Novel sensors: drones for tidal stream current measurements

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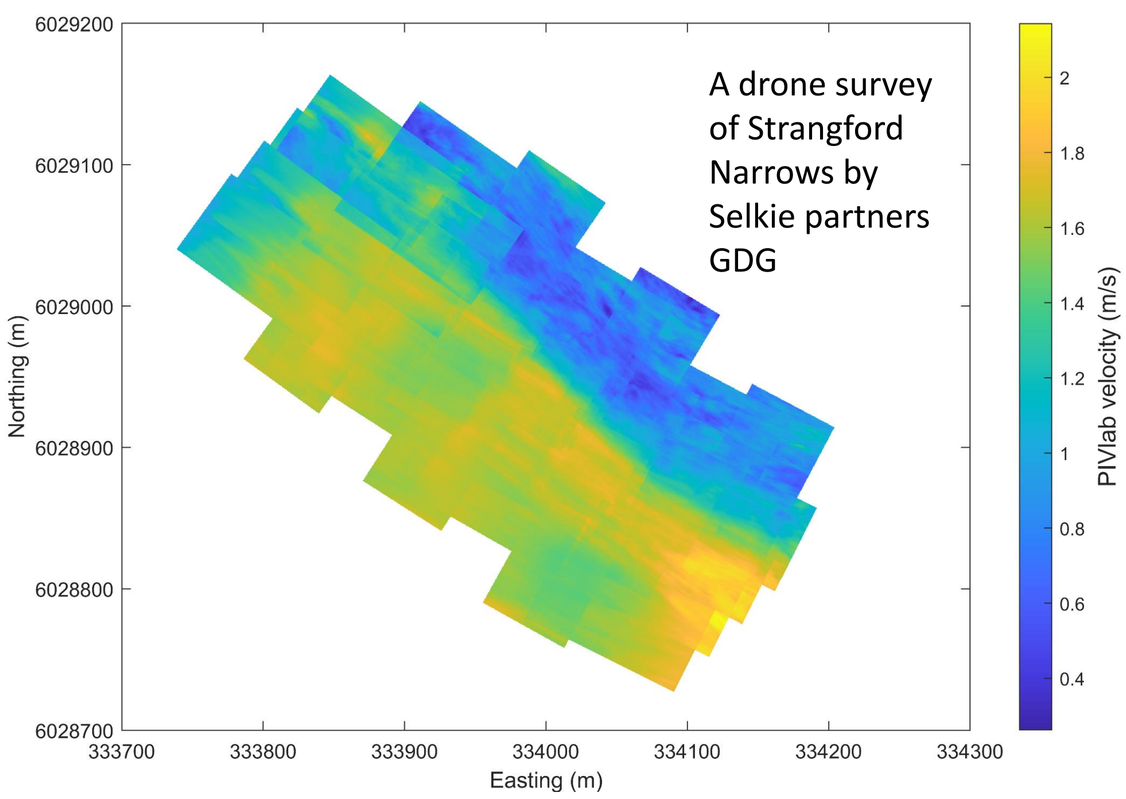
Remote sensing with good accuracy

It is vital that new techniques are properly validated so that users have confidence in the- accuracy of measurements. Therefore, drones were used to collect video data at a range of tidal energy sites while at the same time validation current data were measured with surface drifters (colour plots to right).

A range of existing open-source tools tested. Two approaches show most promise: when environmental conditions are calm, large scale particle image velocimetry works well; as wind speeds increase, ripples can be used to infer surface currents (graphs to right). Results can be stitched together to cover a wide area (image below). A Selkie guidance document describing best practise is under development.

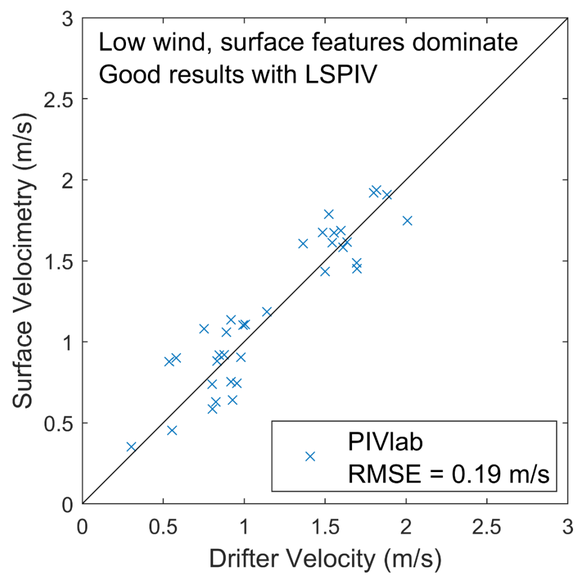


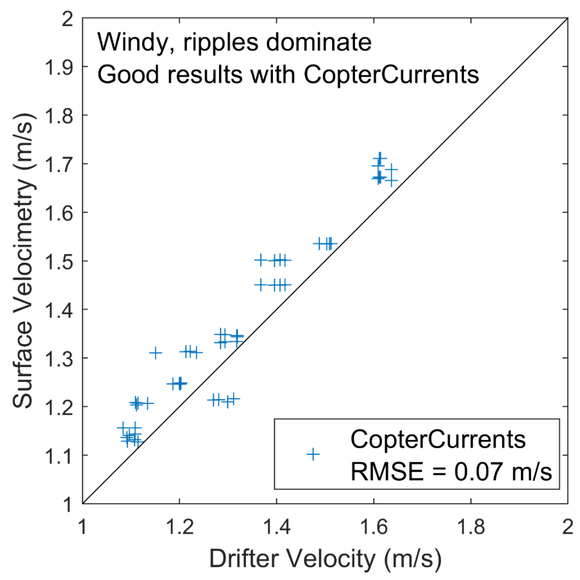
Low cost, low risk approach

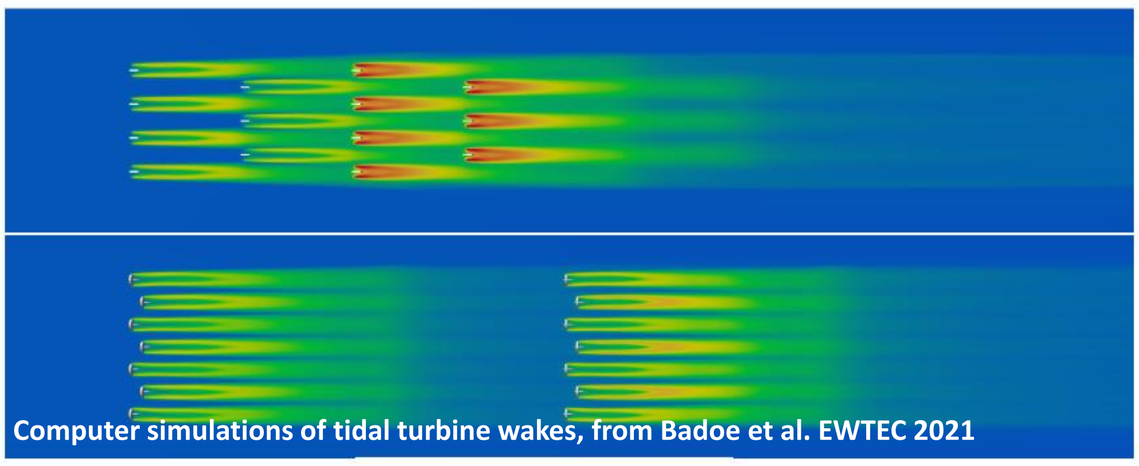
Quadcopter drones are readily available off-the-shelf; they are easily portable, low cost and low risk. Therefore, compared to traditional methods such as vessel-based current surveys, measurement of currents using drones is attractive both financially and logistically.

Drones can record video of the water surface and then currents determined using velocimetry techniques. This approach has been regularly and successfully applied to rivers but has not been rigorously tested at more challenging tidal energy sites.

The sensors are mounted on the Swansea University Self Recovery Instrument Frame (SUSRIF) and the frame could be used for other types of measurement.







Computer simulations of tidal turbine wakes, from Badoe et al. EWTEC 2021

Future Potential

This new tool opens the door for a range of exciting new research avenues. The approach could be used to measure the spatial properties of tidal turbine wakes which would not only provide new understanding of the environmental impact of tidal turbines but also enable spatial validation of numerical models of tidal turbines (e.g. image above). This would allow improvements to the modelling tools. Equally, data collection at undeveloped sites would generate new insights into the complex flow dynamics in spatially non-uniform high energy locations.

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