TNA PROJECT REPORT

1. Project Information

Proposal reference number	JN-CALL 1_12, Agreement n° 16/1212766
Project Acronym (ID)	GLIDER-SOUTH
Title of the project	GLIDER missions in the SOUTHern Sicilian Channel
Host Research Infrastructure	CNRS-INSU Glider National Facility France Contact: Jean-Luc Fuda
Starting date - End date	23rd April – 28th June 2017
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2. Project objectives

The stretch of sea southward of the Maltese Islands beyond 35°N is practically an unexplored area of the Mediterranean Sea. Except for a very limited number of oceanographic surveys, the most recent one conducted within the MEDSUDMED initiative on the shelf area close to Tripoli in summer 2006, data are very scarce and provide only a coarse description of the hydrographical conditions of the region. Knowledge about the thermohaline characteristics and the water mass circulation in the southern Sicilian Channel is mainly derived from regional scale numerical simulations and satellite observations. The surface circulation appears to be complex with the presence of gyres, eddies and current bifurcations, and characterized by a significant seasonal modulation.

The significant extent of the African (Tunisian and Libyan) continental shelf, with a large portion of very shallow bathymetry, renders sampling efforts and the characterisation and location of water masses somewhat demanding; furthermore national structures for data acquisition, even in the coastal sea areas, are greatly lacking.

The GLIDER SOUTH project was principally aimed to sample intensively this historically under surveyed area of the Sicily Channel, by using dedicated glider missions in the area shown in Fig. 1, supported by joint Lagrangian drifter experiments, and assessments through the use of numerical model simulations to better interpret the pertinent processes in this marine domain.

The activity described in this report has received funding
from European Commission's H2020 Framework Programme
under JERICO-NEXT project, grant agreement No. 654410.

3. Main achievements and difficulties encountered

The glider Campe has been deployed on the 23th of April, 2017 by staff of the Glider National Facility with the help of the Maltese team and support of the Armed Forces of Malta. It has since then performed transects between the Maltese Islands and the southern Mediterranean shelf, and after a successful mission of 66 days, the glider was recovered in the north-western approaches to the Maltese Islands, collecting over 2000 profiles.

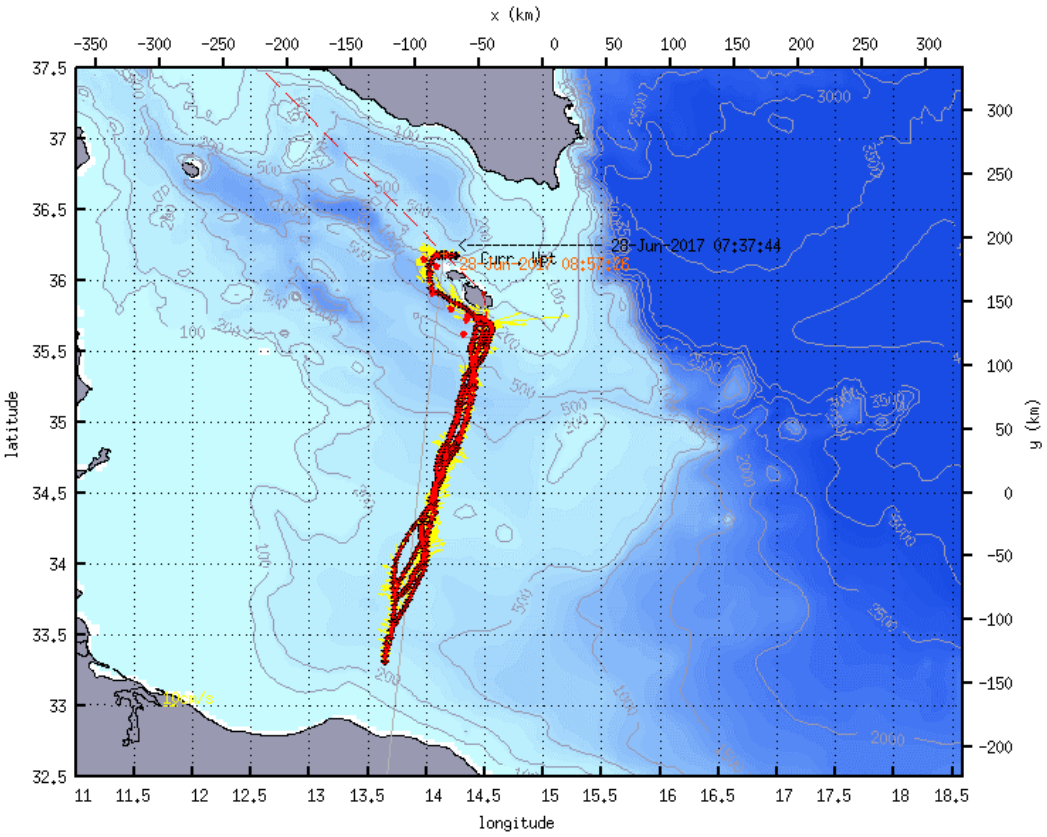

Figure 1 Glider track, complete mission (23 April – 28 June 2017)

Hydrographic data in this region is very scarce and the project provides pristine data which will help to understand the dynamic phenomena observed in the stretch of sea between Malta and Libya.

The sea glider was further employed along a track close to the Maltese Islands to demonstrate how adaptive monitoring strategies using remotely controlled unmanned devices provide cost effective methods to routinely collect basic marine data and measure the health of coastal waters.

The track of this mission and the plots of the measures taken along it, are viewable at the following link:

https://gfcpdsi.ego-network.org/plot/plot_deployment.php?glider=Campe&deployment=GliderSouth

Access to the data is available through a brand new service called SEANOE, which is offered by SISMER, an IFREMER department. GLIDER South data is referenced by SEANOE with a dedicated webpage: **http://www.seanoe.org/data/00400/51145/**. The full raw data set has been processed by CORIOLIS, with all intermediate processing steps available, and it is freely downloadable.

4. Dissemination of the results

A half-day seminar was organized on 7 July 2017, at the Dolmen Resort Hotel, Qawra, to present the sea glider experience in Malta to key stakeholders and interested parties, and showcase how the new generation of sea gliders offers an innovative aid to observe and monitor the sea areas under local jurisdiction. With the participation of local scientists and two foreign experts, the seminar provided an avenue to brainstorm the way to the shaping of the operational marine observing system for the Maltese Islands ("Introducing sea gliders for monitoring the marine environment in Malta", **http://ioi.research.um.edu.mt/GliderSouth/index.php/welcome/events**).

GLIDER South has been presented to the public through media features on radio and TV as well as through a dedicated article on THINK magazine issued quarterly by the University for public outreach.

GLIDER South is also being presented at international fora such as the EMSO-ERIC link workshop in Rome in October and the XXIII Congress AIOL in Cagliari in September.

The project has served to showcase how gliders can provide an optimal monitoring solution in the case of an island state like Malta. With a fleet of three gliders, two units in the sea at any time and moving with a phase difference of half a turn along a common trajectory around the Maltese Islands, it is possible to monitor the whole coastal sea area at least every five days. This would provide a system that can resolve high spatial and temporal variability. Such a system has been proposed to the local Environment Resources Authority who are currently planning a large IP proposal that permits acquisition of marine infrastructure.

5. Technical and Scientific preliminary Outcomes

GLIDER SOUTH has provided pristine water column observations in this area of the Mediterranean Sea where hydrographic data is very scarce. This data, still in the process of being fully analysed, will help to understand the dynamic phenomena in the stretch of sea between Malta and Libya. Important targets concern the vertical water column structure associated to mesoscale and sub-mesoscale circulation features appearing and monitored by satellite during the glider mission; the study of the extension and seasonality of the Bifurcation Atlantic Tunisian Current through its subsurface signatures; assessing for any particular water column structure and water masses in association to bathymetric differences especially in the deeper areas such as the Malta Graben southwest of the Maltese Islands; tracing evidence of deep water formation from the Libyan continental shelf, and obtaining direct observations on the westward LIW flow south of the Maltese Islands.

Furthermore, data collected is being used to validate numerical forecasting models of the area, and work with IAMC-CNR, (Oristano section) will specifically target the Tyrrhenian Sicily Channel Regional Model TSCRM. Figure 2 shows the root mean square error between TSCRM-derived and glider profiles for temperature and salinity respectively.

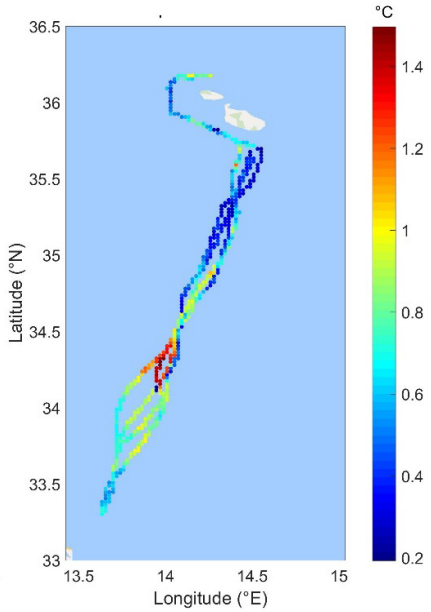

Fig. 2a. Temperature RMSE between glider and TSCRM model profiles

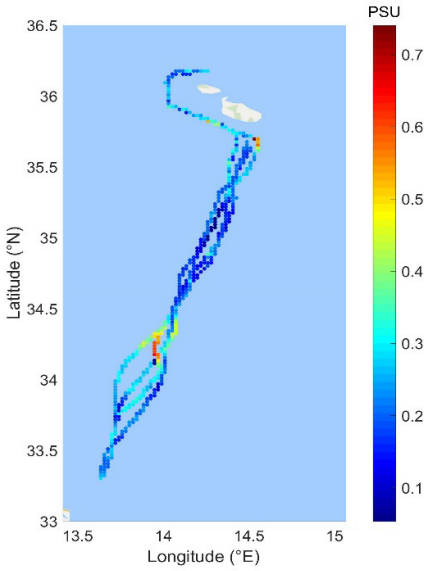

Fig. 2b. Salinity RMSE between glider and TSCRM model profiles

The sea glider was further employed along a track close to the Maltese Islands to demonstrate how adaptive monitoring strategies using remotely controlled unmanned devices provide cost effective methods to routinely collect basic marine data and measure the health of coastal waters.

The project has served to train local staff in the use of sea gliders on the field. The experience on GLIDER South has been essential to understand how glider data is managed, quality controlled and analysed. A substantial effort is ongoing to translate this effort into a comprehensive sea glider data management platform which will serve to (a) process and visualise glider data; (b) integrate glider data with other in situ data, satellite observations, and numerical model data, linking and

superposing data types acquired by different platforms and different temporal and spatial data representations; (c) deploy useful tools developed in this project and in previous work, in a web application that can generate visualisation plots of processed data, for online viewing of both delayed and real time glider data.

The GLIDER South webpage has been set up (**http://ioi.research.um.edu.mt/GliderSouth/index.php/welcome/index**) to show the project activity and will be maintained to show scientific results as they mature.

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