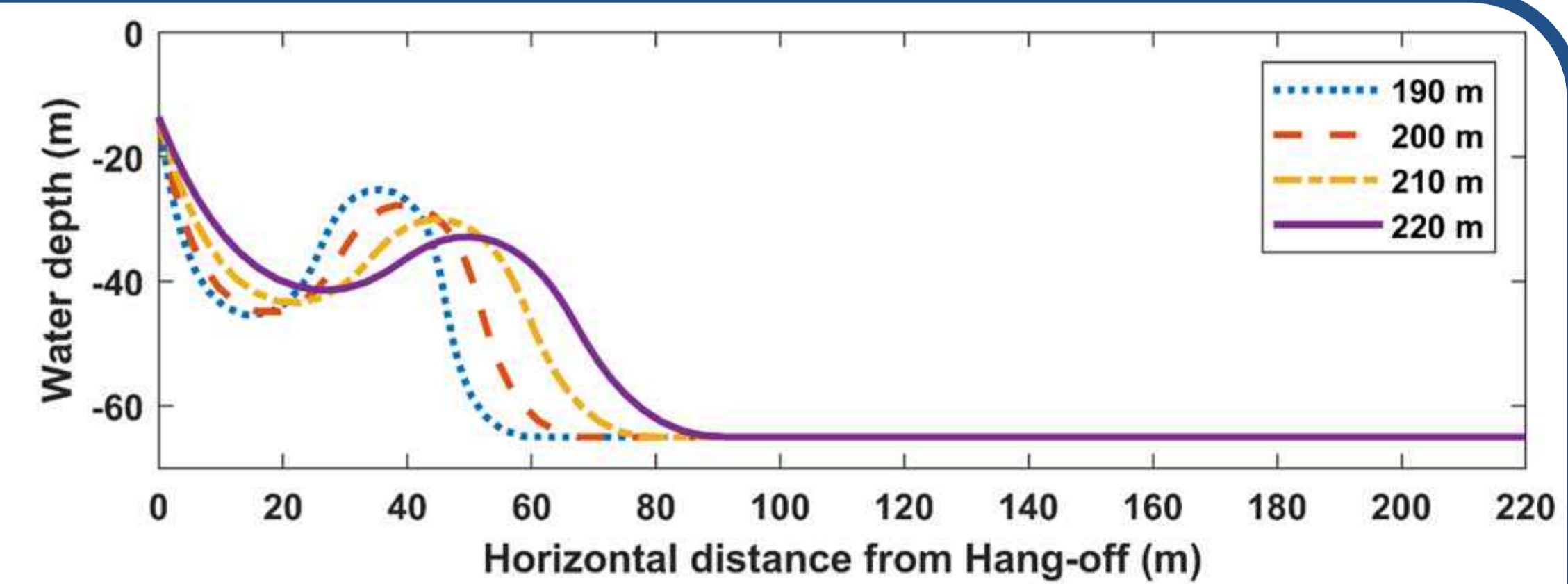
Methodology

Static Modelling

- Conducted using MoorDyn (lumped-mass) integrated in WEC-Sim to identify lazy-wave configurations that maintain acceptable curvature.

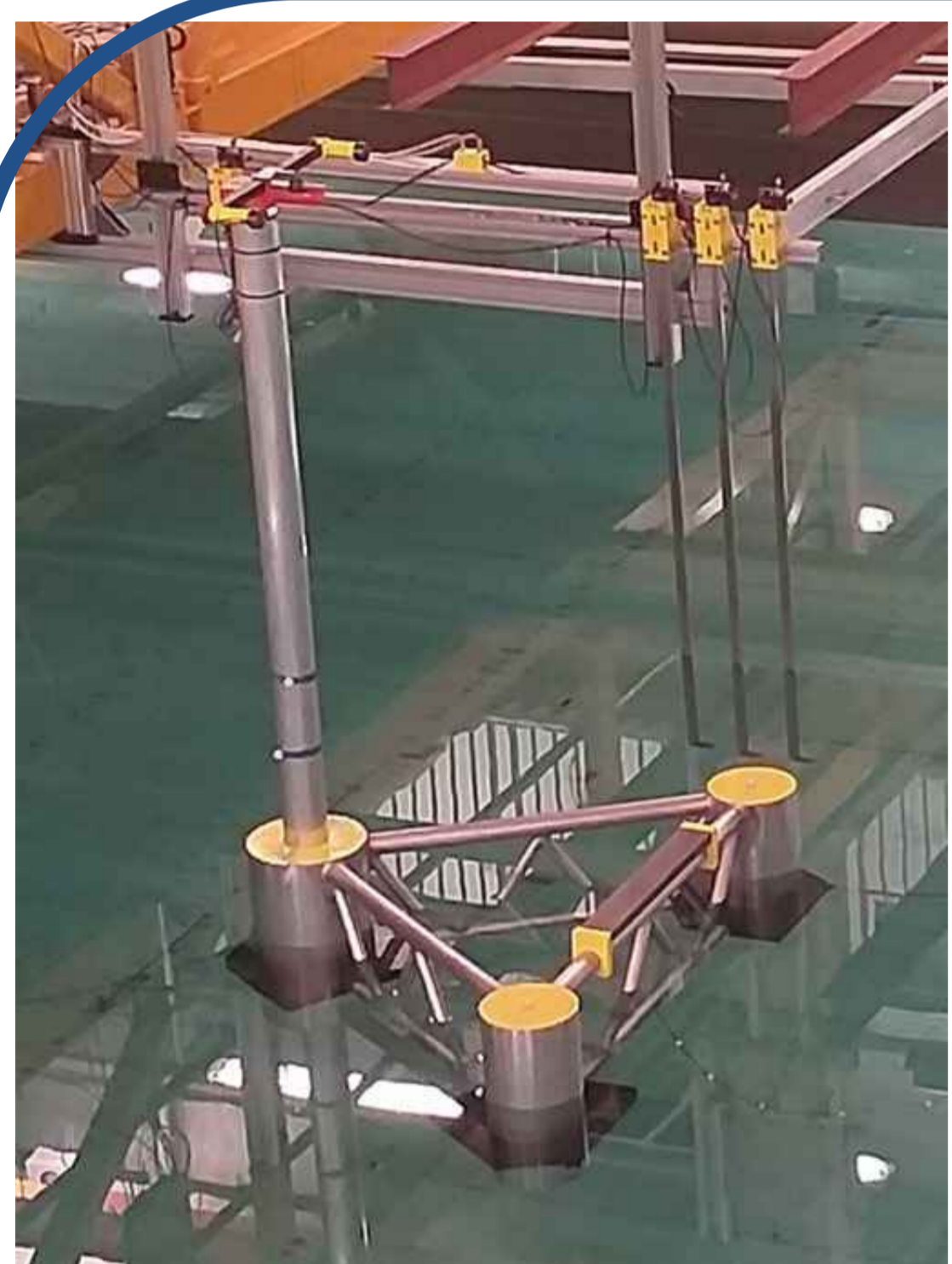
Scaled Riser Representation

- Riser material selected: FKM (Viton) rubber cord, matching:
 - Outer diameter: 3.44 mm (target 3.54 mm)
 - Submerged weight within 1 % of target
 - Bending stiffness: 1.78 x target (acceptable based on literature)
- Buoyancy modules represented by fishing poppers weighted with nylon nuts for correct submerged mass.

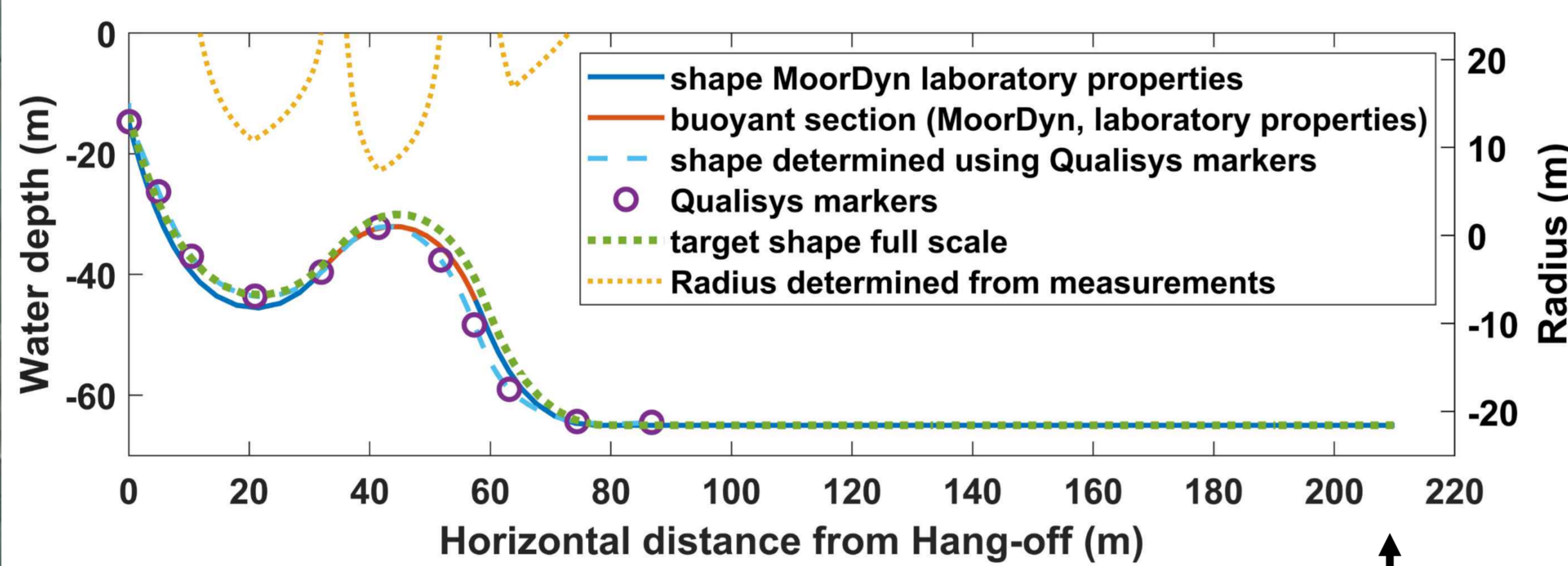


Experimental setup

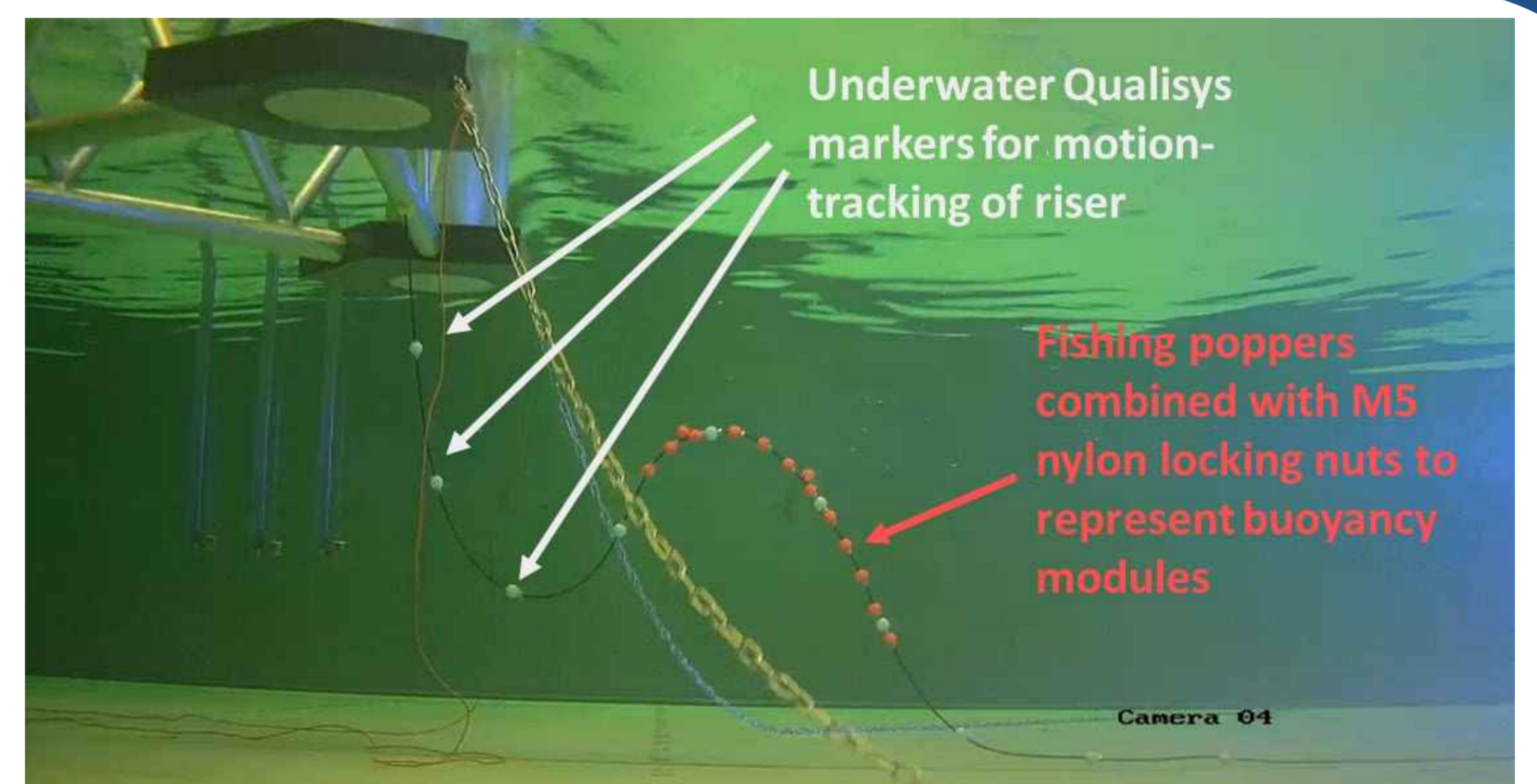
- Riser attached to semi-submersible floating platform with heave plates, representative of the future CSD
- Underwater tracking via 10 Qualisys markers spaced at 0.20 m
 - 2 different horizontal distances investigated: 200 and 210 m
- Sea states modelled (without wind):
 - Operational: $H_s=1.8$ m, $T_p=9.1$ s
 - Storm: $H_s=12$ m, $T_p=14.4$ s
- Short design waves for the platform



Model of the future Commercial Scale Demonstrator at scale 1:62, semi-submersible platform with heave plates

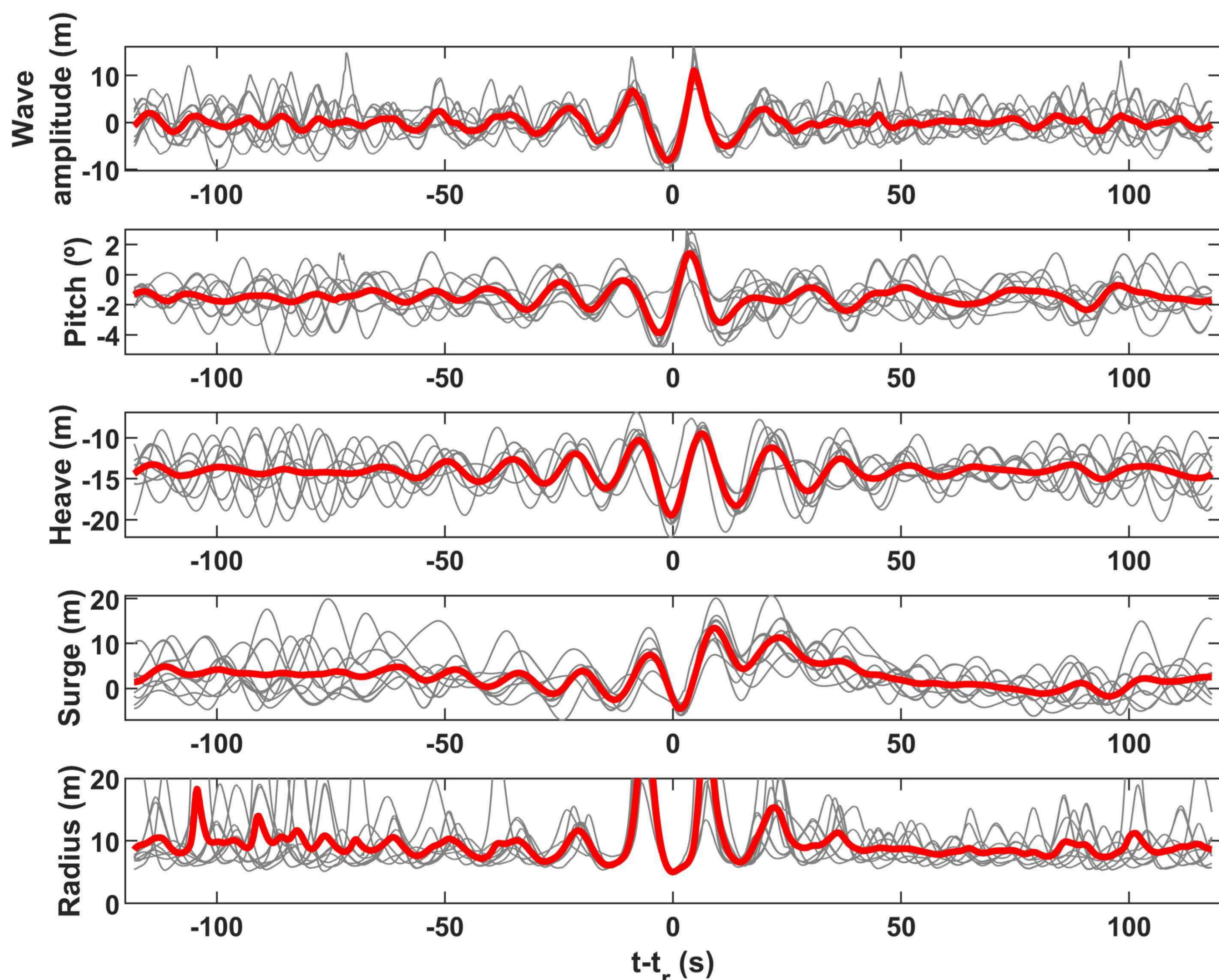


Graph showing static shape of riser determined through positions of Qualisys markers and radius determined from shape, and comparison to target shape and shape predicted using properties in the lab (210 m)



Underwater camera image of experimental setup (200 m, slightly lower buoyancy provided by buoyancy modules)

Results



Timelines around moments when radius of hog bend is lowest during a storm for a distance of 210 m. Thin grey lines are each one of a total of 12 timelines. Thick red line is the average of the individual timelines. t_r is the moment when the radius is determined to be lowest. A typical average shape for waves producing lowest radius during storms can be observed

Lowest Bending Radius determined (Full-Scale Equivalent)

The riser stayed above the minimum allowable 1.87 m in all tests
210 m distance resulted in slightly lower lowest curvature
Slightly lower buoyancy of buoyancy modules leads to higher lowest radius for 200 m
Lowest bending radius observed for MLER Surge is close to lowest observed during storm

Sag Bend

Operational: 7.2 - 9.9 m
Storm (lowest) : 5.2 - 5.6 m
MLER Surge of platform: 5.4 - 5.6 m

Hog Bend (Critical location)

Operational: 6.0 - 7.0 m
Storm (lowest) : 4.4 - 4.8 m (minimum value observed)
MLER Surge of platform : 4.6 - 5.0 m

Bend near Seabed

Operational: 12.9 - 14.8 m
Storm (lowest): 5.6 - 8.1 m
MLER Surge of platform : 7.5 - 8.7m

Conclusions

- For the riser configuration tested, all minimum radii were safely above 1.87, even in storm conditions
- Hog bend consistently produced the lowest radius (~4.4m) but remained within allowable limits.
- Future improvements recommended:
 - Determine and test short design waves which could produce lowest radius and could be a reliable, shorter alternative to 3-hour storm tests
 - Include wind loading to capture higher surge amplitudes
 - Add a bend stiffener at the attachment point
 - Direct measurement of riser tension
 - Compare against dynamic MoorDyn simulations

Acknowledgements

- R&D Solutions Fund by Enterprise Solutions from the University of Plymouth
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- Impact Accelerator Account, University of Plymouth (EPSRC): Study of flexible riser for hydrogen transport
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- Many thanks to Dr Anna Holcombe for advice on the scaled representation of a riser, GMD Eurotool and Dr Kieran Monk for the model build and the experimental setup, and Dr Jeremy Clark for assistance with determining material properties of the rubber cord.

