UK National Report to GLOSS Group of Experts XVIII

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The UK's contribution to the GLOSS core network combines gauges from the UK's national tide gauge network, gauges in British Dependent Territories, and some sites in Antarctica. The main UK network falls under the responsibility of the Environment Agency (EA), which it maintains on behalf of UK Coastal Flood Forecasting (UKCFF), a partnership between the EA, the Scottish Environment Protection Agency, National Resources Wales, and Northern Ireland's Department for Infrastructure Rivers. The National Oceanography Centre (NOC) maintains the South Atlantic tide gauge network, and is in the process of installing new GLOSS-standard equipment at 7 key UK sites.

UK National Tide Gauge Network

Figure 1. The UK National Tide Gauge Network

The UK national network is made up of 42 gauges, three of which are included in the GLOSS core network (Newlyn, Stornoway and Lerwick) and five are included in the long term trends set (Newlyn again, Sheerness, North Shields, Aberdeen and Liverpool).

As mentioned in recent UK reports to GLOSS, the quality of the network has decreased over time due to ageing installation, a lack of maintenance, and the primary aim of the network's funder is to provide forecasts of flooding. As displayed in figure 2, the number of monthly means submitted to PSMSL has steadily declined since 2010.

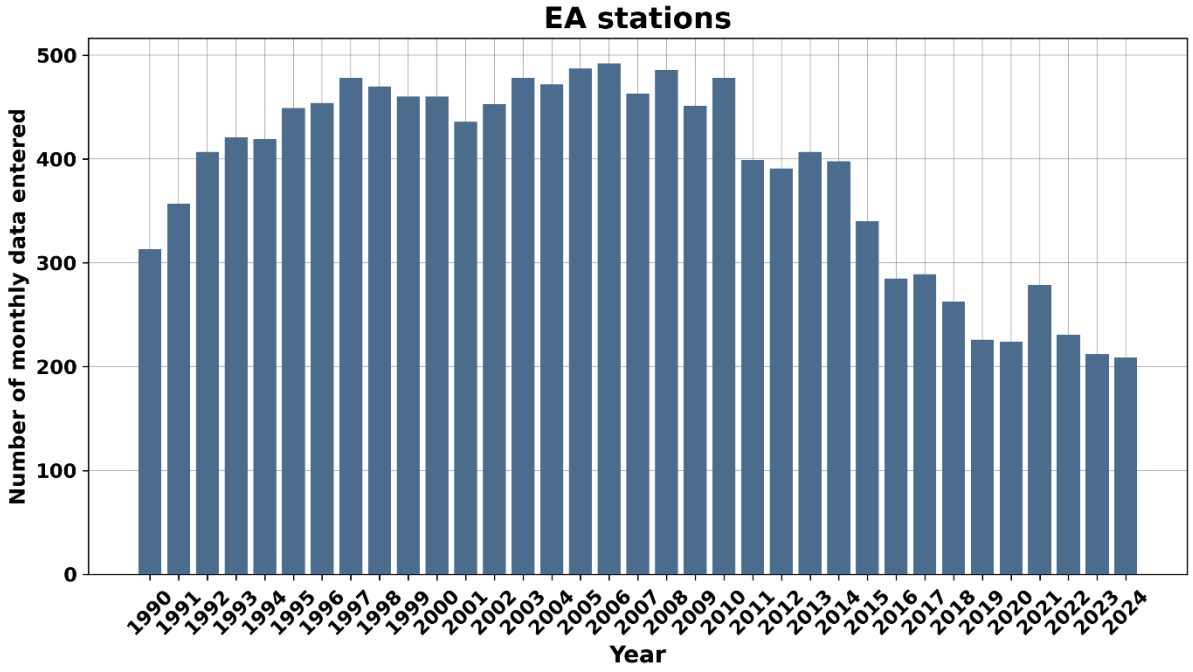

Figure 2. Total number of months of data entered each year to the PSMSL from all sites in the Environment Agency network

NOC Scientific Network

In 2021 and 2022, the National Oceanography Centre obtained funding to install GLOSS standard gauges with operational GNSS-IR at three of the long-term UK installations to act as redundancy to the UKCFF network. In the past two years our engineers have made several visits to maintain and improve the sites.

The NOC has also secured funding to expand the network to cover the two other UK GLOSS core network sites (Stornoway and Lerwick), and two other long-term sites (North Shields and Aberdeen). These sites are currently being planned, and we are aiming to install them in 2026

Liverpool (Alfred Dock)

The Liverpool site (actually in Seacombe, the other side of the River Mersey) was damaged when a ship collided with the radar arm, which needed to be replaced. A

mains supply was installed in 2024 to ensure continuous operation – the initial installation was powered by solar and wind.

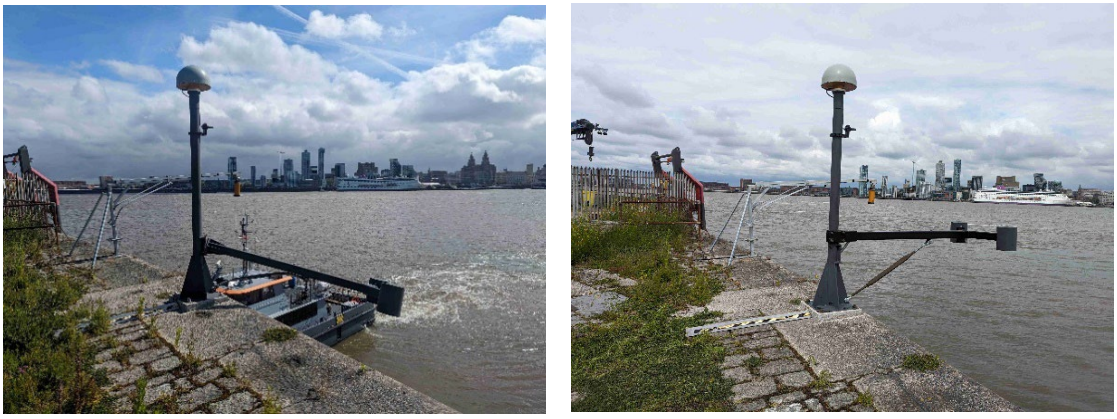

Figure 3. The damage at the Alfred Dock site (left) and after repair (right)

Newlyn

In September 2023, the NOC visited Newlyn to replace the old GNSS Trimble NetR9 with a new Trimble Alloy receiver. The existing GNSS antenna was checked and the cable attached to the Newlyn lighthouse. Accurate levelling was carried out to connect the datums of the new radar sensors to the historical Newlyn installation: the Munro Chart Recorder's contact point and the Fundamental Benchmark (from which all heights on mainland Great Britain are measured).

Further repairs were carried out in June & July 2024, with the now faulty GNSS antenna and cable removed, and replaced by a new Trimble antenna and a new cable run into the tide gauge building.

Figure 4. The Newlyn lighthouse and new GNSS antenna

Sheerness

Sheerness was visited to resolve an issue with the 4G modem that required it to be rebooted. An additional brass benchmark was installed at the base of the GNSS monument and all benchmarks on the jetty were levelled back to the tide gauge benchmark.

At the time of writing, the Trimble GNSS receiver is currently faulty, but a maintenance visit has been planned to repair it.

South Atlantic Network

The NOC also is responsible for maintaining the UK South Atlantic network, now composed of eight stations since the decommissioning of the Signy site in 2016.

All sites are operating well, with the exception of Tristan da Cunha (see below). The ongoing AtlantiS project includes funding to perform necessary updates to data processing software and to produce quality controlled data.

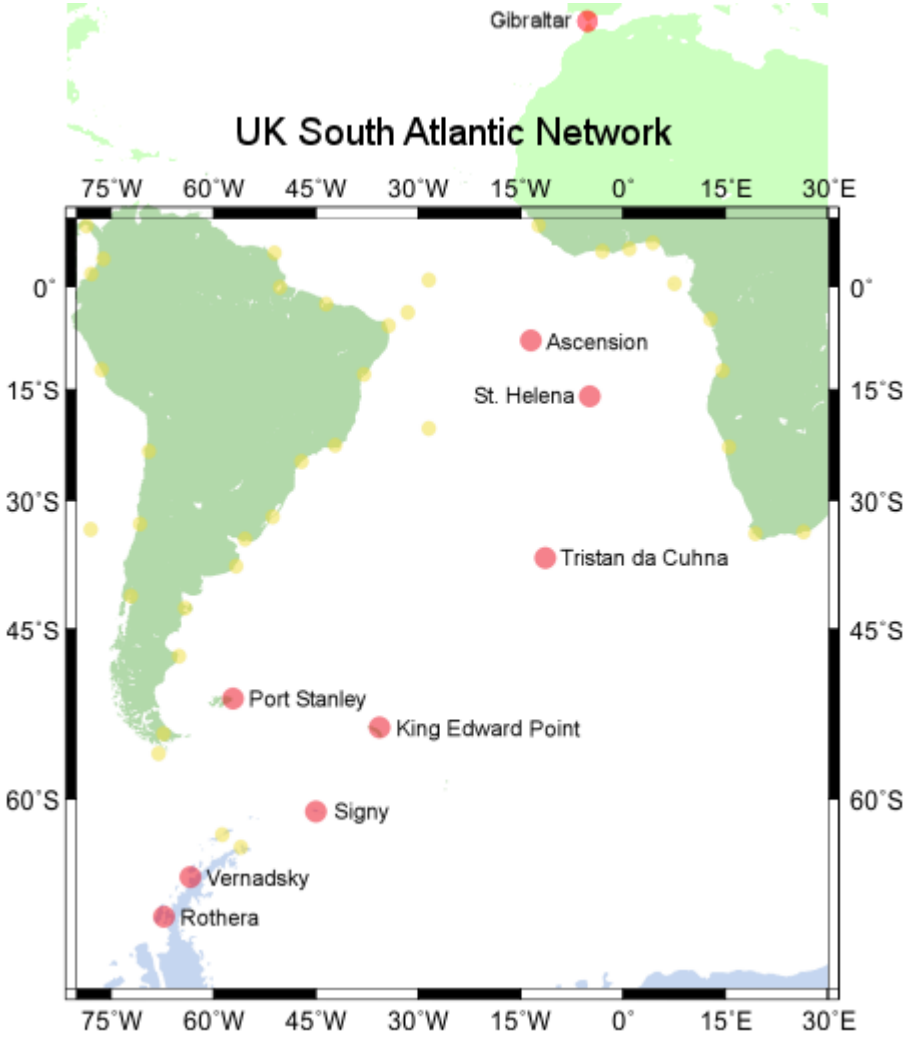

Figure 5. The UK South Atlantic Network

Ascension (English Bay)

The site was visited in April 2023, and the old gauge was replaced with a state of the art twin radar powered by renewable energy.

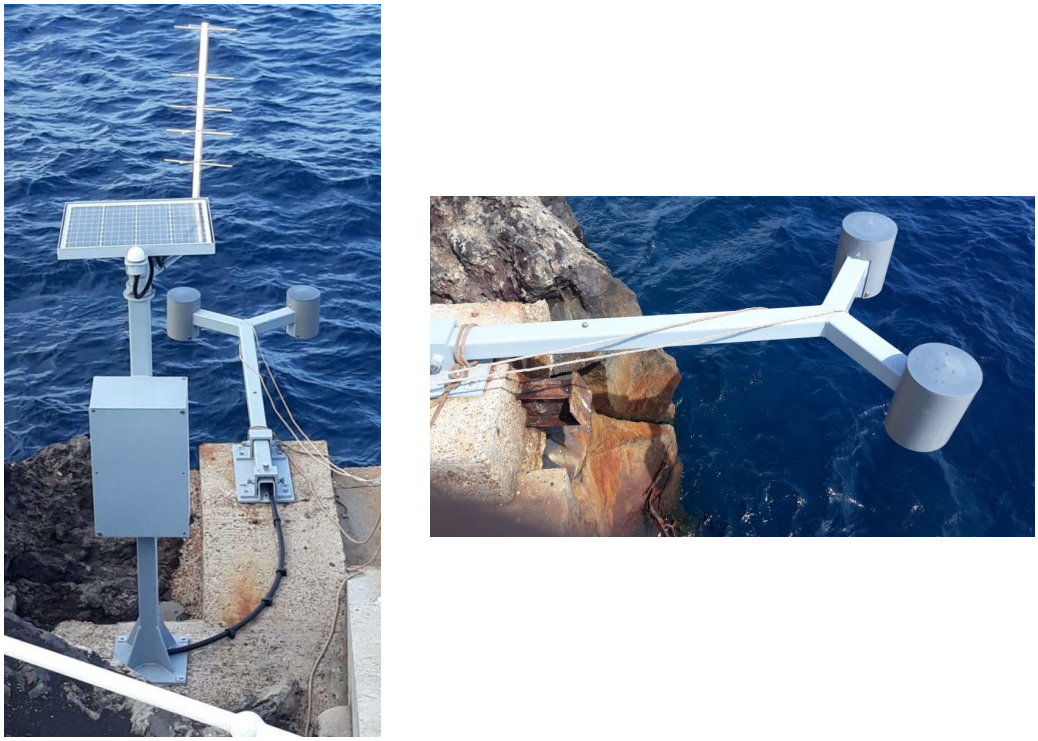

Figure 5. New equipment at Ascension

Port Stanley

In April 2024 the existing FIPASS tide gauge was replaced with a dual radar system. The pressure sensors were also replaced.

Figure 6. The repaired site at Port Stanley

Gibraltar

The radar sensor was damaged during port operations, and was replaced in July 2023

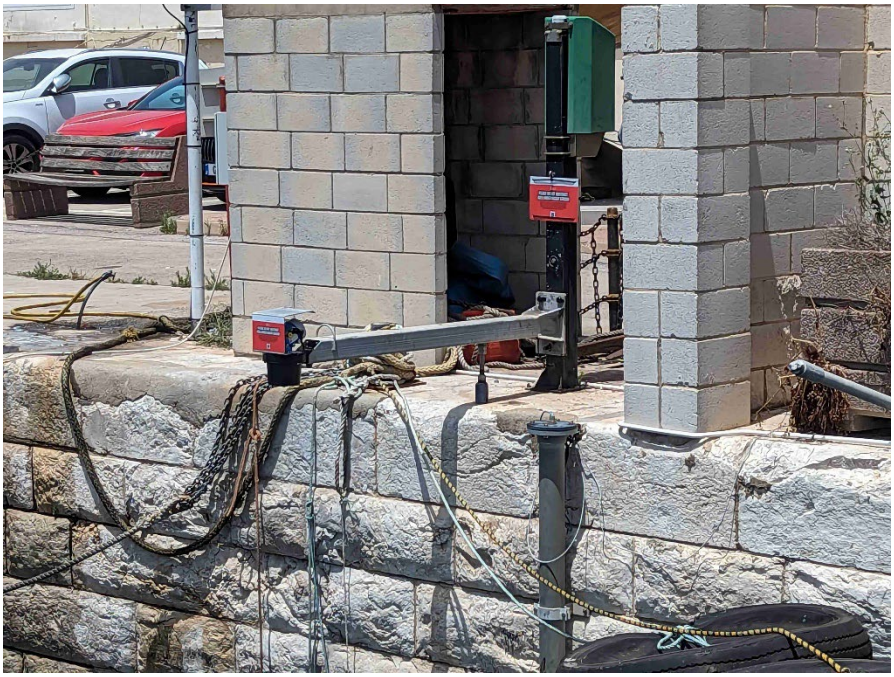

Figure 7. The radar at Gibraltar

Tristan da Cunha

This continues to be a very difficult site to observe, where conventional tide gauges have sustained environmental damage. We are planning to trial a GNSS-IR based system sited away from the harbour that will monitor waves and sea level within and outside the harbour.

Other installations

The NOC also has installed or provided support to several other locations.

St Lucia

The St Lucia government contracted the NOC to install three tide gauges in 2021 to supplement the existing gauge at Ganter's Bay. The batteries were replaced at all sites in 2024. The Dennery site is currently failing to transmit and following a consultancy visit by Angela Hibbert in February 2025 we have put in place an action plan to try and resolve this. The metalwork has deteriorated considerably in some places, although this has not occurred at the other three sites.

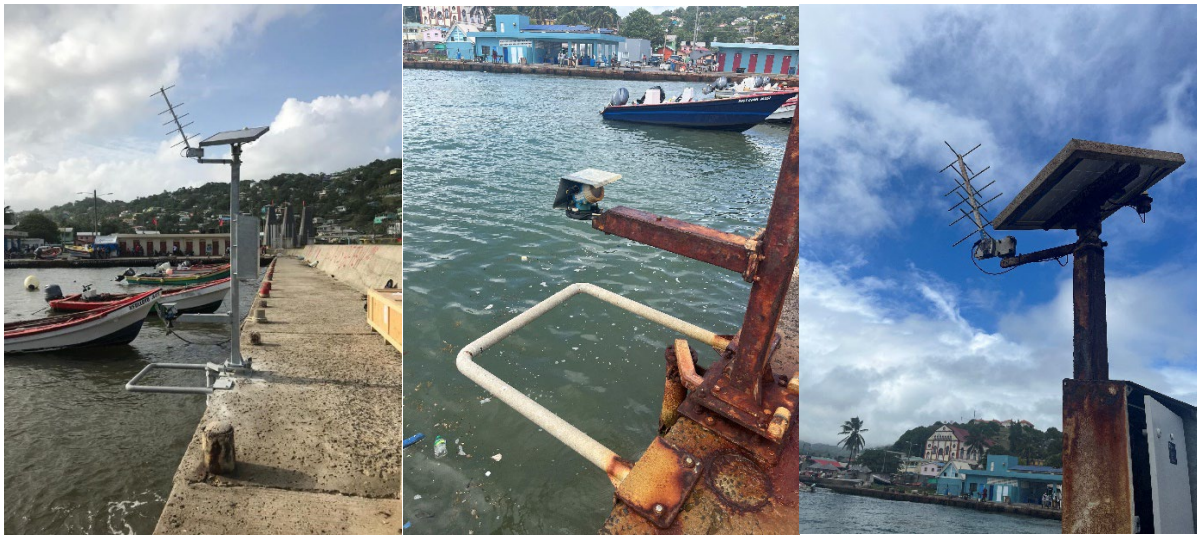

Figure 8. Dennery at installation in 2021 (left) and in 2025 (centre and right)

Karachi, Pakistan

The NOC have continued to provide equipment and technical support to the Karachi Met Office to this site installed as part of the ODINAfrica project in 2009. New radar and pressure sensors were provided to replace the existing failed sensors. These have been installed and the gauge is fully operational.

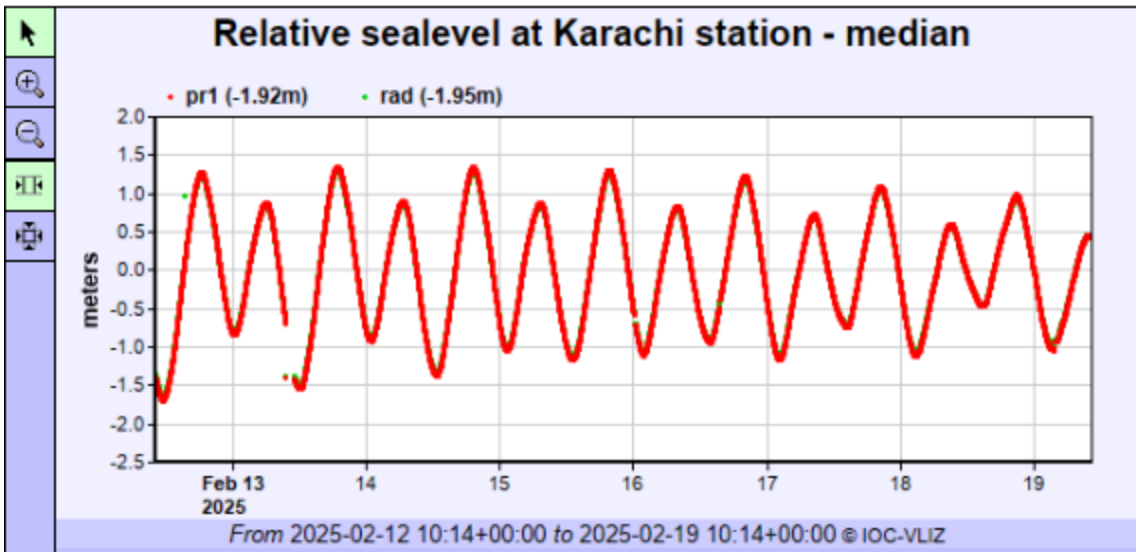

Figure 9. Data from the new sensors from https://www.ioc-sealevelmonitoring.org/station.php?code=kara

Aden, Yemen

This is another ODINAfrica site the NOC have historically supported. Unfortunately this site fully stopped working in March 2024. The equipment is now very old, so we believe a new installation is necessary.

New Installations

As part of the EuroSea project, the NOC prepared and assisted in the installation of two new sites in **Barcelona, Spain** and **Taranto, Italy**, and a third site is awaiting installation in **Buenaventura, Colombia**. All sites have multiple sea level sensors and meteorological observations, and are suitably situated for sea level and significant wave heights to be measured using GNSS-IR.

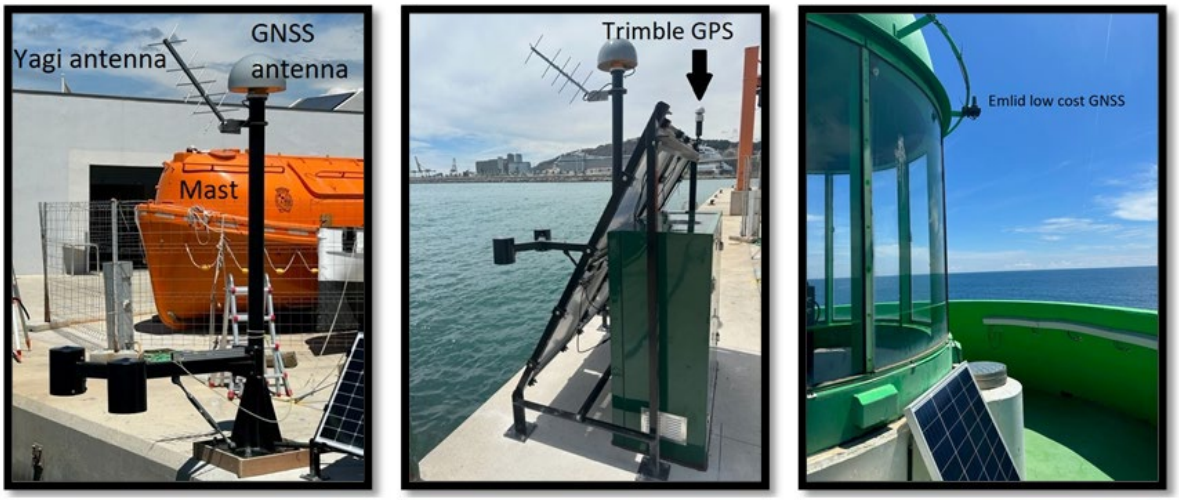

Figure 10. Tide gauge installation at Barcelona, showing primary site (left / middle), and a secondary site with a low-cost GNSS (right)

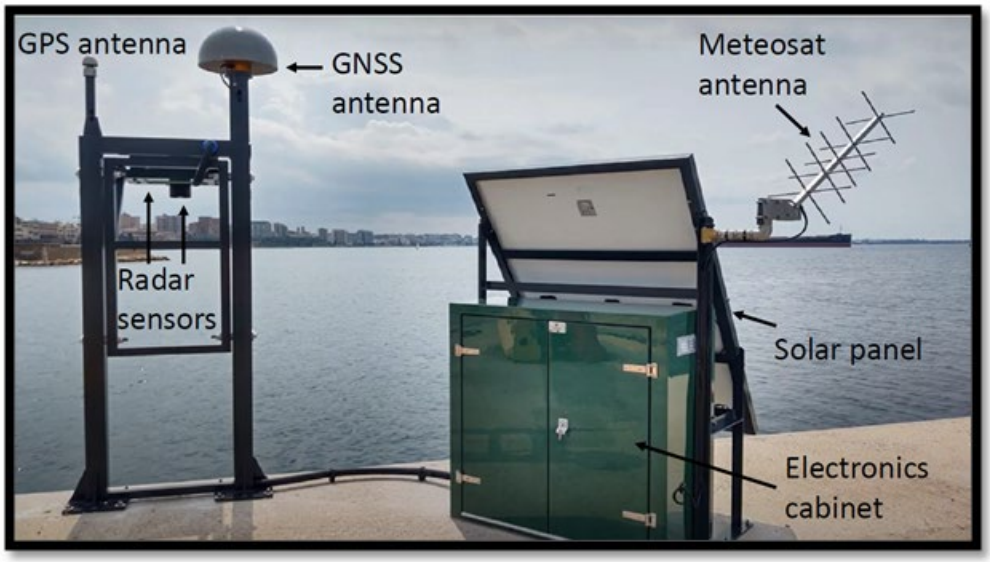

Figure 11. Tide gauge installation at Taranto

The IOC have also contracted the NOC to install a new tide gauge in **Alexandria, Egypt**. This is currently being prepared for delivery and will be installed soon alongside a training course.

GNSS-IR installations

The NOC have continued to experiment with GNSS-IR technology, and we have installed low-cost sensors for specific operational contexts, such as temporary installations to produce tidal predictions for local authorities and lifeboat operators in smaller locations, and for extra observations in the Severn Estuary in the SWOT UK calibration and validation project.

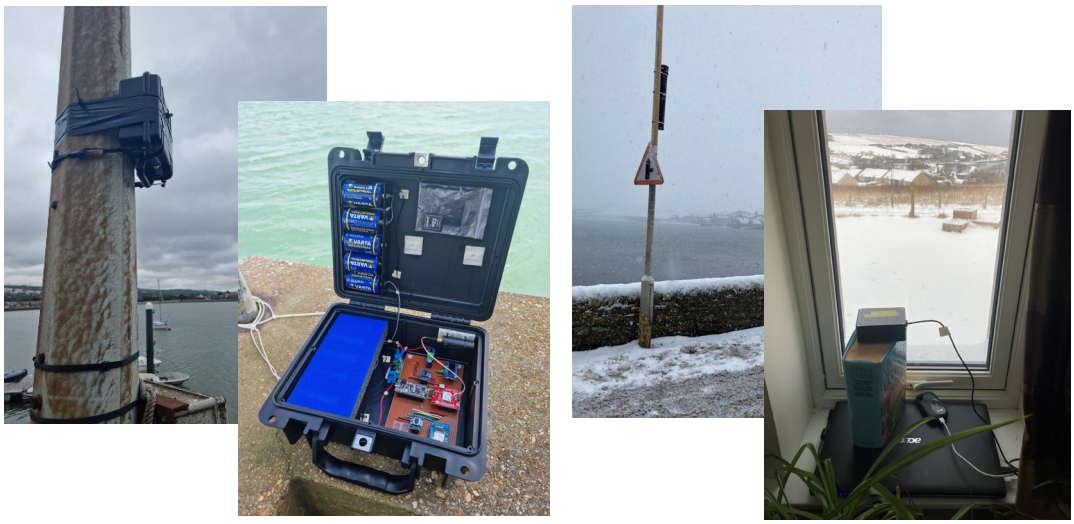

Figure 12. Some examples of low-cost GNSS-IR sensors