HEC-WSI Annual Workshop 2023 (online)
16th October 2023

HEC-WSI
a High End Computing Consortium for Wave Structure Interaction

Recent HEC-WSI-supported examples

Dr Edward Ransley
University of Plymouth

University of Plymouth
University of Exeter
Manchester Metropolitan University
University of Bath
City University London
The University of Manchester
Newcastle University
Science and Technology Facilities Council
Engineering and Physical Sciences Research Council

HEC-WSI
a High End Computing Consortium for Wave Structure Interaction

Investigating flow field characteristics around Artificial reefs (Reef Cube®)

Amir Bordbar[1], Vasilios Kelefouras[1], Yeaw Chu Lee[1]

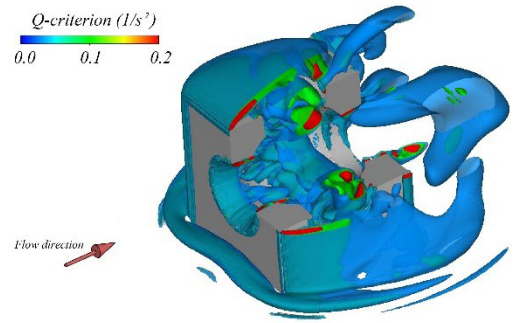
[1]University of Plymouth

Access mode: HEC-WSI partner (UoP)

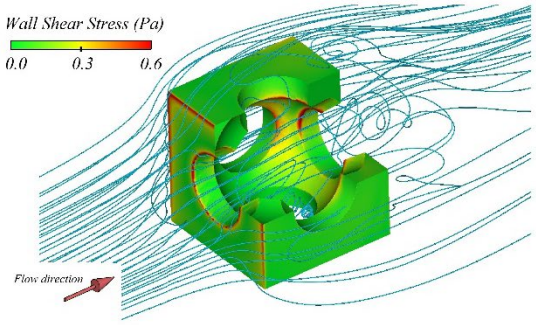
- Funded by R&D solution fund (university of Plymouth) and ENGYS Ltd.
- Supported by ENGYS Ltd. and ARC Marine
- Numerical investigations into flow field characteristics both around and within these structures using OpenFOAM.
- Various configurations and orientations are explored to identify the most suitable structures in terms of flow velocities for marine organisms and assess the positional stability of these cubes.
- This research aims to optimize the artificial reef environment for marine life.

(a) Artificial reefs attract fish and other aquatic organisms.

(b) In favorable condition, marine organisms grow on artificial reefs.



(c) Formation of vortices and eddies in the presence of the reef cube.



(d) Shear stress on reef surface and flow field around it using streamlines.

UNIVERSITY OF PLYMOUTH

engys
Open-source CFD for Enterprise

ARC Marine

HEC-WSI
a High End Computing Consortium for Wave Structure Interaction

CFD investigation of an isolated surging wind turbine rotor and a surging wind turbine rotor in a wake

Aleksandr Tsvetkov[1]

[1]University of Plymouth

Access mode: HEC-WSI partner (UoP)

- MSc Dissertation project (Offshore Renewable Energy Engineering, University of Plymouth - Supervised by Dr Edward Ransley)
- Blade resolved wind turbine simulation using OpenFOAM
- Prescribed surge motion
- Isolated and in wake (cyclic boundary condition)

UNIVERSITY OF PLYMOUTH

HEC-WSI
a High End Computing Consortium for Wave Structure Interaction

Numerical Simulation of CPT using PFEM with Application to Offshore Geotechnics

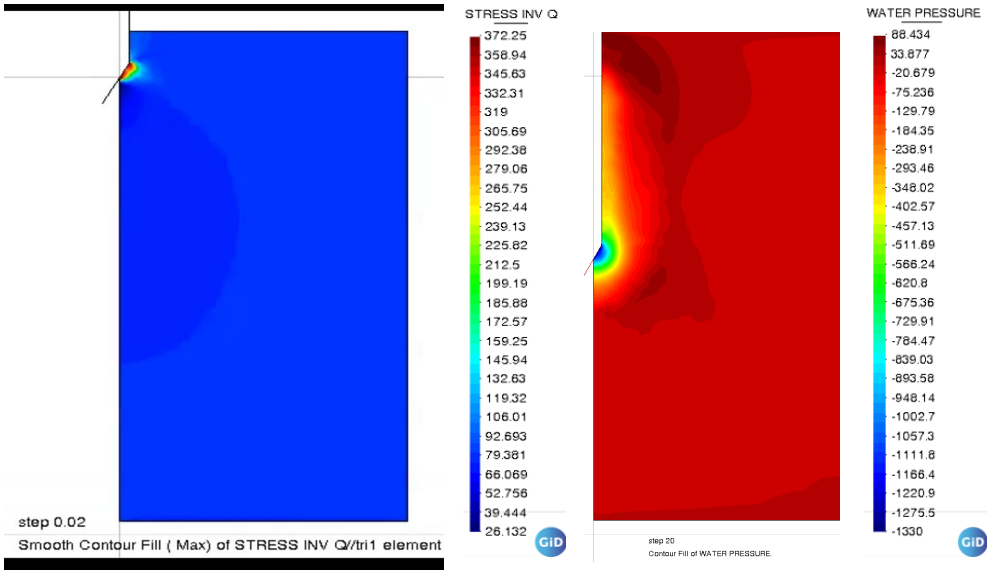
Gosai Alyamani[1], Mohamed Rouainia[1] & Lluís Monforte[2]

[1]Newcastle University, UK

[2]CIMNE, Barcelona, Spain

Access mode: HEC-WSI partner (NU)

- PhD project (Newcastle University)
- Simulated Cone Penetration Testing (CPTu) for subsurface investigation
- Numerical method: Large deformation Particle Finite Element Method (PFEM)
- Simulation: cone penetration into London clay up to 35m in a domain governed by strong non-linearities
- Computational time: significantly reduced (e.g., from one week per simulation on local CPUs to executing up to 18 parallel simulations in under a day).



Newcastle University CIMNE

HEC-WSI
a High End Computing Consortium for Wave Structure Interaction

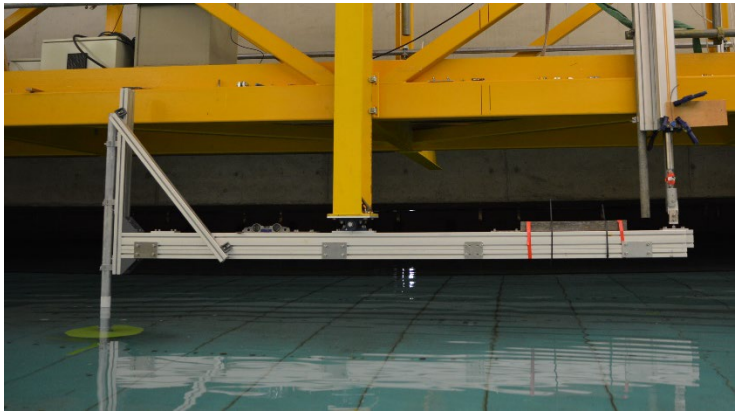
Motion reduction strategies for SSP foundations for FOWT

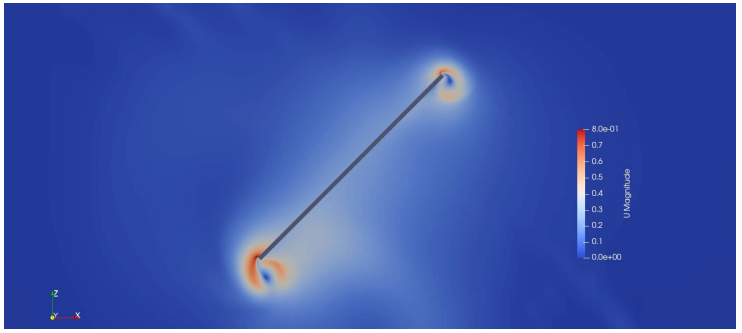
Ignacio Pregnan Johannesen[1], Edward Ransley[1], Martyn Hann[1], Shanshan Cheng[1], Deborah Greaves[1]

[1]University of Plymouth, UK

Access mode: HEC-WSI partner (UoP)

- PhD project (University of Plymouth)
- Focusing on pitch motion (rotation).
- Additional surfaces to: increase viscous damping forces on the platform; increase added mass effects and shift the platform's natural frequency to enable smaller lightweight platform concepts.
- Simulations using OpenFOAM.





UNIVERSITY OF PLYMOUTH

HEC-WSI
a High End Computing Consortium for Wave Structure Interaction

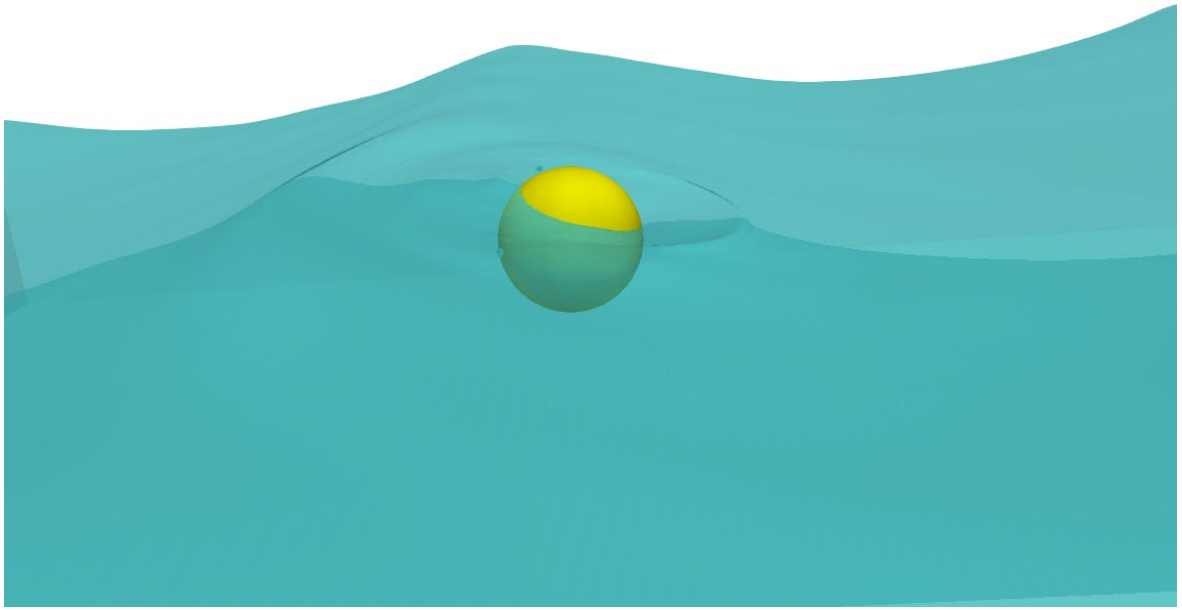
IEA OES Task 10 – 'Kramer Sphere' w. excitation force

Scott Brown[1], Edward Ransley[1]

[1]University of Plymouth, UK

Access mode: HEC-WSI partner (UoP)

- University of Plymouth's contribution to the IEA OES Task 10 on WEC Modelling Verification and Validation
- Simulations using OpenFOAM



UNIVERSITY OF PLYMOUTH

OES OCEAN ENERGY SYSTEMS