Open Metocean Data for ORE Applications

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Motivation

Improved understanding of the dynamics of tidal currents and ocean waves and the loads they impose on offshore structures is a prerequisite for an economically viable offshore renewable energy industry. The energetic and dynamic environment affects machine design and reliability, operations and maintenance and energy yield.

Introduction

The University of Edinburgh and the metocean data team within the School of Engineering is collecting, collating, comparing and processing multiple datasets for applications in ORE across UK and international projects. These projects include:

- ReDAPT (2010-2015)
- FloWTurb (2016-2019)
- RealTide (2018-2020)
- RESOURECODE (2019-2021)

Analysis to date has revealed that site characterisations are sensitive to instrument placement, sensor configuration, machine installation depth and wave-current interaction. Recent analyses and published papers and conferences are listed below. Ongoing analyses include impact of detailed flow characterisation on electro-mechanical sub-systems, tide-to-wire modelling and instrument benchmarking.

Case Study: ReDAPT

An extensive field measurement campaign was conducted at the Fall of Warness, Orkney, UK (see maps below) between 2012 and 2015 as part of the ETI £13M Reliable Platform for Data Acquisition (ReDAPT) project. ReDAPT centred around a 1MW tidal turbine developed by Tidal Generation Ltd, deployed at EMEC with the aim of producing a comprehensive suite of data on turbine operation and the flow field. 1TB of data was collected and processed and is available at:

- UKERC Energy Data Centre http://data.ukedc.rl.ac.uk
- University of Edinburgh http://redapt.eng.ed.ac.uk

Our objective is to collaboratively use our capabilities and infrastructure to help academic and industrial partners in the acquisition, management and exploitation of existing and new marine datasets.

Challenge

Data must be captured over a vast range of spatial and temporal scales to capture the key underlying fluid motions. These potentially include information varying across annual and seasonal time scales to fluctuations in velocity at timescales of seconds and below with different scales of motion understood to have a range of effects on energy extraction devices. Data must meet the needs of differing engineering tools, numerical and physical simulations, that exploit these datasets to reduce the cost of energy of MRE systems.

Recent Outputs from the ReDAPT Dataset

- Sensitivity to TI depending on TEC position and instrument configuration. From Sellar et al. ENERGY 2018.