HYD2M

Hydrodynamics of the Alderney Race: measurements and modelling

DURATION: 44 months (2016-2019) | BUDGET: €1,753K

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CONTEXT

The improvement of the estimate of the productible is one of the major sectors of research in the field of offshore renewable energies. The error on the prediction of the current is typically 10%, which translates into an error of 30% on the tidal power. To reduce these errors, it is essential to take into account the current wave interactions in hydrodynamic models.

OBJECTIVE

To determine the producibility of the different turbines of a tidal farm in the Alderney Race, taking into account regional hydrodynamics and sea states.

MAIN ACHIEVEMENTS

- In-situ observations with high frequency radars to better understand the processes of wave/current interactions, and thus refine the parameters of the numerical models

- Construction of a numerical platform for forecasting the hydrodynamics of the Alderney Race

CONCLUSION

HYD2M provides a wealth of data and knowledge on the hydrodynamics of the Alderney Race area, which is conducive to the deployment of tidal turbine systems. The data acquired during the project have been integrated into a model that is now available to support the actors of the hydrodynamic sector in the estimation of the hydrodynamic production in the Alderney Race area.

TECHNOLOGIES

STAGES OF THE VALUE CHAIN

Preliminary studies

Design

RESOURCES GENERATED

- Mapping of hydrokinetic resources by HF and VHF radar

- Three-dimensional, high-resolution maps of currents calculated taking into account the sea state

- Current database from ADCP measurements and video images of the nature of the sea bottom

- New algorithm for processing radar data acquired in extreme environments

- High-resolution configuration of the circulation and sea state models for the simulation of the hydrodynamics of the Alderney Race

- Improvement of numerical models for the representation of three-dimensional dynamics

- New algorithm for the simulation of the producible at tidal turbine and farm scales

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LISTE DES PUBLICATIONS SCIENTIFIQUES ISSUES DU PROJET

2020

- Bally du Bois *et al.* **The Alderney Race: general hydrodynamic and particular features.** *Philosophical Transactions of the Royal Society A,* Vol. 378, 20190492
  -> https://doi.org/10.1098/rsta.2019.0492

- Bennis *et al.* **Numerical modelling of three-dimensional wave-current interactions in complex environment: Application to Alderney Race.** *Applied Ocean Research,* Vol. 95, 102021
  -> https://doi.org/10.1016/j.apor.2019.102021

- Furgerot *et al.* **One year of measurements in Alderney Race: preliminary results from database analysis.** *Philosophical Transactions of the Royal Society A,* Vol. 378, 20190625
  -> https://doi.org/10.1098/rsta.2019.0625

- Lopez *et al.* **Surface currents in the Alderney Race from high-frequency radar measurements and three-dimensional modelling.** *Philosophical Transactions of the Royal Society A,* Vol. 378, 20190494
  -> https://doi.org/10.1098/rsta.2019.0494

- Sentchev *et al.* **Turbulence characterization at tidal-stream energy site in Alderney Race.** *Developments in Renewable Energies Offshore,* pp. 616-623

- Thiébot *et al.* **Numerical modelling of hydrodynamics and tidal energy extraction in the Alderney Race: a review.** *Philosophical Transactions of the Royal Society A,* Vol. 378, 20190498
  -> https://doi.org/10.1098/rsta.2019.0498

2019

- Thiébaut *et al.* **Merging velocity measurements and modeling to improve understanding of tidal stream resource in Alderney Race.** *Energy,* Vol. 178, pp.460-470
  -> https://doi.org/10.1016/j.energy.2019.04.171

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