

TNA PROJECT REPORT

1. Project Information

Proposal reference number	JN-CALL 1_2
Project Acronym (ID)	ABACUS-3
Title of the project	Third Algerian BASin Circulation Unmanned Survey
Host Research Infrastructure	SOCIB glider facility (SOCIB-GF)
Starting date - End date	Total project duration: 25/Oct/2016- June 2017 Glider activities at sea: 04/Nov/2016 - 23/Dec/2016
Name of Principal Investigator Home Laboratory Address E-mail address Telephone	Giorgio Budillon Università degli Studi di Napoli “Parthenope” Centro Direzionale Isola C4 – Napoli, Italy giorgio.budillon@uniparthenope.it +39 081 5476584
User group members	Giorgio Budillon, Yuri Cotroneo, Giuseppe Aulicino, Giannetta Fusco Università degli Studi di Napoli “Parthenope”

2. Project objectives

The project aims at assessing the importance of a new monitoring line across the Algerian Basin (AB) between Palma de Mallorca and the Algerian Coast. Through its activities, ABACUS-3 project will contribute to data collection in the Southern European Seas, one of the main EU maritime policy objectives, as outlined in the Marine Strategy Framework Directive (MSFD).

The realization of a new glider mission will allow to extend the dataset previously collected in the area (Autumn 2014 and 2015) in order to enrich the data useful for an interannual comparison.

The main objectives of the ABACUS-3 project are:

- To continue the time series of oceanographic data collected in the AB along the endurance line between Mallorca and Algeri, enriching the dataset obtained during both the JERICO TNA-ABACUS project in 2014 and the external-access SOCIB call in 2015;
- To identify the physical and biological properties of the surface and intermediate water masses between Balearic Islands and Algerian Coast;
- To intercept any mesoscale eddy identified during the mission;
- To understand the sub-basins dynamics and the complex interactions due to eddies;
- To assess the ocean description capabilities of several satellite products when approaching coastal areas, also comparing them to glider high resolution in situ data;
- To validate the new along-track (L3) and gridded interpolated maps (L4) altimetry products provided by the Sentinel-3 altimetry mission and the other satellites for the western Mediterranean Sea.



3. Main achievements and difficulties encountered

Data collected during the ABACUS 3 mission allowed:

- A real time monitoring of the main physical and biochemical properties of the water column;
- The comparison with new generation satellite data;
- The extension of the glider high resolution dataset;
- The extension of the research activities connected to mesoscale eddy.

From a technical perspective, the glider:

- spent 49 days in water;
- navigated 1127.90 Km (609 Nm);
- collected about 1800 profiles;
- was overflown twice by SENTINEL-3 satellite;
- navigated four times 2 SENTINEL-3 target groundtracks.

The ABACUS team faced the following difficulties:

- Scheduling work to guarantee satellite overflights;
- Severe sea weather conditions during deployment;
- Need to reduce time at surface to avoid collisions;
- Need to break to surface every second cast, in order to sample the very surface layer.

Additionally, an estimated number of 34 to 38 profiles were not recorded due to a problem in the data-logging system on-board the glider. Precisely, it was due to an overflow in some data buffers. This issue is normally logged by the glider under the name "DRIVER_ODDITY:science_super:906:Input ringbuf overflow" and started appearing on 15/Nov/2016@03:10am,UTC. Consequently, the glider stopped logging scientific data until this situation was solved on the 17/Nov/2016@15:12pm,UTC. This overflow anomaly is very difficult to predict when all the sensors at sampling at its max. rate.

In order to avoid this issue during next mission, data transmission will not be paused unless strictly necessary and all efforts will be put in not missing any warning message from the glider during one of the daily report calls.

4. Dissemination of the results

The results achieved during this and previous ABACUS glider missions have been presented at several national and international conferences as the EGU General Assembly 2017 and IUGG/IAPSO-IAMAS-IAGA Joint Assembly 2017.

Results have been submitted to appropriate, internationally recognized and peer reviewed journals.

We realized seminars for graduate and post-graduate students, at Università degli studi di Napoli "Parthenope" and Università Politecnica delle Marche.

A video has been realized to disseminate the project and published in the You Tube channel (<https://www.youtube.com/watch?v=GZ43huftfGI&feature=youtu.be>).

References

- EGU 2017 “Intercomparison of numerical simulations, satellite altimetry and glider observations in the Algerian Basin during fall 2014 and 2015: focus on a SARAL/AltiKa track” by G. Aulicino, Y. Cotroneo, S. Ruiz, A. Sanchez Roman, A. Pascual, G. Fusco, J. Tintoré, and G. Budillon
- IUGG/IAPSO-IAMAS-IAGA Joint Assembly 2017 “Monitoring of the Algerian Basin Circulation through glider observations, numerical simulations and altimetry during fall 2014-2016” by Y. Cotroneo, G. Aulicino, S. Ruiz, A. Sanchez Roman, A. Pascual, G. Fusco, J. Tintoré, and G. Budillon

5. Technical and Scientific preliminary Outcomes

Through its activities, ABACUS-3 project contributed to data collection in the Southern European Seas, one of the main EU maritime policy objectives, as outlined in the Marine Strategy Framework Directive (MSFD).

The new glider mission realized in November-December 2016 through JERICO-NEXT allowed to extend the dataset previously collected in the area (Autumn 2014 and 2015) in order to enrich the data useful for an interannual comparison (Fig. 1). The ABACUS glider mission was first realized in 2014 through application to the 3rd JERICO TNA call. Since then two more mission have been realized.

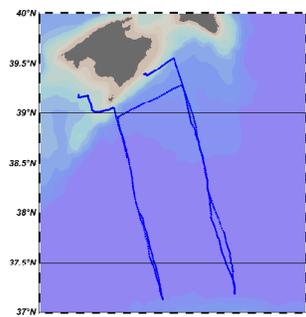


Fig.1 Glider track of the ABACUS 3 project

Glider data acquired during ABACUS 3 have been quality controlled and analysed through three different steps:

- 1) After the mission, data were transferred from the internal glider memory to the SOCIB Data Center where pre-processing, quality control and validation were carried out and production of level 1 and level 2 data occurred;
- 2) A second quality control process was applied in order to identify any persistent spike in the data and to smooth all the profile along depth in order to reduce the noise of the signal;
- 3) A final visual check was performed on the single profiles also through the realization of a θ/S diagram (Fig. 2)

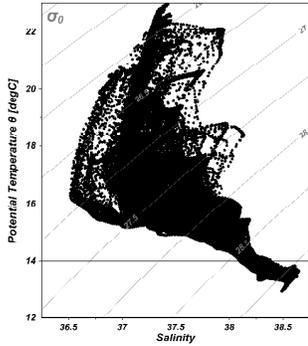


Fig. 2 θ/S diagram of the data collected during the entire ABACUS 3 glider mission

The quality controlled dataset was then used to realize a preliminary analysis focused on the identification of water masses and on their location along depth and latitude.

As an example, figures 3 and 4 shows the vertical sections on Potential Temperature, Salinity and Potential density anomaly (Fig. 3), as well as turbidity, chlorophyll-a and oxygen concentration (Fig. 4) between Mallorca and the Algerian coasts from 6 to 12 November, one of the four transects realized during the mission.

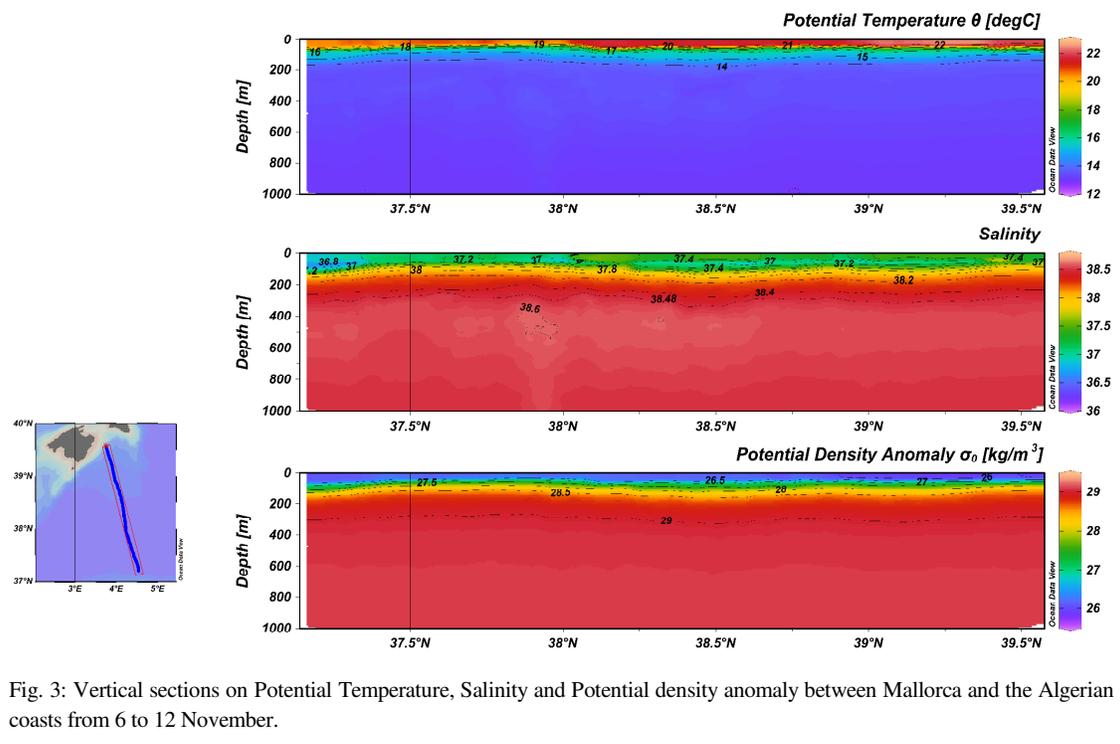
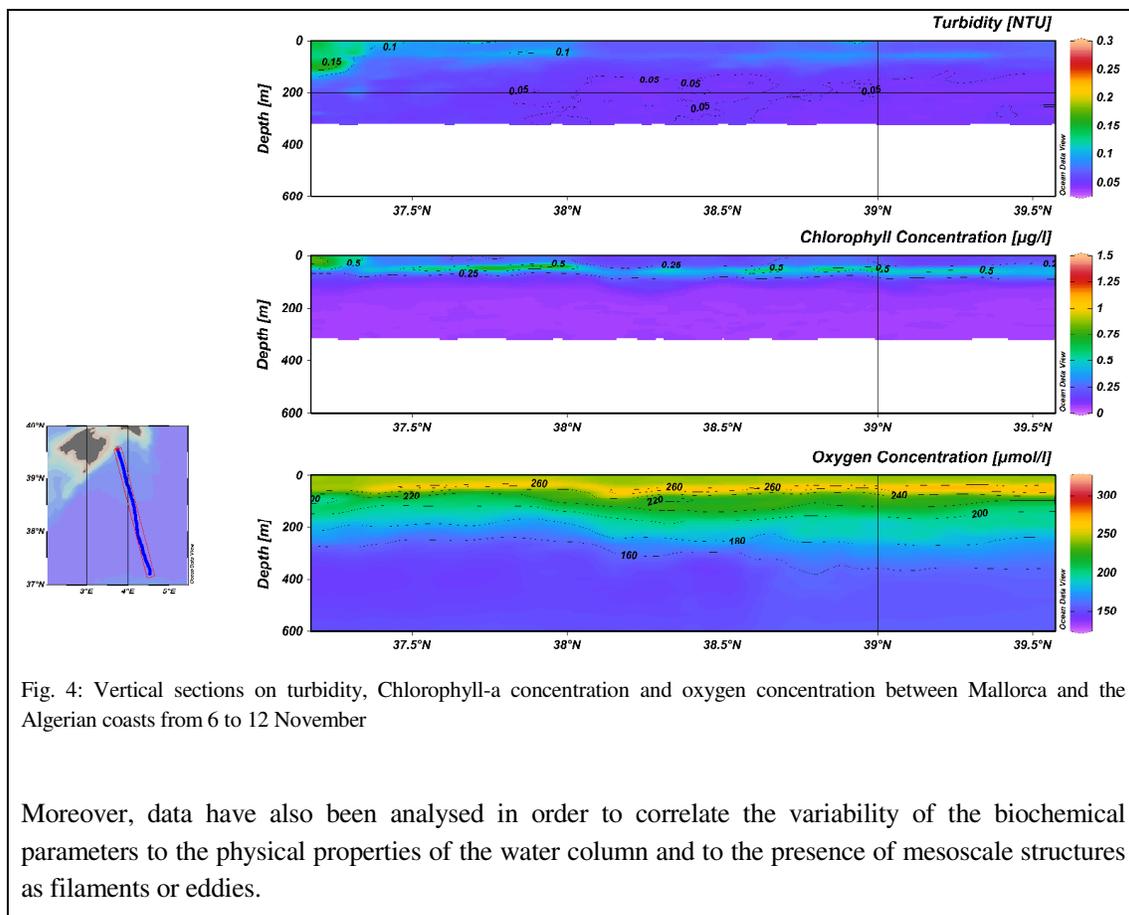


Fig. 3: Vertical sections on Potential Temperature, Salinity and Potential density anomaly between Mallorca and the Algerian coasts from 6 to 12 November.



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