PLOCAN: A gliderport infrastructure in the East-Central North Atlantic

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SUMMARY

The Macaronesia is a vast area playing a key role in the East boundary of the Central North-Atlantic ocean-circulation system. Despite a significant and varied scientific and research activity in terms of ocean monitoring in several oceanographic disciplines for decades mainly by key EU research-groups through the use of a wide range of observing systems and methodologies, the area is still under-sampled, mainly due to access and coverage constrains, as well as the observation sustainability. Nowadays, ocean gliders offer a new approach in terms of capacity and sustainability, allowing undertake ocean-monitoring in spatiotemporal scales hitherto unavailable. The present work shows preliminary results from the latest mission with buoyancy-driven and surface ocean gliders in the area, as joint-initiatives between multidisciplinary institutions from Portugal, USA, Germany and Spain, whose main goal focuses on to improve and expand ocean observation capabilities strengthening glider endurance lines between archipelagos, as part of the global ocean-observation strategy conducted by the Macaronesia Marine & Maritime Network (R3M), as aligned contribution with the European and international efforts in the North Atlantic basin through initiatives like GEOSS, EGO, EuroGOOS, EMODNet or AtlantOS, among others.

PLOCAN GLIDERPORT FACILITY

The **Oceanic Platform of the Canary Islands (PLOCAN)** is a multipurpose technical-scientific service infrastructure that provides support for research, technological development and innovation in the marine and maritime sectors, available to public and private users. Its mission is to provide a cost-effective combination of services, including housing, operations, data, and access to the offshore multiuse platform, the integrated observatory and test site facilities. The vision is to become a world-class infrastructure offering great value services, attracting national and international users, responding to the R&D&I challenges of the marine and maritime sectors, and helping to maintain Spain and the EU at the forefront of these sectors. PLOCAN comprises a number of specialized facilities that together provide access to study or test excellent and innovative science and technology concepts and devices in coastal and oceanic environments. It includes an observatory, a test site and a multi-purpose offshore platform. They provide data, operations and hosting services for experiments or new devices. Its main role is to accelerate research, technological development and innovation in the marine and maritime sector, as well as to provide critical facilities necessary for the international scientific-community and industry to carry out their experiments.

The **PLOCAN Base for Autonomous Ocean Vehicles (VIMAS)** comprises a multidisciplinary fleet of unmanned state-of-the-art technologies such as buoyancy-driven and surface ocean gliders, mini-ROVs and AUVs, with dedicated labs, boats, control room, tooling and skilled technicians and managers. Besides, the VIMAS supports missions deploying customers' vehicles in real operational scenarios at local, regional and ocean-basin scale. It has a dedicated control room to manage and track the UUVs in real-time once in mission, and laboratories and warehouses to support missions' needs such as calibration, refurbishment and storage.

Currently, the fleet of ocean gliders hosted by VIMAS comprises a wide representation of the main existing commercial technologies of surface (Wave Glider and Sailbuoy) and buoyancy-driven (Slocum G2 and G3, Seaglider 1K and SeaExplorer) gliders, with specific payload sensor configurations, addressed to monitor respectively physical and bio-chemical variables in surface and through the water-column.

These glider units are often used to cover not only the own monitoring needs of PLOCAN at i.e. the integrated observatory within the framework of research projects (GROOM, AtlantOS, MARCET, FixO3, PERSEUS, NeXOS, etc). They are also used in scientific and demonstrative missions from regional to ocean-basin level (i.e. Challenger One) in cooperation with research institutions and companies. VIMAS fleet is also available to support new technological developments and improvements in close cooperation with the leading manufacturers.


Within the framework o AtlantOS EU-project a partnership between OOM, Instituto Hidrografico-Marinha (IH), Armada Española and PLOCAN, a scientific mission across the NE Atlantic Ocean was conducted between Madeira and Gran Canaria, during April and May 2016. A "Slocum G2" glider, with a scientific payload to measure conductivity, temperature, pressure, dissolved oxygen, chlorophyll and turbidity, was deployed from the Portuguese Navy Vessel (N.R.P 'Zaire'). The glider covered 280 nautical miles, doing repeated dives through the water column down to 1000 m depth. This pioneering initiative in the Macaronesia provides a new scientific approach to validate and improve regional-scale forecast models and satellite products, including water masses characterization. Satellite derived observations including SSH and SLA from AVISO, SST from GHRSST, Ocean Surface Currents derived from satellite altimeter and Scatterometer data (OSCAR), monthly averages of Chlorophyll-a from MODIS-Aqua, NCEP wind and wave forecast using WAVEWATCH III, and forcing winds from GFS have been used as product-tool. MERCATOR-IBI36 hydrodynamic regional model forecast based on NEMO application updated daily to plot SSH, SST, SSS, ocean current vectors over flow speed. http://gliders.plocan.eu
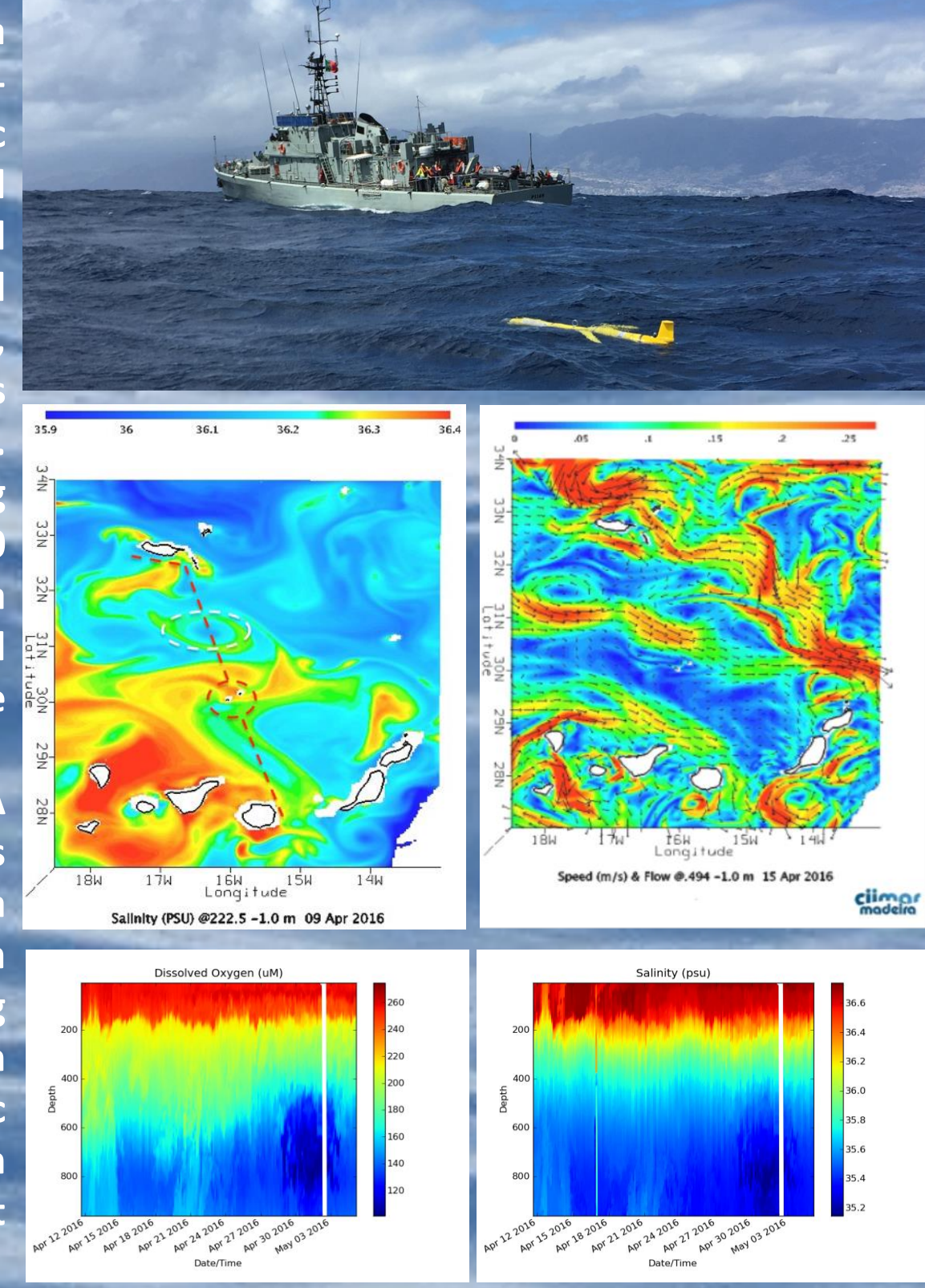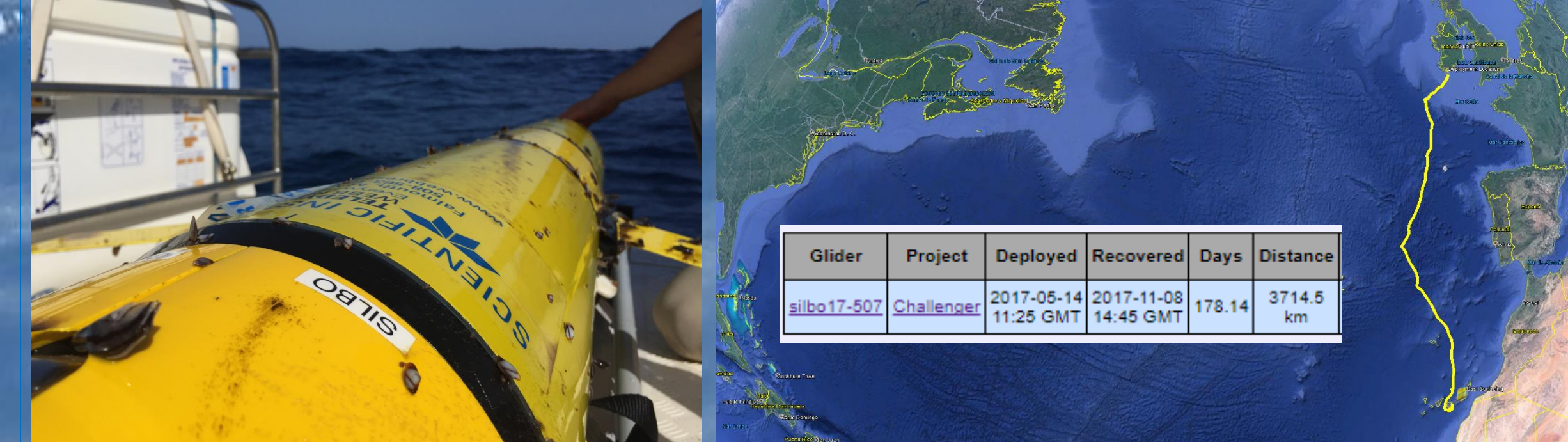
Oceanographic cruise MSM61 aboard the German research vessel RV/Maria S. Merian to study the physical and bio-geo-chemical characterization of the outstanding ecosystem of the Senghor Sea Mount located Northwards Cape Verde Archipelago, and to assess the operational response and capability of new, autonomous oceanic observation technologies in real operational scenarios. The study is part of the European AtlantOS Project, and includes deploying and operating a range of autonomous observation equipment and platforms, such as multi-parameter modules anchored in the water column and on the seabed, autonomous surface marine vehicles (gliders) - SV2 and SV3 Wave Gliders - and profilers (Slocum G2-1000), all fitted with specific sensor equipment for taking samples and data in-situ, in response the scientific and technical needs and objectives set for the mission and the project.
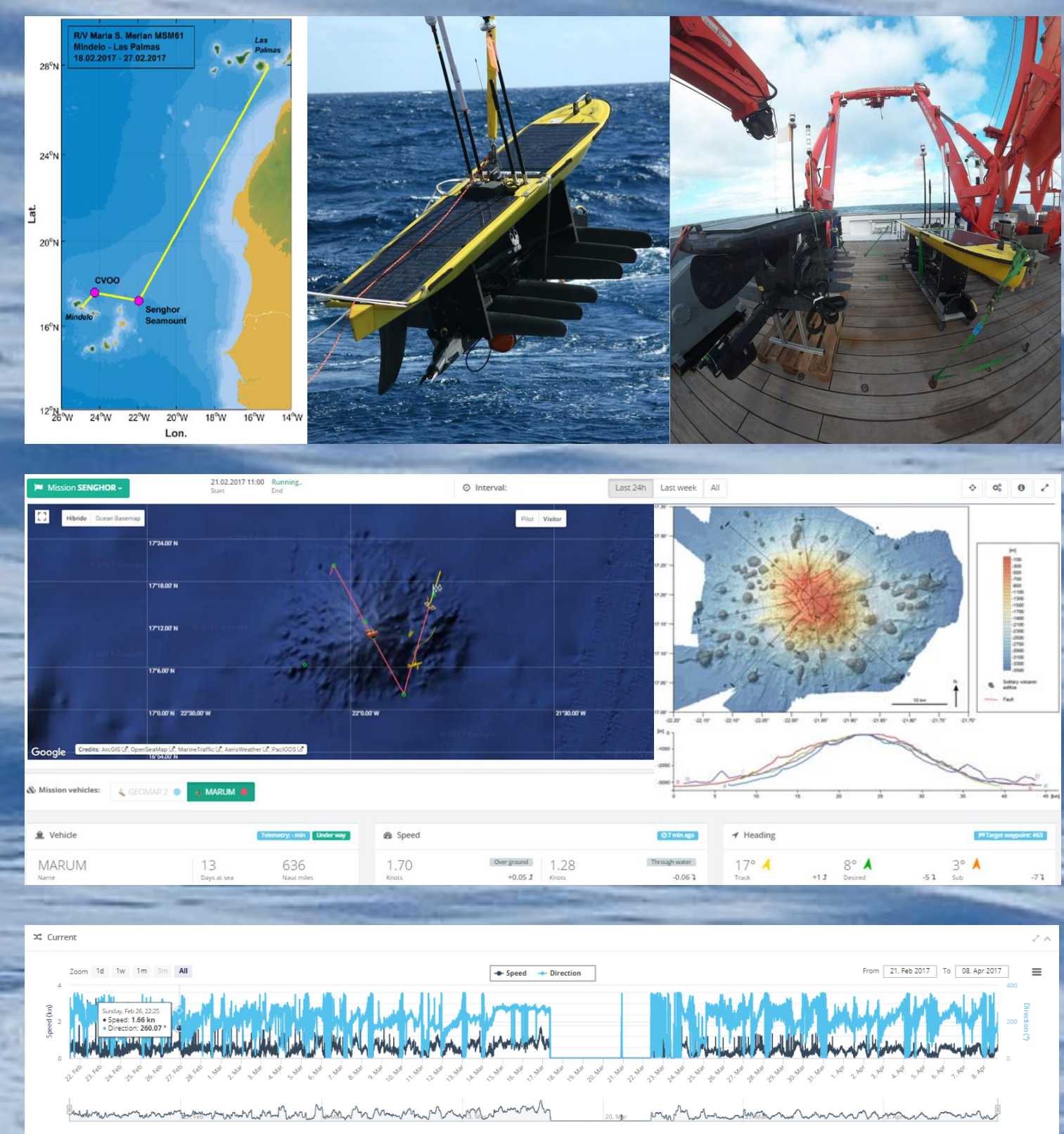
ESTOC ocean time-series site, as deep-node of the PLOCANS' Integrated Ocean Observatory, has a permanent multiplatform monitoring program since 1994, where ocean-gliders nowadays represent a key-one of the latest technologies able to provide data in NRT. Different glider technologies (buoyancy-driven and surface) are operated interchangeably to support a seasonal observations program. Primary sampled parameters are conductivity, temperature, dissolved oxygen, Chl-a, turbidity and CDOM. Gliders provide useful information for surface and intermediate water masses characterization (MMW, NASTMW, ENAW, MW, AAIW, etc) in the area of interest. Each seasonal mission last three weeks in order to cover the distance of 200 nautical miles. http://gliders.plocan.eu
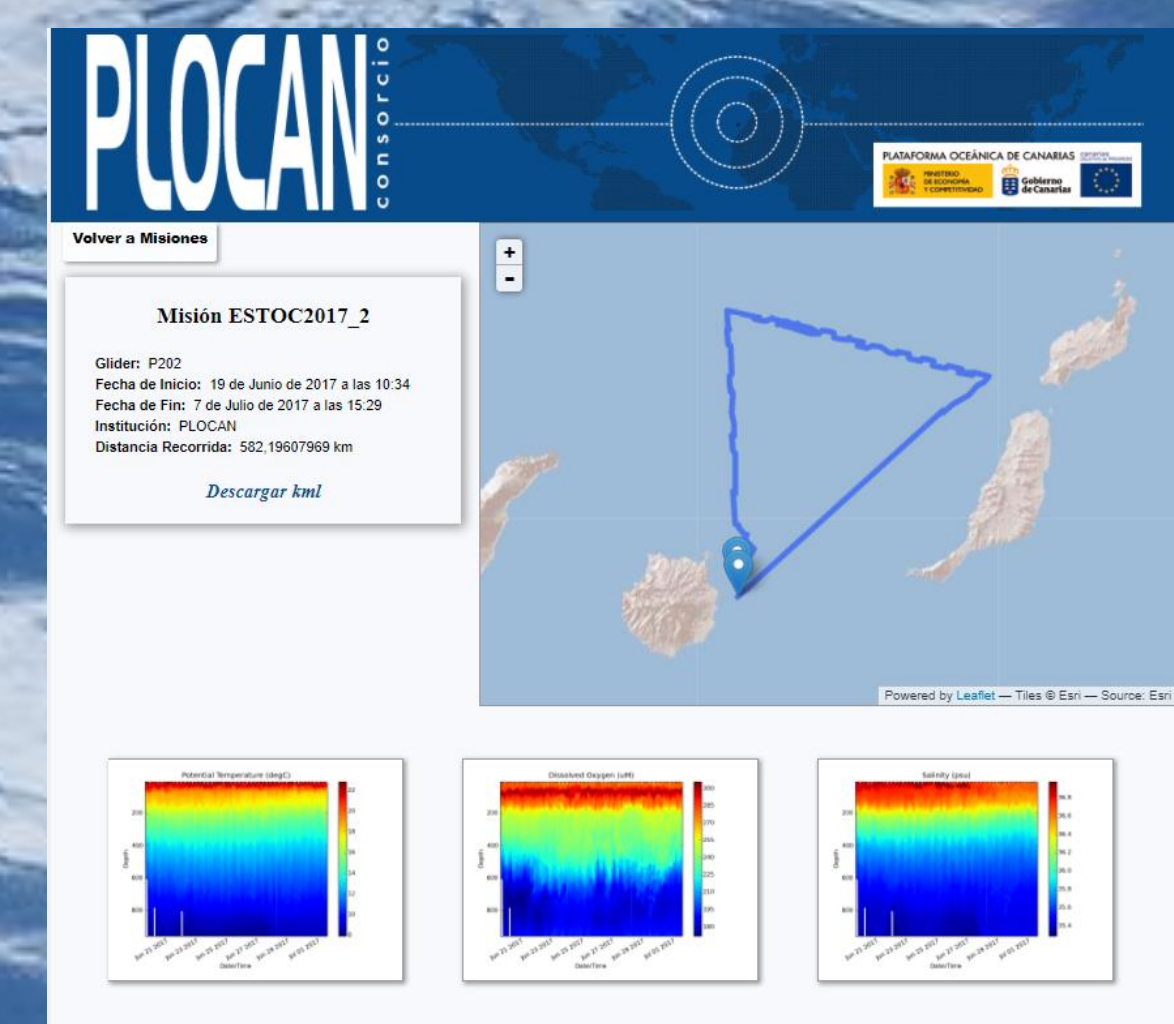
The Challenger One is an international program initiative where PLOCAN cooperates with Teledyne Marine and Rutgers University in regards a Slocum G2 glider unit, under the name of *Silbo*, that attempts to circumnavigate the North Atlantic basin, for scientific and technological purposed. Deployed in Ireland in May 2017, after 178 days of navigation across the Macaronesia, *Silbo* reached Gran Canaria on November 2017, where is expected a maintenance and battery replacement before to be re-deployed

Glider	Project	Deployed	Recovered	Days	Distance
silbo17-507	Challenger	2017-05-14 11:25 GMT	2017-11-08 14:45 GMT	178.14	3714.5 km

Glider data from the Challenger Mission is flowing to Global Telecom System and is being assimilated by European and American global ocean forecast models. The glider data has been used to assess the predictive skill between the American and European operational global ocean forecast models. Results have identified discrepancies between the two models that vary in time and space.