

Marine Renewable Energy Sector Application of low cost GNSS-IR for Sea State Characterisation

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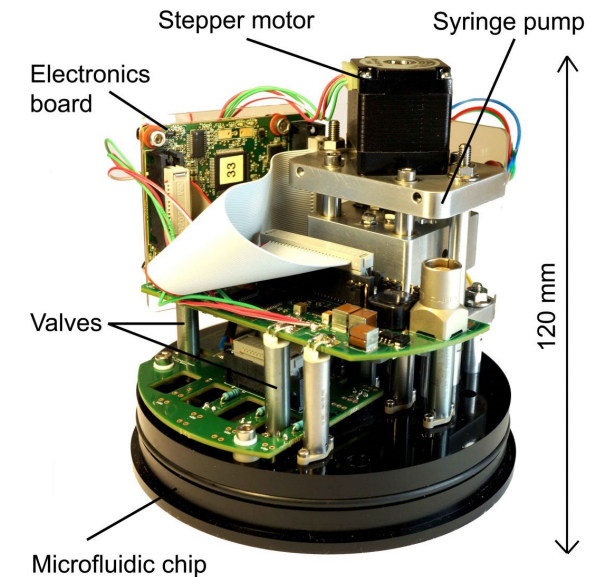
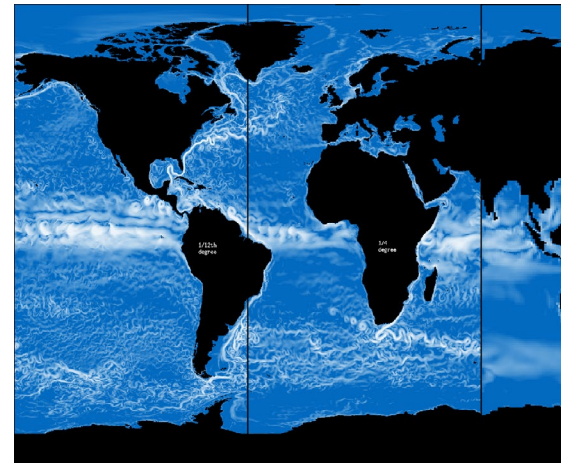


Innovative approaches to monitoring marine environment

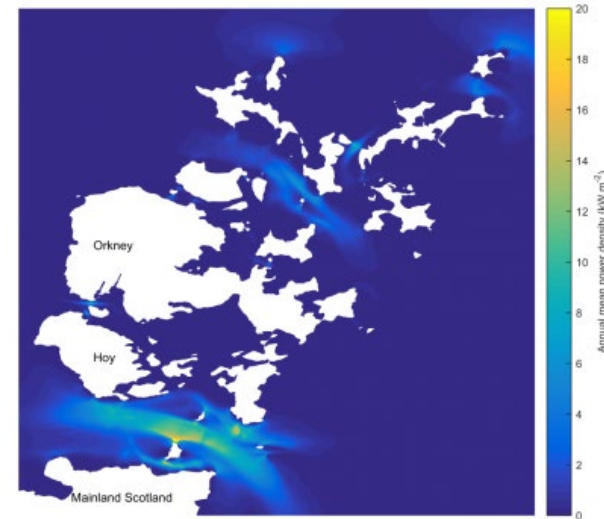
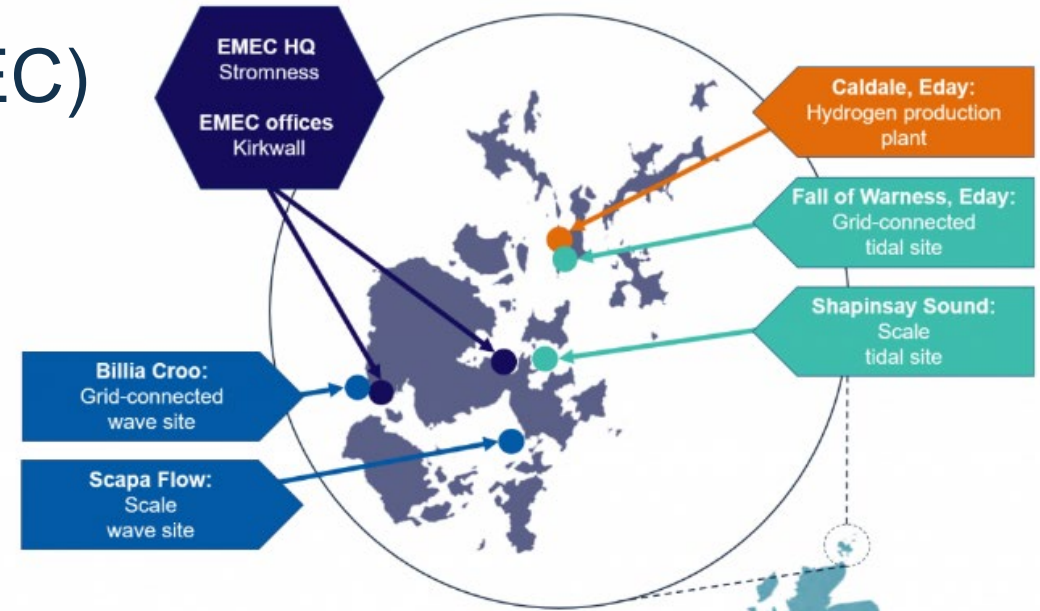
Wide recognition that we need to work more closely with science 'user' communities towards co-development of solutions

Project is part of the **ESA Atlantic Regional initiative** providing insights and solutions in the **Blue Economy topic**

- ESA Blue Economy: Innovation Clusters, Atlantic Natural Resources Management and Maritime Spatial Planning



European Marine Energy Centre (EMEC)

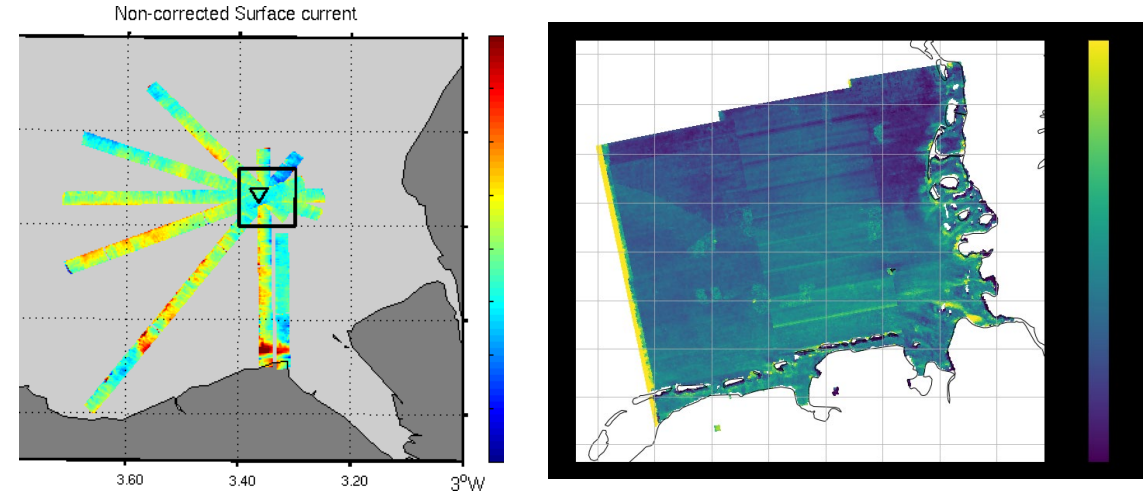


User Needs..

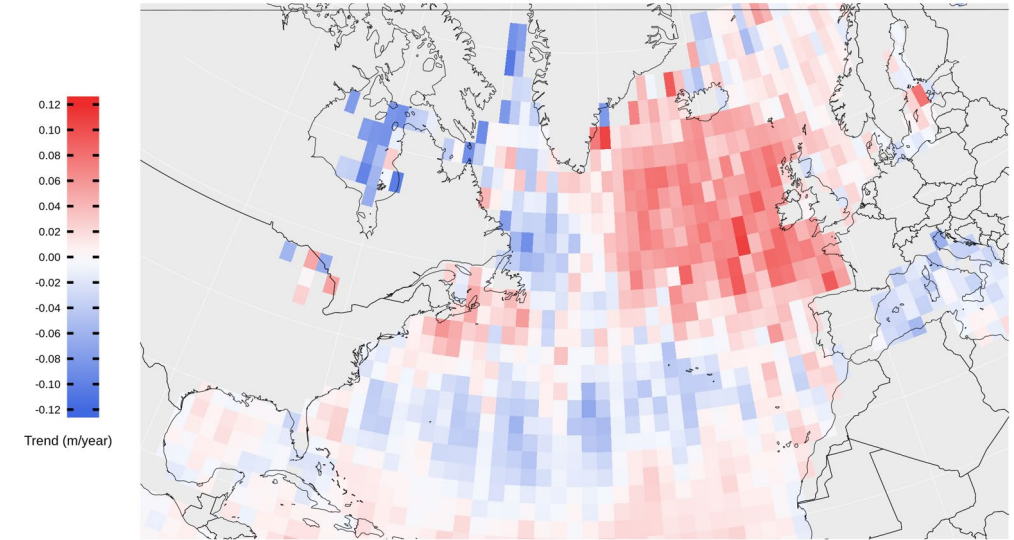
Range of topics discussed including:

- Non tidal currents
- Sea State
- Model validation and forcing
- Physical and biological information needs for MRE project consenting and development processes

Best opportunity for delivering impact so close to the coast??

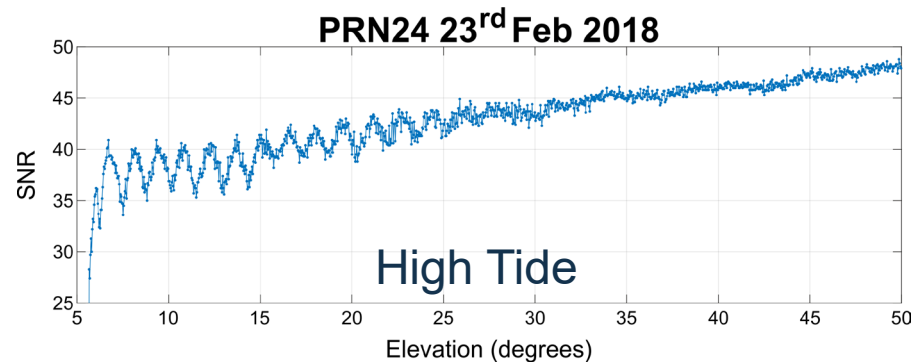
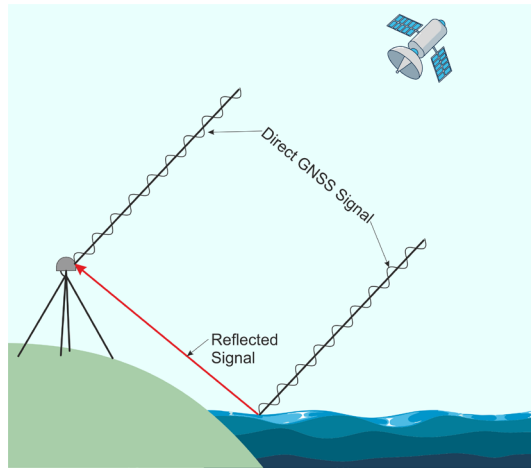


2010-2018 (CCI L4): Trend in swl_mean (JFMOND,n_summer,none)



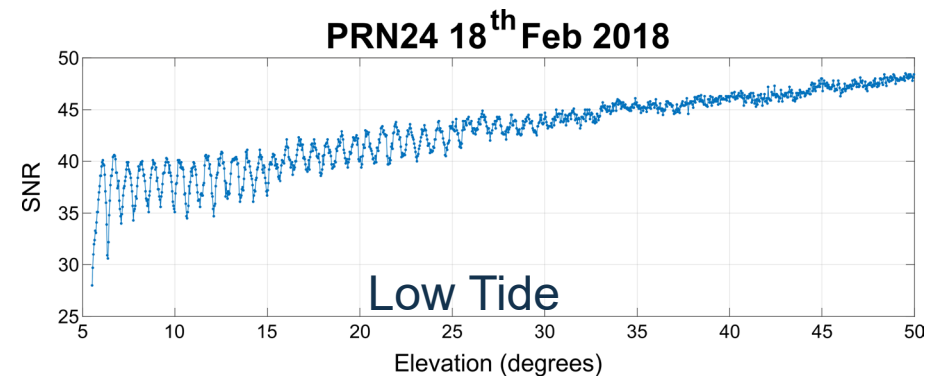
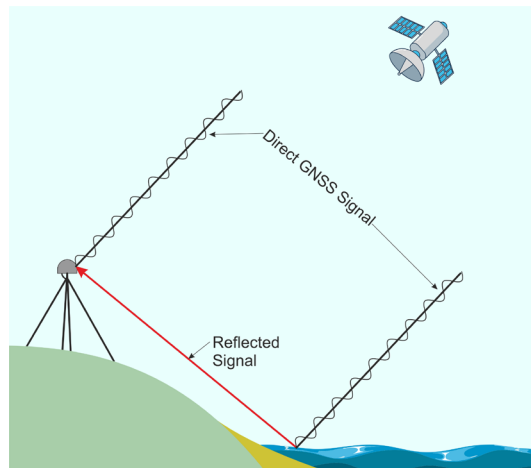
Figures from work by Adrien Martin & Ben Timmermans et al. (NOC)

Ground based GNSS - Interferometry Reflectometry (GNSS-IR)



GNSS receivers suffer from multipath.

Multipath is monitored using the signal to noise ratio (SNR).

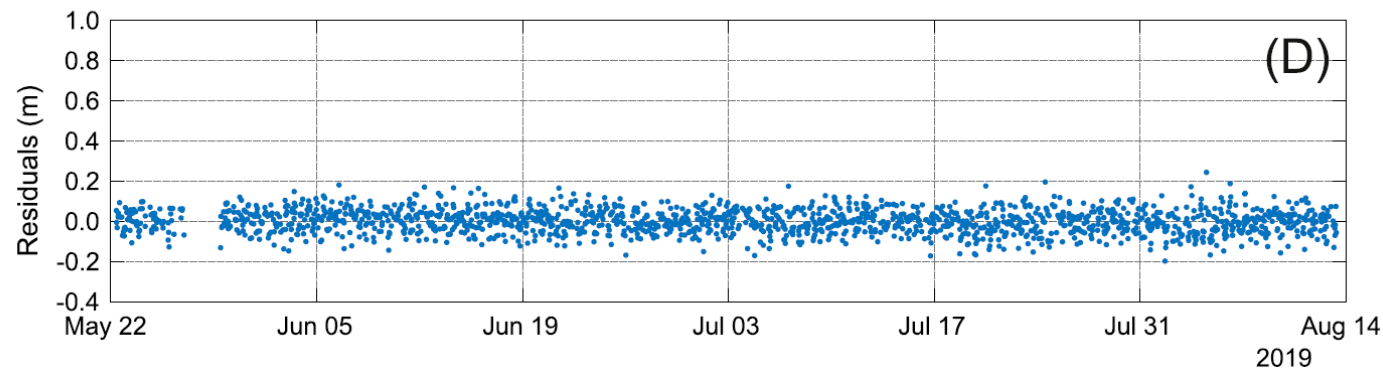
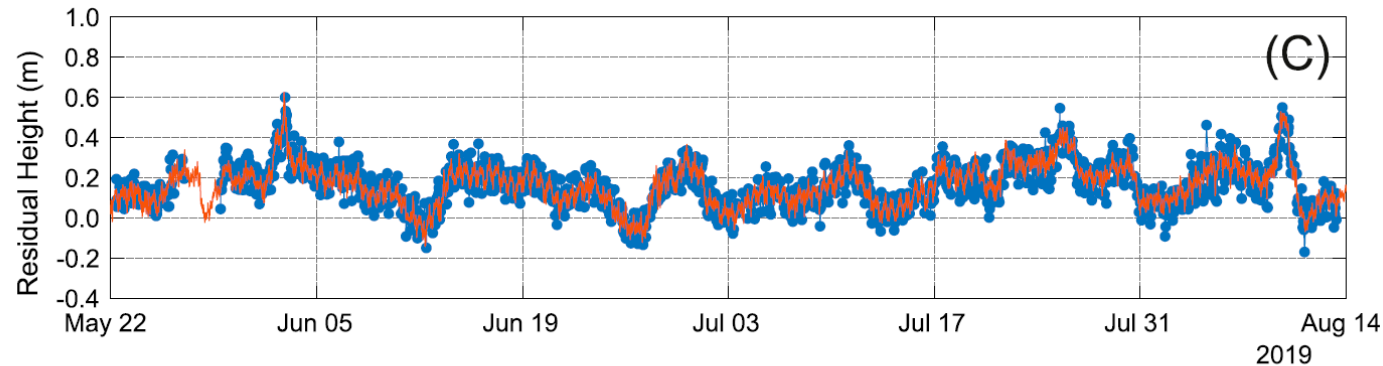




If we understand the physical and geometric effects multipath has on the measured signals then we can turn this around and measure those environmental parameters

Previously demonstrated GNSS-IR as a low cost GPS tide gauge

We achieved results comparable or better than a conventional GNSS-IR for a fraction of the cost
5-6 cm residuals, 1.7 cm daily averages.

The results were so good we identified a potential scale issue in the co-located tide gauge.



 Demonstrating the Potential of Low-Cost GPS Units for the Remote Measurement of Tides and Water Levels Using Interferometric Reflectometry 

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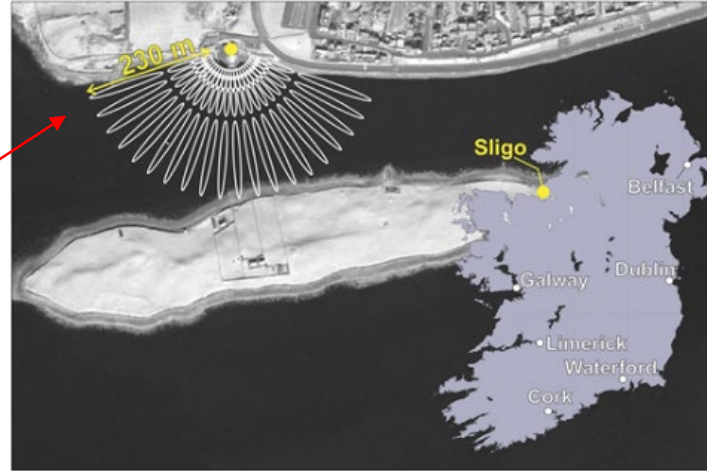
Still operating several years on..

Used to support public service 'text for tide' to avoid being cut off by the water

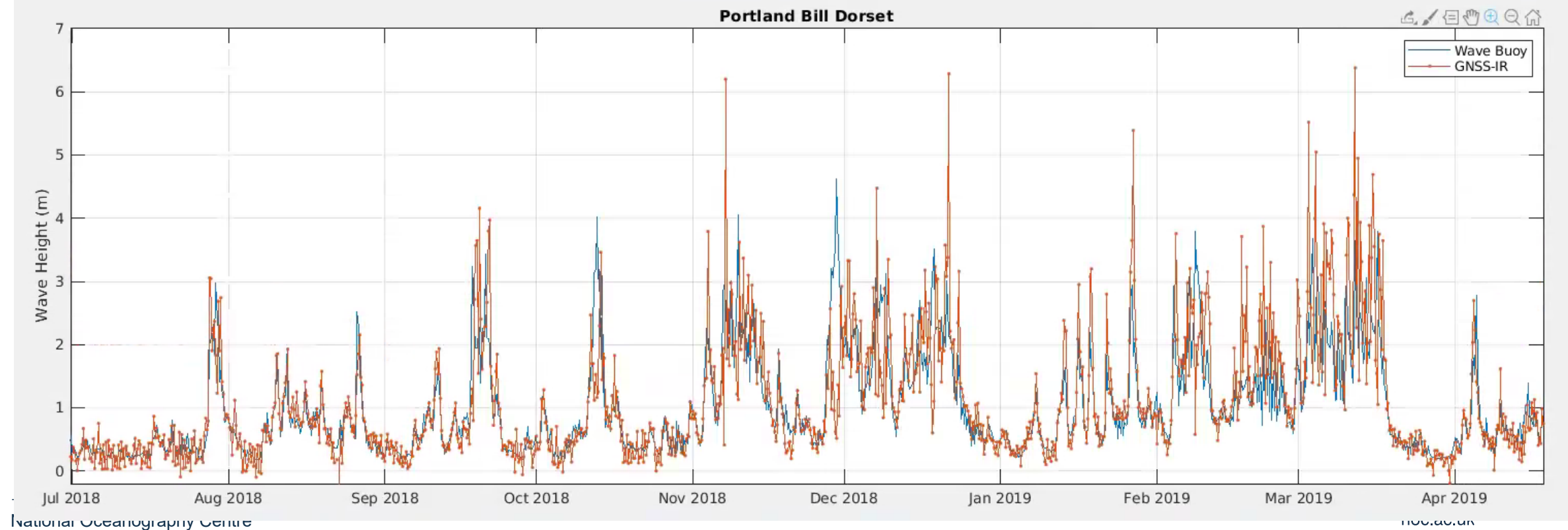
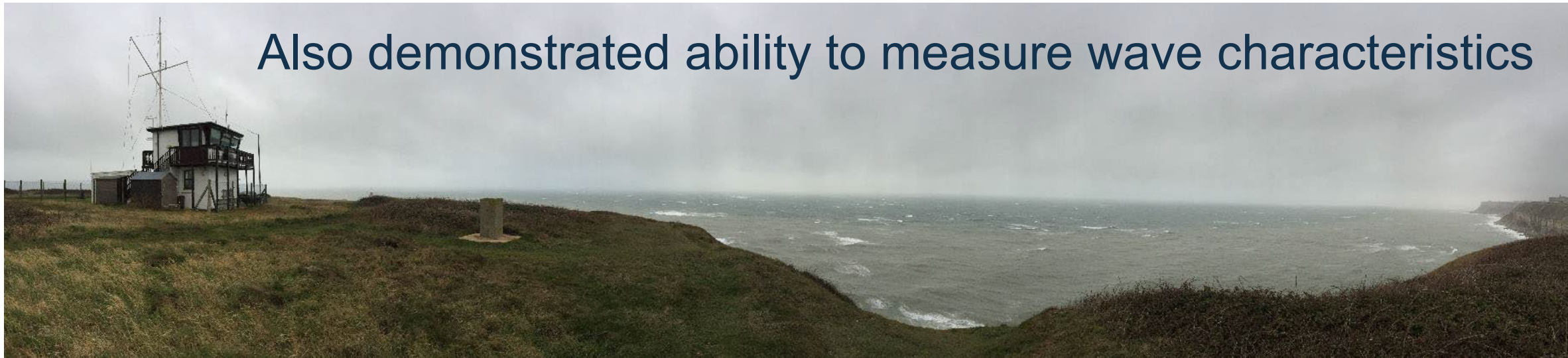


Low Cost Receiver

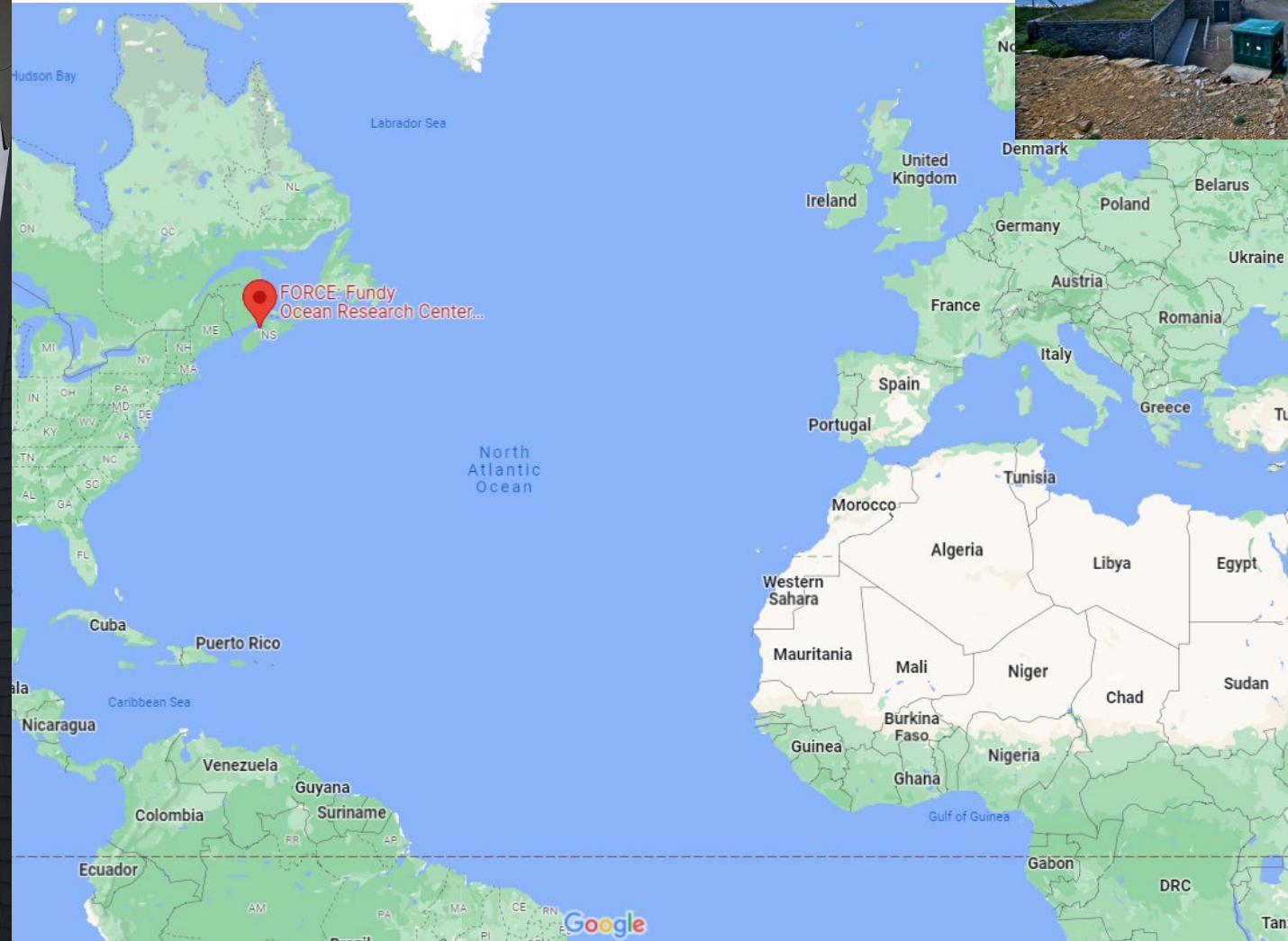
Line of sight (data coverage) and location



Also demonstrated ability to measure wave characteristics



Planned parallel deployments



In meantime ..

- GNSS-IR Portal (260+ Sites) added to PSMSL
- Low-Cost GNSS system design development and local testing



You are here: home > data > gnssir >

GNSS-IR Portal

- Portal Homepage
- Map
- GNSS shadow widget

Please note this portal is still under active development - we're still adding and improving what's here, so content, structure, links and data formats may change. While we've made our best efforts to make what's here accurate, there may still be bugs and other mistakes. If you've got any feedback you'd like to send us, please email psmsl@noc.ac.uk with the subject line "GNSS-IR portal".

GNSS-IR Portal

Links to other pages on the GNSS-IR portal:

- Map of GNSS-IR sites
- Site page (e.g. Newlyn)
- Site page description - metadata and plots
- List of GNSS-IR sites
- Documentation page - what is GNSS-IR?
- Documentation page - how have records been processed
- File formats and contents
- Documentation page - information on underlying json files
- GNSS shadow widget
- An example of using GNSS-IR data in python

This project has received funding from the European Union's Horizons 2020 research and innovation programme under grant agreement No. 862626

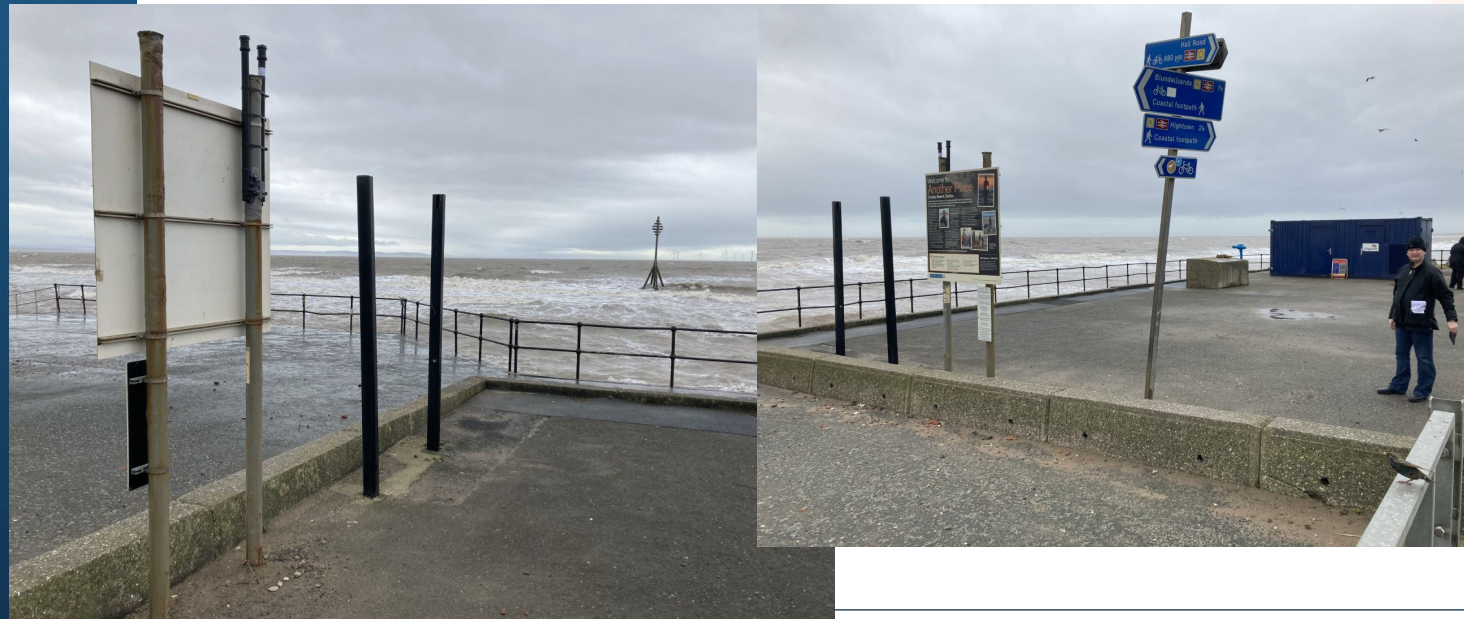


Ocean Sites

Lake Sites

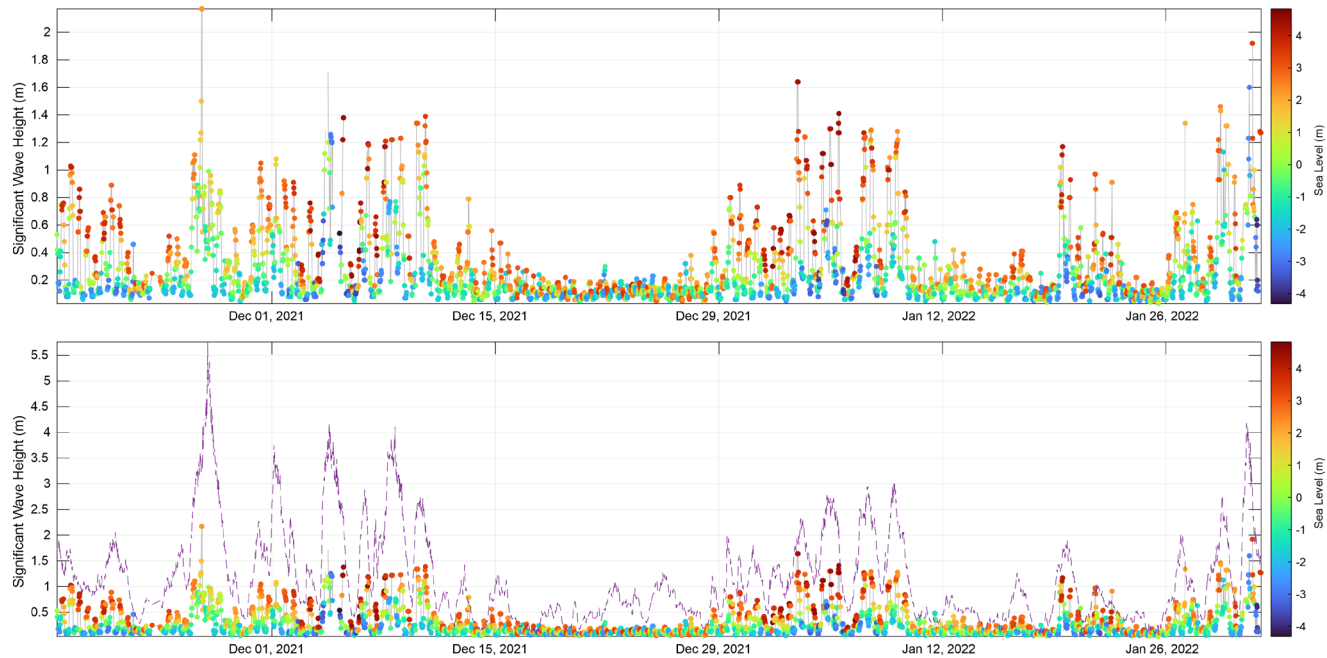
Unusable Sites

Untested Sites



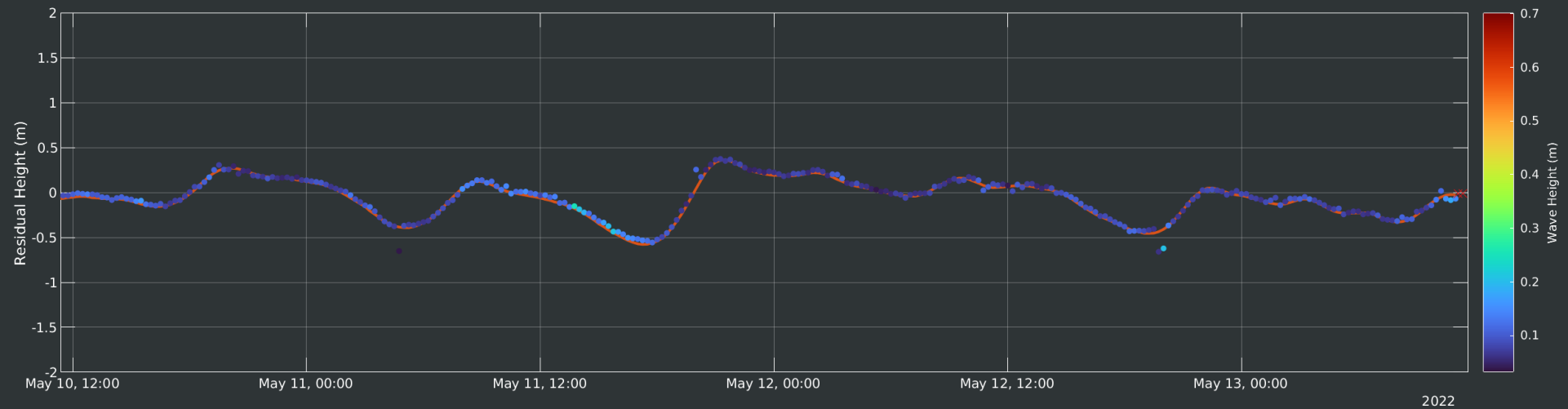
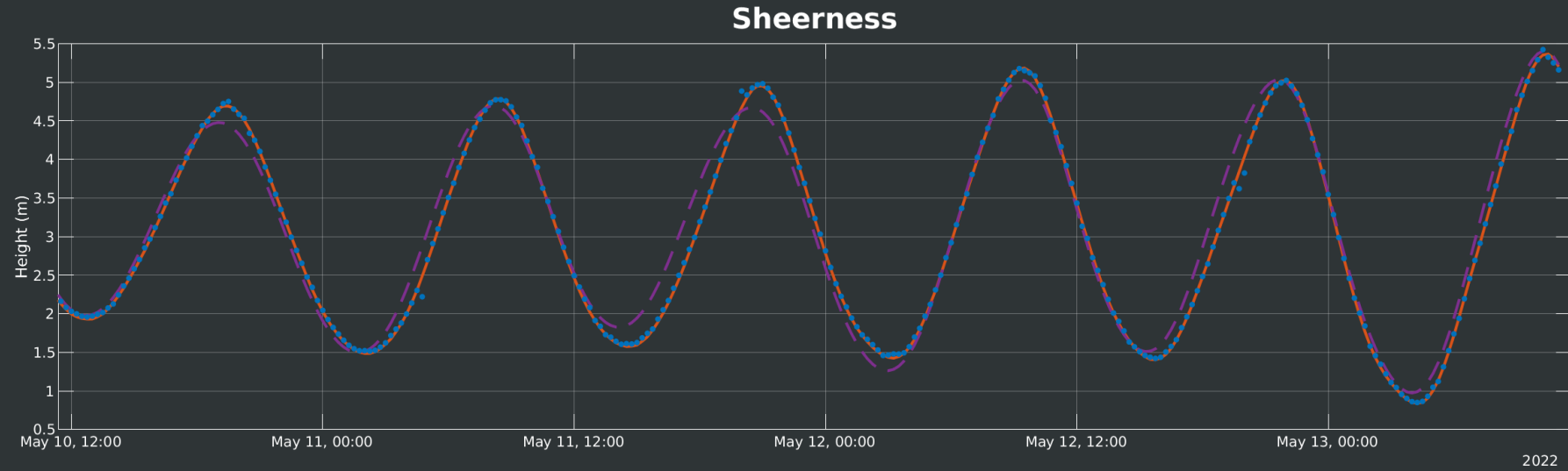
National Oceanography Centre

Significant wave height from low cost systems



We installed two low-cost systems on Seaforth Tower over the 2021/2022 winter and managed to measure Sea-Level and Significant Wave Height.

Near Real Time (15 minutes) running at Sheerness and Alfred Dock



Conclusions

- Lots more opportunities for this technology
- Scaling up
- Research applications
- Practical applications
- Accessible for data sparse regions..

