FASTWATER

Freely Available Simulation Toolset for Waves, Tides and Eddy Replication

THE UNIVERSITY of EDINBURGH

Supergen Offshore Renewable Energy

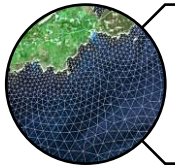
Research Challenges

Regional scale hydrodynamic models are of high value to the ORE sector, but their exploitation faces key barriers:

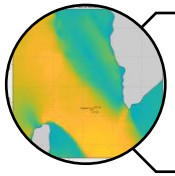
- Expensive (staff, compute, software & data).
- Open models do not appear to have the same level of trust in this sector c/w commercial models.
- High quality validation data is costly with high levels of technical risks.
- Recent academic research for tidal energy suggests oustide-channel affects are important to inside-channel affects and subsequent yield predictions and array layout.
- Industrial-academic experience proves that 3D and coupled models are needed; yet most models in use by developers are 2D and un-coupled. Coupling requires extensive modeller and end-user expertise.
- Single-point calibration is typically employed but spatial calibration is a must for array design and operation.
- Cal/Val is not optimised to end-use (e.g., yield estimates) leading to poor useability and uncertainty quantification, and KT from other sectors can be improved.

Research Objectives

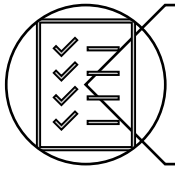
To deliver robust **fit-for-purpose methodologies** that are readily re-implementable by the sector to accelerate the exploitation of regional modelling tools.



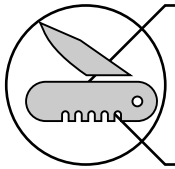
Construct a validated, stable, model-agnostic unstructured base model mesh that could be used in a variety of numerical solvers, and that is flexible to enable rapid changes to grid resolution.



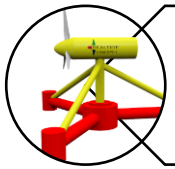
Build and run the Base Model based on recently developed Telemac3D models.



Specify, collate, demonstrate and provide guidance on pre-defined bathymetry, bottom roughness, open-boundary forcing, surface forcing, and boundary wave conditions for the multi-year base model



Define methods and provide tools for robust calibration-validation of numerical simulations.



Exploit the FASTWATER *Platform* to produce:

(i) a demonstrator model variant suitable for EMEC's ORE applications and (ii) a demonstrator model variant suitable for developers requirements around understanding machine performance

FASTWATER

Freely Available Simulation Toolset for Waves, Tides and Eddy Replication

THE UNIVERSITY of EDINBURGH

Supergen Offshore Renewable Energy

FASTWATER Methodology

FASTWATER is an inter-disciplinary, targeted and short-timeframe programme of work that improves links and skills/knowledge transfer between disciplines working in ORE from different backgrounds. FASTWATER commenced August 2021 running for 1-year with the core programme of work scheduled from January 2022

Data Management is key to FASTWATER execution and long-term impact. A Data Management Plan has been produced operating to FAIR principles and building on extensive experience and data infrastructure outputs of the European RealTide and Resourcecode projects.

FASTWATER will create/collate, clean, exploit and report on Open-Access datasets and model meshes (targeting a generalized approach) to accelerate future re-implementation of the modelling methodologies and tools.

The project is combining the skills of oceanographic modellers with applied statisticians to implement, test, tune and report on robust calibration-validation methods to lower uncertainty in model outputs and to provide guidance on model design and implementation.

FASTWATER builds on stakeholder engagement from project industrial partners (EMEC, ORE-Catapult and SIMEC-Atlantis) and requires input from the wider sector on further defining “fit-for-purpose” and ensuring that the FASTWATER model case-studies that will be developed and assessed are of high value and provide long-term impact.

The FASTWATER Team (& Further Information)

FASTWATER is an inter-disciplinary research project supported by Industrial Partners and involving collaboration between the School of Engineering and the School of Mathematics at the University of Edinburgh.

Dr Brian Sellar
Principal Investigator
Institute for Energy Systems
School of Engineering
University of Edinburgh
brian.sellar@ed.ac.uk

Prof Chris Dent
Co-Investigator
School of Mathematics
University of Edinburgh
chris.dent@ed.ac.uk

Dr Chris Old
Research Co-Investigator
Institute for Energy Systems
School of Engineering
University of Edinburgh
c.old@ed.ac.uk

Dr Amy Wilson
Co-Investigator
School of Mathematics
University of Edinburgh
amy.l.wilson@ed.ac.uk

Dr Athanasios Angeloudis
Co-Investigator
Institute for Infrastructure and Environment
School of Engineering
University of Edinburgh
a.angeloudis@ed.ac.uk

FASTWATER is supported by:

The European Marine Energy Centre
Offshore Renewable Energy Catapult
SIMEC Atlantis Energy
and funded by:
Supergen ORE Hub