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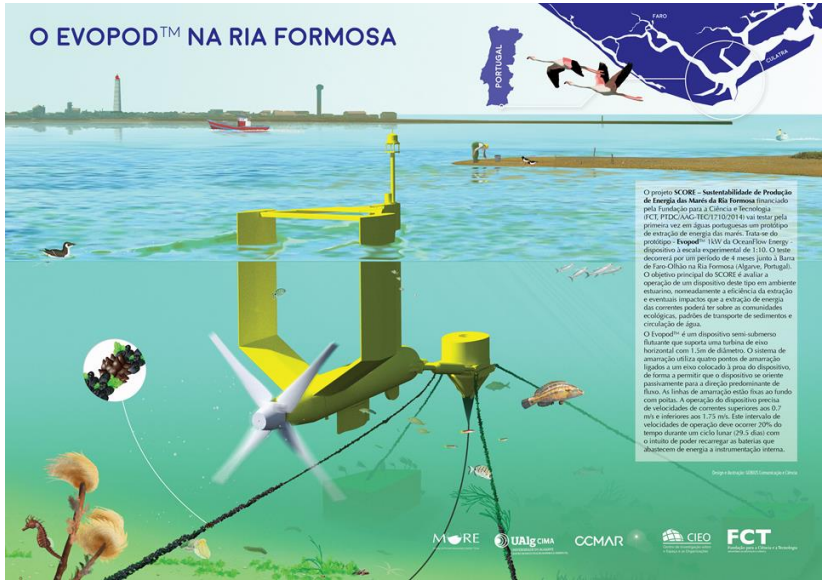
LESSONS LEARNED FROM E1 EVOPOD TIDAL ENERGY CONVERTER DEPLOYMENT AT RIA FORMOSA, PORTUGAL

Pacheco, A., Gorbeña, E., Plomaritis, T., Gonçalves, J.

OUTLINE

- The SCORE Project;
- The Evopod Device and TRL;
- The Test site: Reference situation
- Deploying the device: E1 on the water
- Operating the device: Data Collection
- Final remarks: Lessons learned



The SCORE project

Objectives / Innovation

- Sustainability of Ria Formosa Currents on Energy Production;
- Examine a small-scale tidal current turbine (Evopod E1, 1kW) to be deployed in a shallow-water estuarine environment, looking at both the impacts of the turbine on its environment and the effects of the flow conditions on the turbine;
- Evolve all the disciplines that normally take part on a marine renewable project (authorities, marine services, marine biologists, oceanographers, developers, economists, community, etc)

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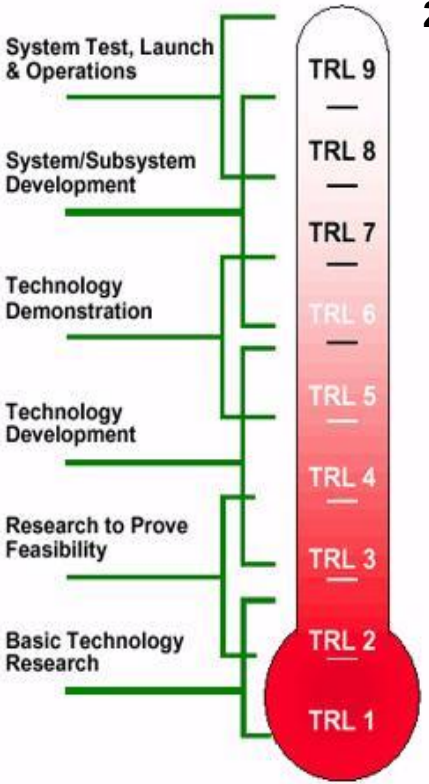
The Evopod device

Technology Readiness Level

Evopod™



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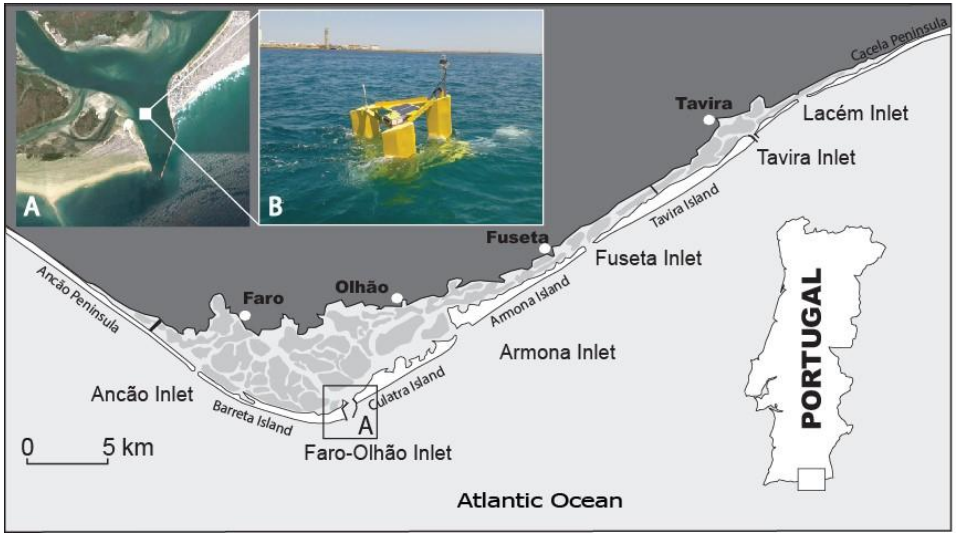
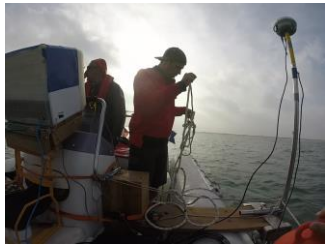
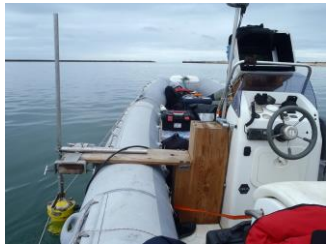
The Test site – RIA FORMOSA, PORTUGAL

Reference situation



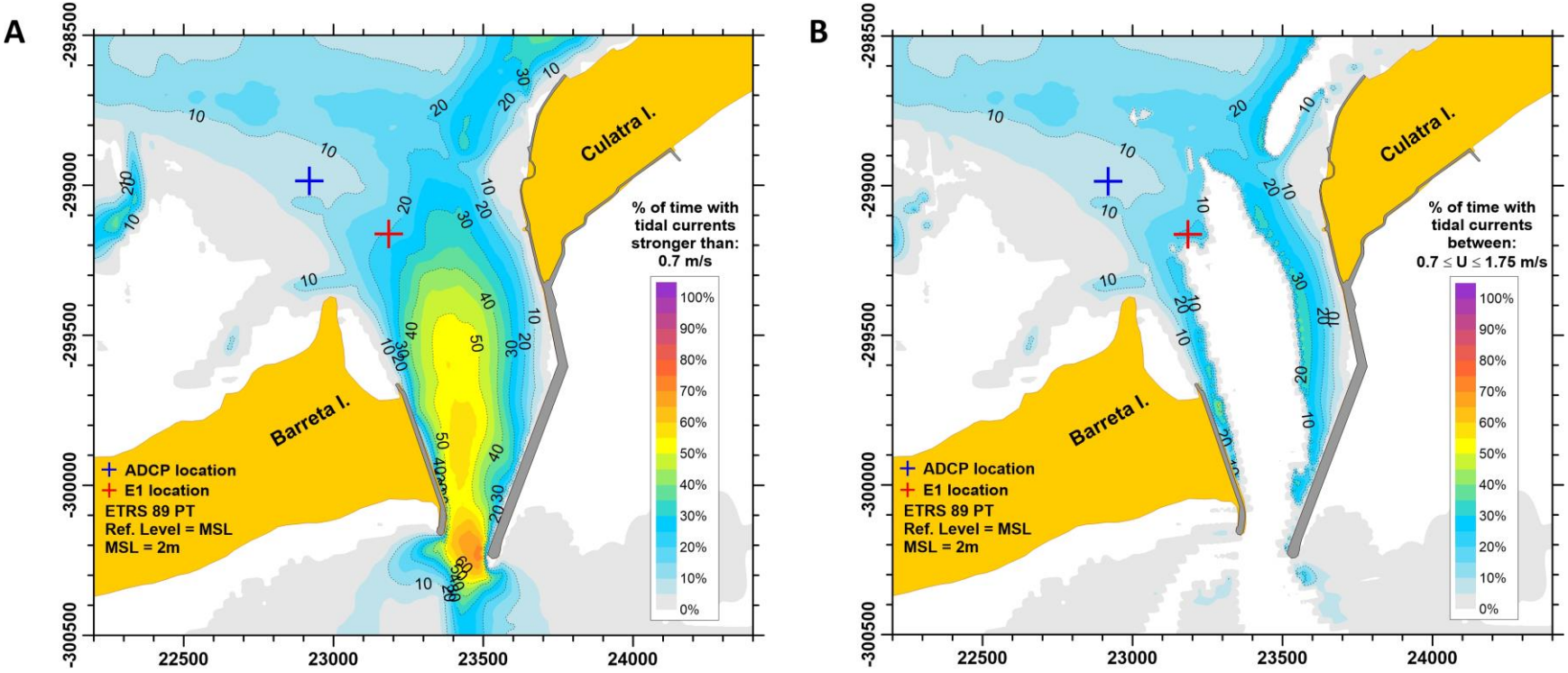




The innovative aspect of E1 testing in Portugal lied with the unique morphological characteristics associated with the device deployment site at Ria Formosa.

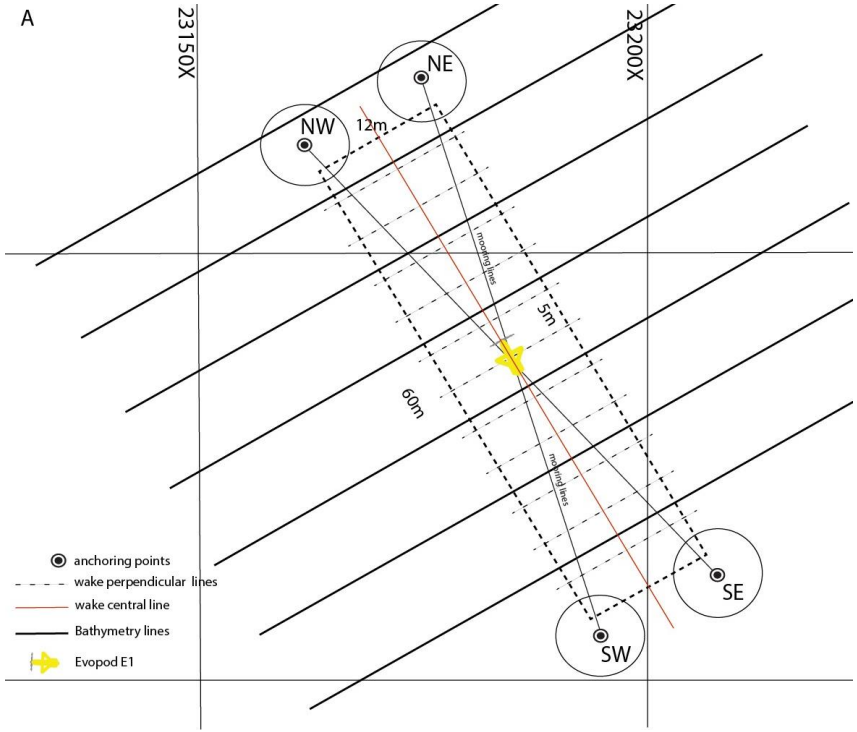
The Test site – RIA FORMOSA, PORTUGAL

Reference situation



The Test site – RIA FORMOSA, PORTUGAL

Reference situation



Deploying the device

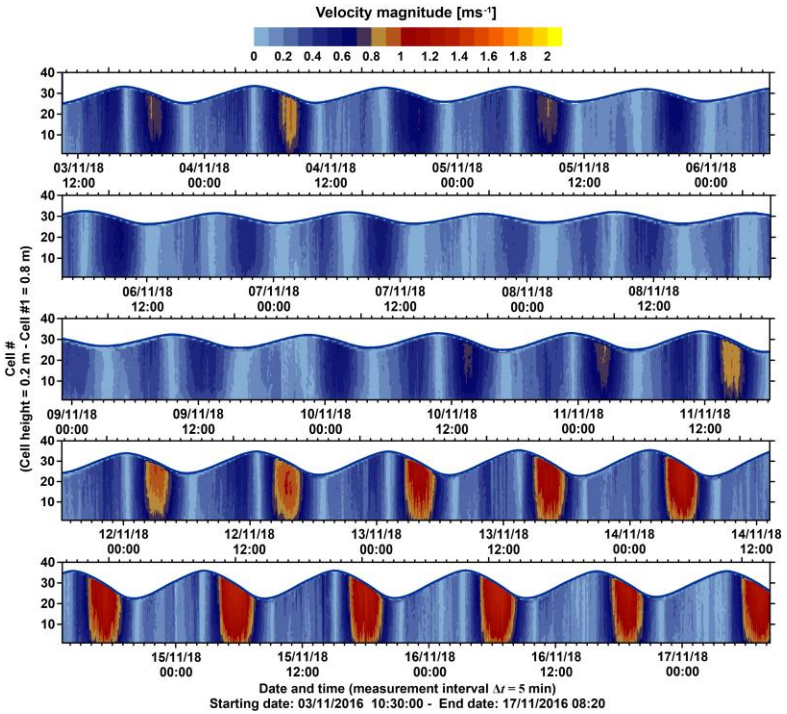
E1 on the water

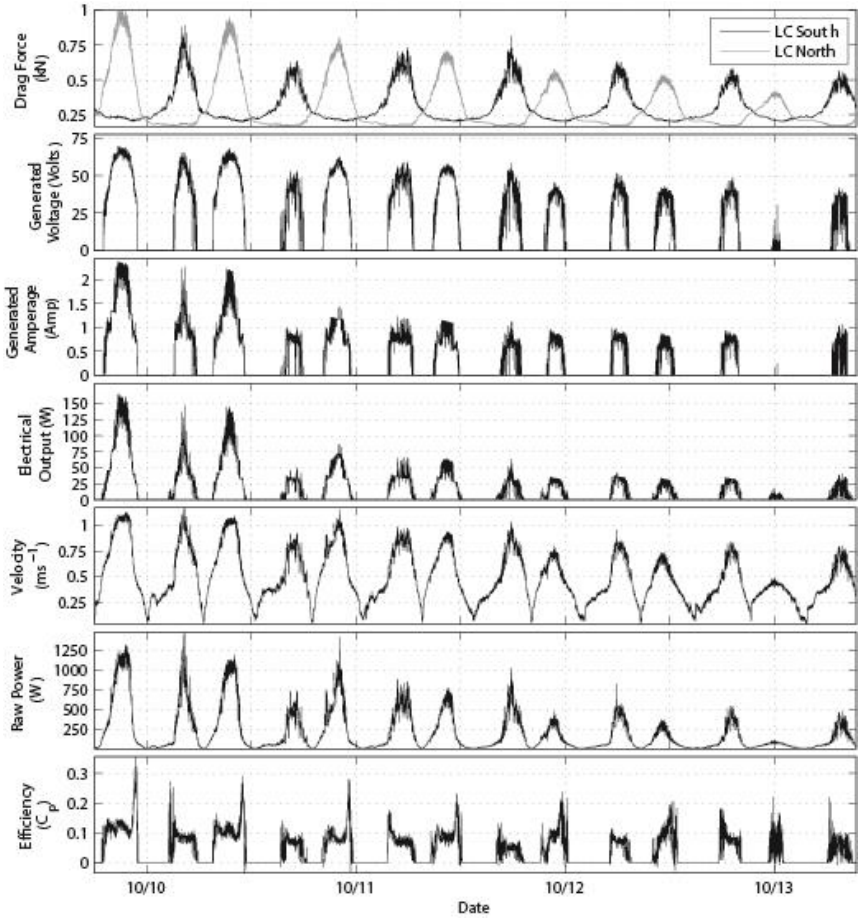





Operating the device

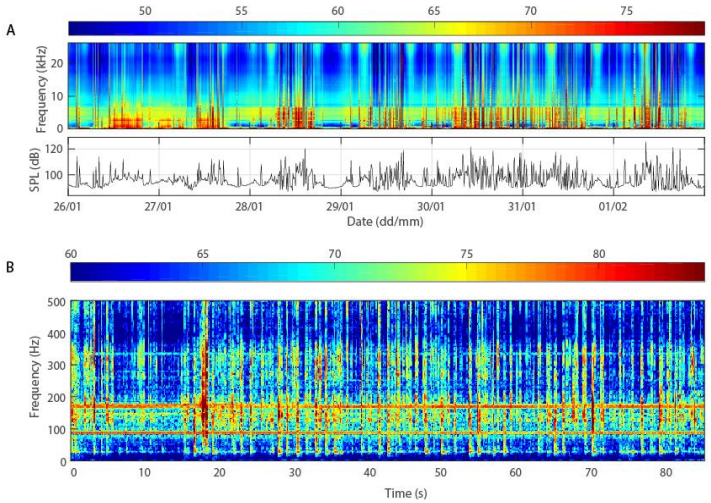
Data collection





Operating the device

Data collection



Open data to the science community at:

http://w3.ualg.pt/~ampacheco/Score/database.html

Type of data	Date of Survey	Method used
Bathymetry	2011-2015	LiDAR / Single beam echosounder syncronized with a RTK-DGPS / tide corrected
Side scan sonar	07/2016	Transects performed with a bed imaging system to characterise the bottom of the deployment area in terms of materials and the texture type
Bed characterization	07/2016 – 07/2017	Van Veen dredge operated from the boat.
Habitat characterisation	07/2016 – 07/2017	Bottom trawling, visual census and ROV images to capture, identify and quantify fish species, invertebrates, and epithelial or benthic species on mobile substrate
Tidal currents	03/11/2016 - 17/11/2016	ADP Nortek Signature 1 MHz - bottom mounted on a frame structure, up looking
Tidal currents	03/11/2016 - 17/11/2016	ADP Sontek 1.5kHz Static survey, down looking
Acoustic measurements	19/01/2017 – 14/02/2017	DigitalHyd SR-1
Wake measurements	03/11/2017	ADP Nortek Signature 1 MHz Static E1 centreline profiles at: 5 m up-stream, and 5/10/15/20/25/30 m down-stream.
Wake measurements	03/11/2017	ADP Sontek 1.5kHz Transect survey - E1 transversal profiles 5m spaced within the deployment area. Down looking
Turbine performance data	08/06/2017 – 21/11/2017	Evopod E1 data collection

Final remarks

Lessons learned

➜ Environment

No collisions or major interactions occurred with wildlife; No bed changes; Amount of acoustic energy introduced into the aquatic environment is limited in frequency band and time; Physical environmental impact from E1 small-scale TEC pilot project was found to be reversible on decommissioning;

➜ Operation

E1 proved to be easy to disconnect from the moorings and it transport inshore for maintenance; Biofouling can be a major issue affecting performance of devices; Static ADCP wake measurements performed represent a valid data set for wake modelling validation; The operational data collected is essential for modelling floating TEC prototypes on other locations by providing values of turbine drag, power coefficients and power outputs for different flow conditions and operating settings; It can also serve as basis for developing advanced power control algorithms to optimise energy extraction under turbulent flows; Finally, efficiency data can be scale up for proposing realistic tidal array configurations for floating tidal turbines and on supporting the modelling of mooring and power export cabling systems for these arrays.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