

Flow measurement for accurate tidal turbine design

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NATURAL ENVIRONMENT RESEARCH COUNCIL

Aim: Develop low-cost, robust turbulence probe

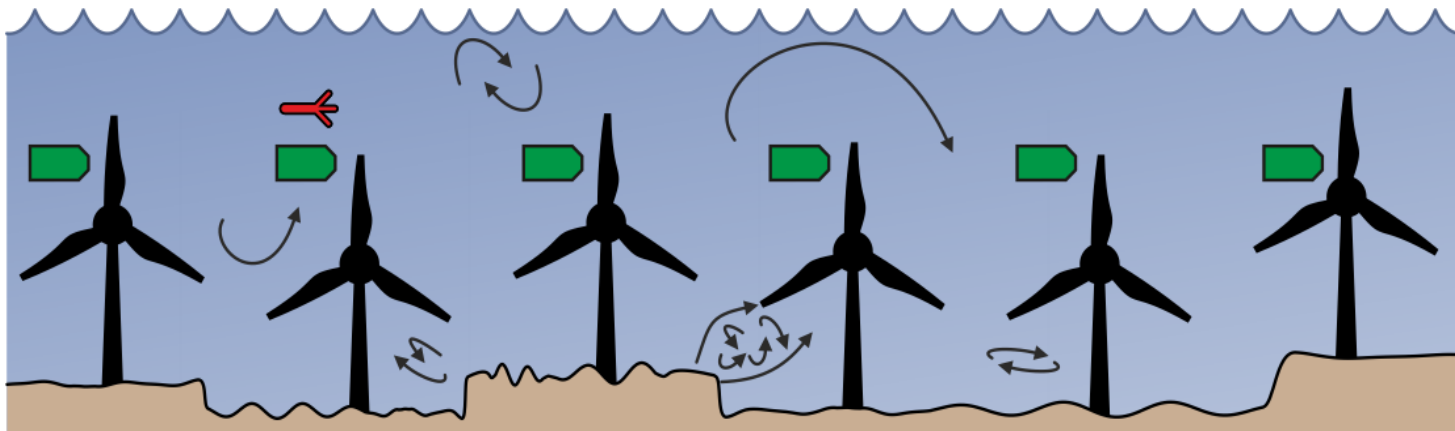
Industry needs to be able to measure real site conditions in order to know fatigue life and performance of turbines

Reflected in two Supergen ORE Challenges:



A1: measurement techniques for forecasting and characterisation

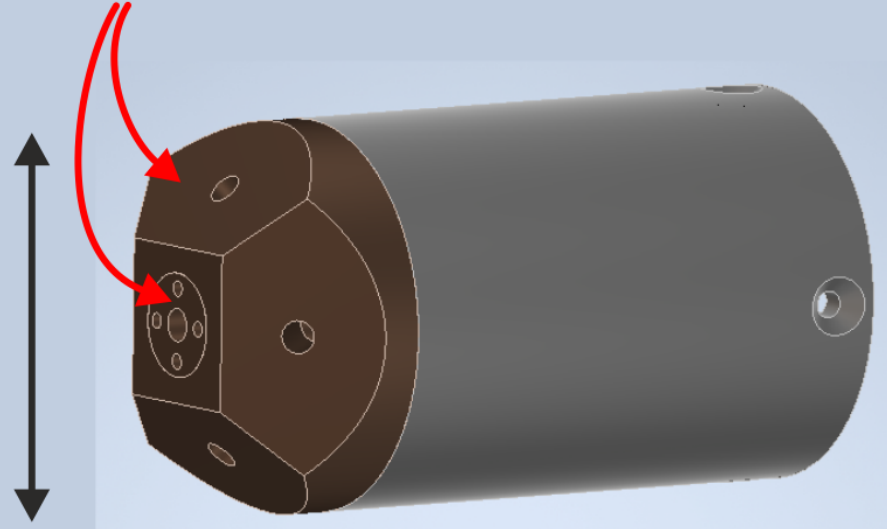
A2: improved modelling for resource/load assessment



Low-cost: more data for given survey budget

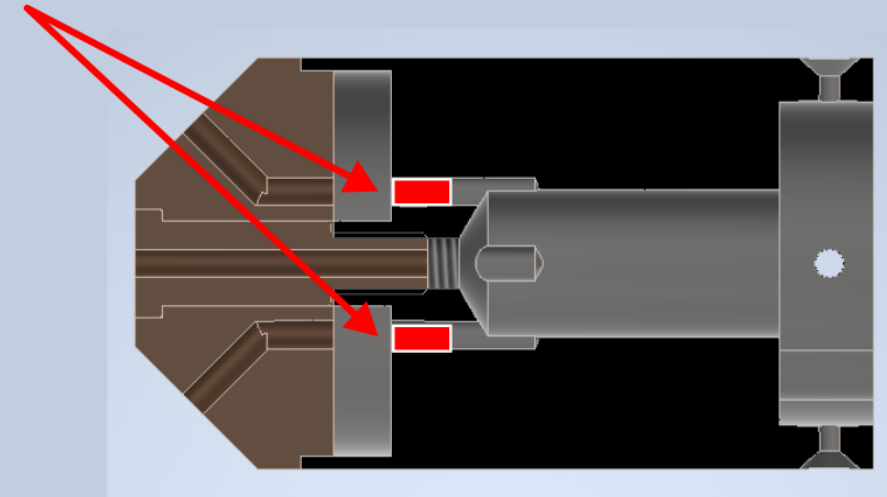
Barnacle probe: based on aerospace techniques

Measure pressure difference
between slanted faces and centre



75 mm head
diameter

Sensors mounted in head
for high frequency response

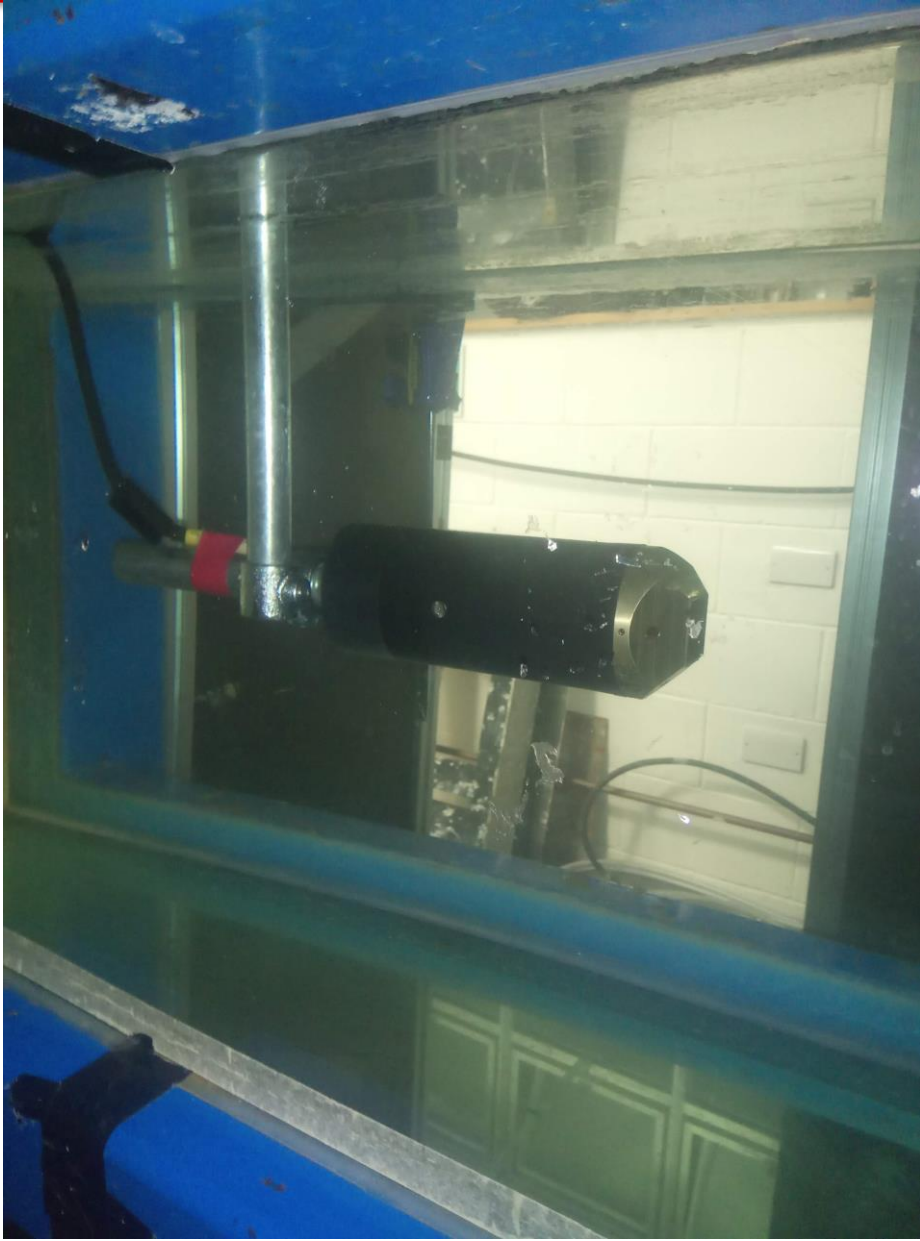


Dynamic pressure decoupled
from hydrostatic for high accuracy

Previous work: flume tank prototype tested

This project: build and test a marine-ready device

Barnacle probe built and tested in lab and field



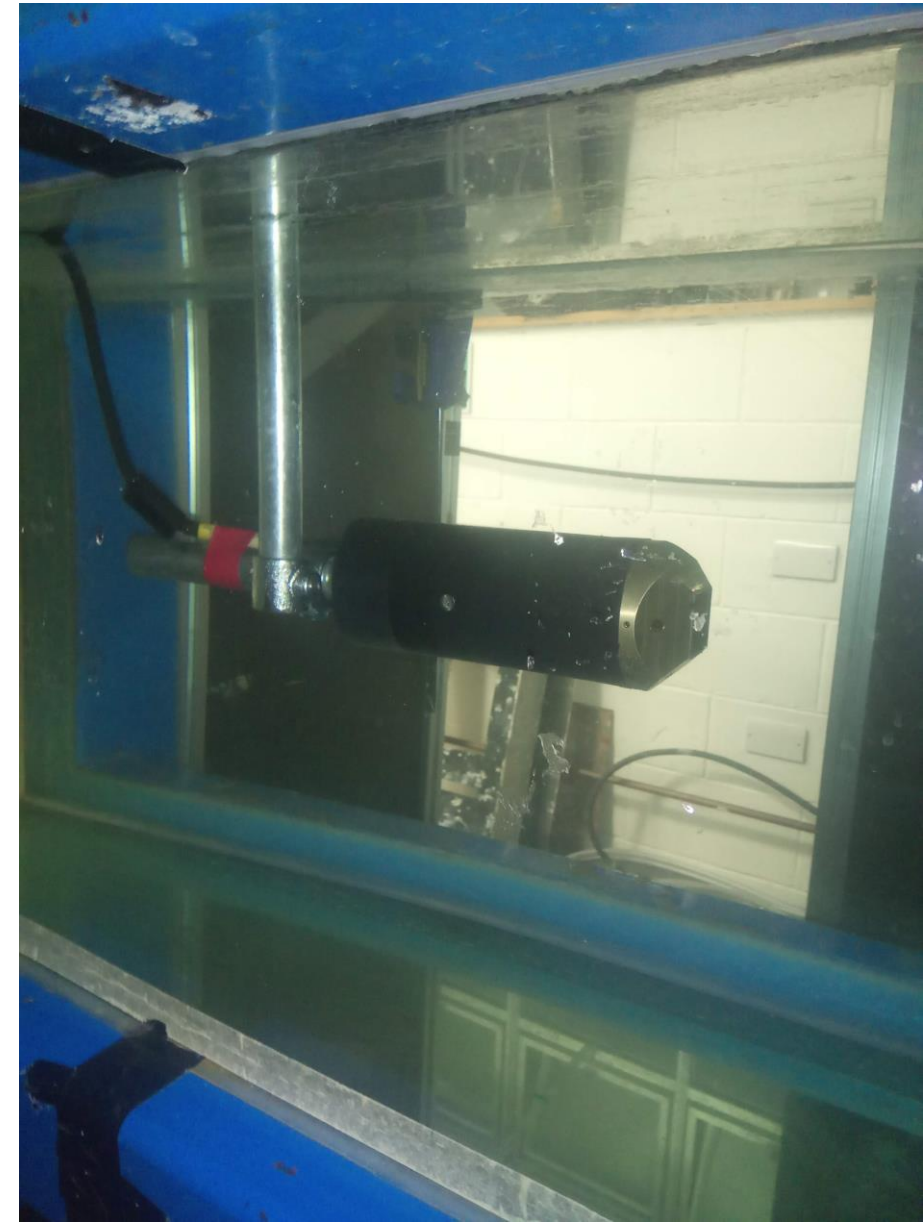
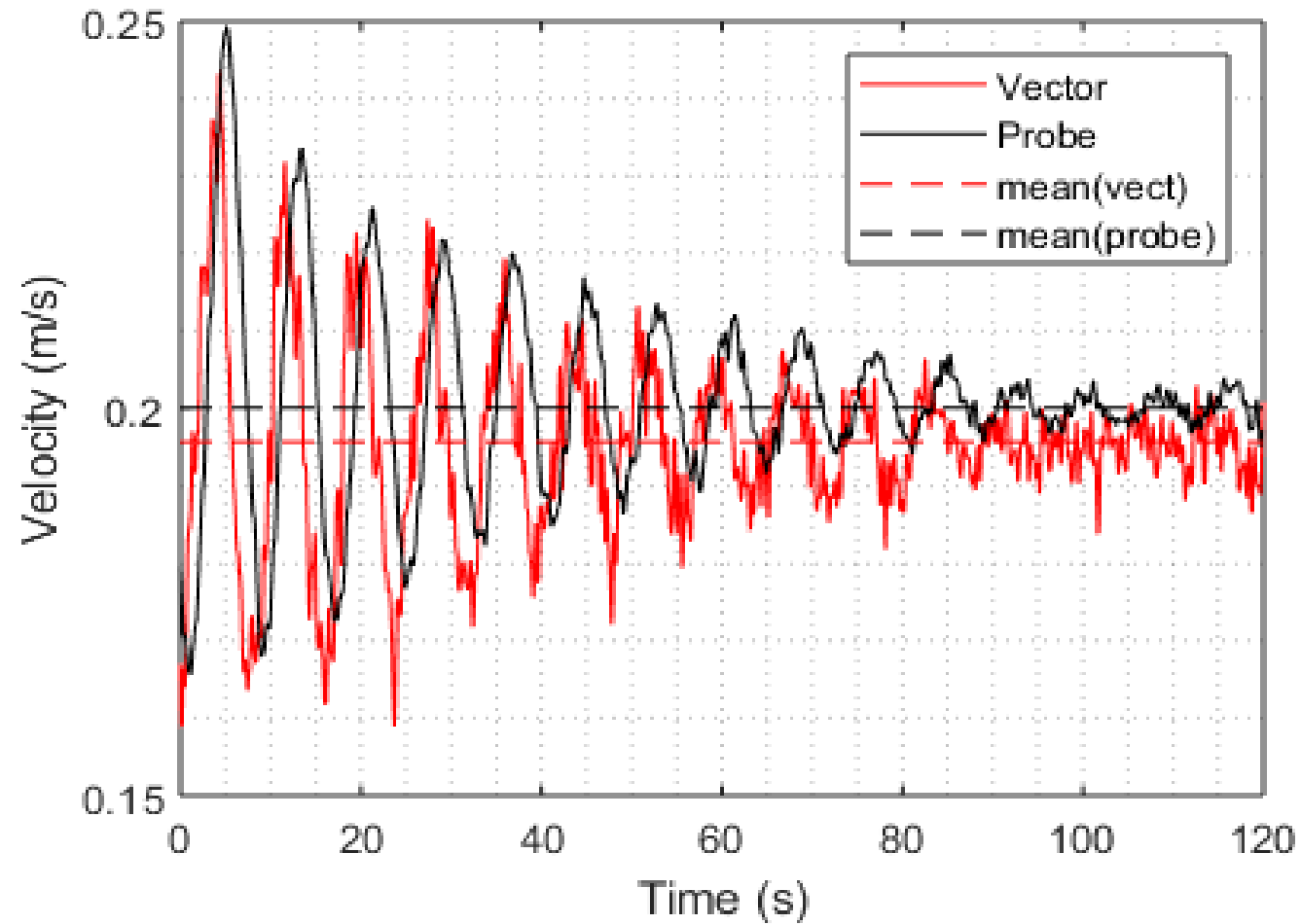
New probe head designed and tested in water tunnel

- Analog electronics optimised for tidal flows
- Excellent performance at very low speeds (0.2 m/s)
- Promising for wider uses (e.g. British Antarctic Survey)

Field tests at Strangford Lough

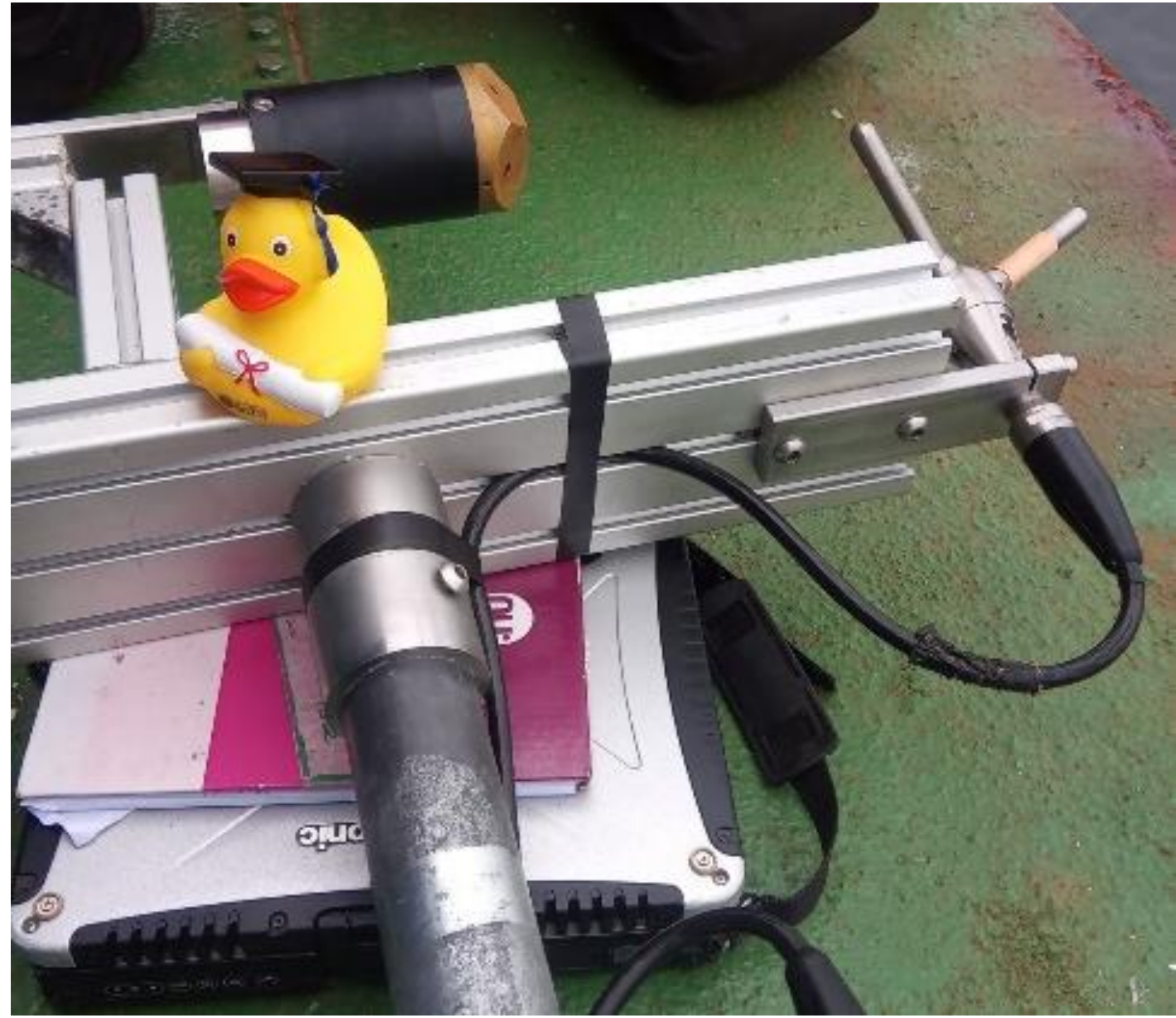
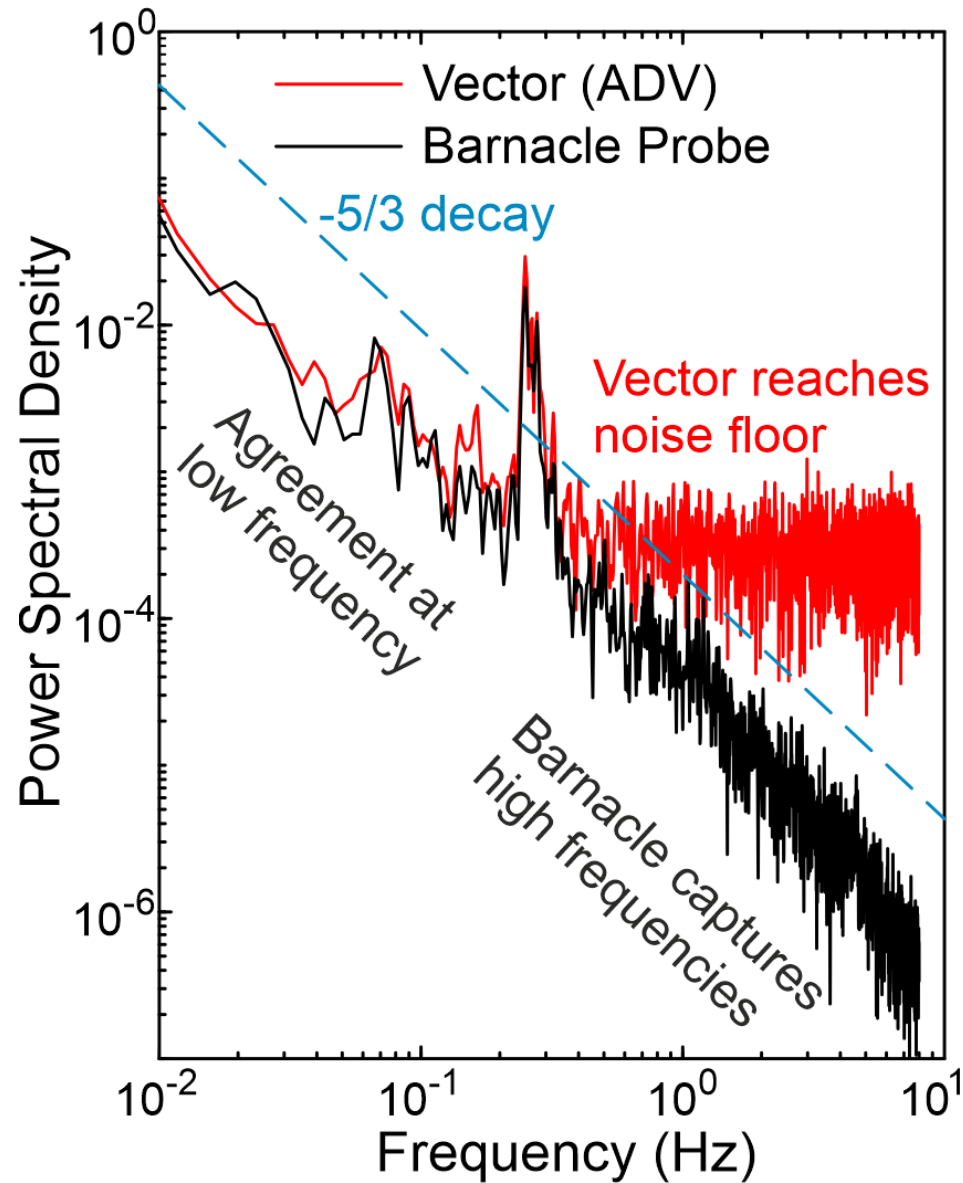
- Good agreement with Vector and superior frequency response

Barnacle performs at least as well as Vector



Superior response to oscillations in tunnel velocity

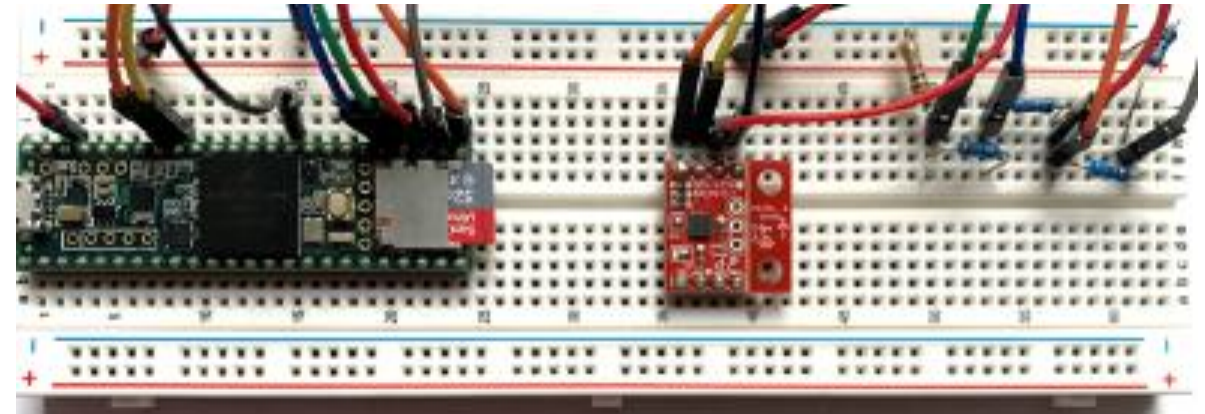
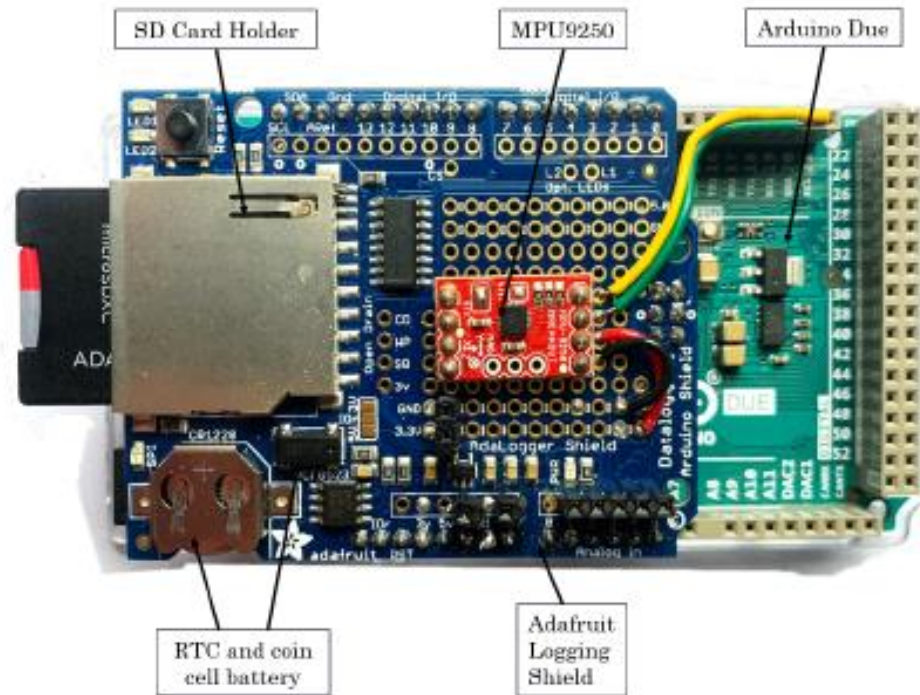
Barnacle performed well in Strangford Lough



Arduino-based data logger developed

Records pressure, temperature and position

Future use for autonomous deployment with motion-correction



Follow-on funding secured



5-month follow-on (Feb-June 2022) from University of Bath Impact Acceleration Account

Design for production device

Demonstration in flume tanks and other facilities

Market sector identification

Collaboration opportunities being explored with British Antarctic Survey and National Oceanography Centre on use of Barnacle probe in autonomous oceanographic surveys



**National
Oceanography
Centre**



**British
Antarctic Survey**

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