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TNA PROJECT REPORT
2nd Call of Proposals
19 September – 25 November, 2013

A) General Information

Proposal reference number(1)	CALL_3_3
Project Acronym (ID) (2)	ABACUS
Title of the project(3)	Algerian BAsin Circulation Unmanned Survey
Host Research Infrastructure(4)	CSIC glider
Starting date - End date(5)	01/09/2014 - 19/12/2014
Name of Principal Investigator(6) **Home Laboratory** **E-mail address** **Telephone**	Prof Giorgio Budillon Università degli Studi di Napoli "Parthenope" Dipartimento di Scienze e Tecnologie Centro Direzionale Isola C4 Napoli, Italy giorgio.budillon@uniparthenope.it +39 081 5476584
Additional users (7)	Yuri Cotroneo, Giuseppe Aulicino, Giannetta Fusco – DiST, Univ. "Parthenope" Napoli, Italy Nadira Ait-Ameur, Hemdane Yacine – ENSSMAL, Bois des Cars, Delly Brahim, Algeria

B) Project objectives (max. 250 words) (8)

The proposed research aims to combine traditional (ship collected) in situ data, glider observations and a large set of satellite observed variables to get insights into the Algerian basin circulation, dominated by the presence of very energetic mesoscale structures, characterized by meandering of the Algerian Current and isolated cyclonic and anti-cyclonic mesoscale eddies. In particular merging the glider sampling capabilities with satellite information will advance knowledge on mesoscale features overpassing the well-known in situ measurement limits both in space and time.

C) Main achievements and difficulties encountered (max. 250 words) (9)

ABACUS project completed two Slocum deep glider missions along the monitoring line between Mallorca and the Algerian Basin. Along a total of four transects, ocean physical and biological features have been monitored from surface to 975m depth performing one deep CTD, O2 sensor and fluorimeter cast every 4Km. During the return leg of the first mission, a butterfly route has been inserted to sample an eddy evidenced by the AVISO altimetry and ratified by two SOCIB drifters. Water masses trapped into the eddy, mean radius, rotational speed, and track from origin to dissipation have been monitored using AVISO maps and glider data. Also, the glider track was overflown by SARAL-ALTIKA satellite once during the first mission and twice, along two neighbor ground tracks, during the second mission. Technical problems encountered by the glider at sea (pumping, unexpected resets) caused two mission aborts; the excellent SOCIB-IMEDEA technicians readily solved these issues and assured the perfect accomplishment of the project.

D) Dissemination of the results [10]

We expect to disseminate technical and scientific results achieved by the ABACUS group joint efforts through both scientific papers on peer reviewed publications and communication to scientific conferences and workshops. Joint papers involving results achieved by other projects carried out under TNA-JERICO are in plan too. Seminaries and other outreach activities for students and academics are also in our programs.

E) Use of the Infrastructure/Installation [11]

	In situ	By remote
Nr. of Users involved	2	4
Access units (days/months/etc)	68 days	
In situ stay day / Remote Access duration	6 days	62 days

F) User project scientific field

Main field [12]	Earth Sciences & Environment
Scientific description [13]	Marine Science/Oceanography

H) Technical and Scientific preliminary Outcomes (max. 2 pages) [14]

After the Alboran Sea, the Algerian Basin is the first wide basin crossed by Atlantic water entering the Mediterranean Sea. It is dominated by the presence of very energetic mesoscale structures that usually develop from meander of the Algerian Current to isolated cyclonic and anti-cyclonic mesoscale eddies. Our project aims at contributing to these studies realizing an integrated monitoring of this area using both deepwater glider technology to collect high-quality observations in three dimensions and near real time satellite Chl-a and SST maps to identify mesoscale features. The research project was realized between September and December 2014 through access to JERICO TNA infrastructures at SOCIB/IMEDEA (Mallorca-Spain). In situ data have also been collected by the ENSSMAL partners (Algeria) onboard the SOMBA cruise developed in the study area between August and September.

During the second half of August 2014, the Slocum G2 glider SDEEP01 has been prepared by specialized technicians from SOCIB-IMEDEA (balasting, calibration, informatics, data management and other required laboratory operations). On Sept 1st the SDEEP01 Slocum glider has been deployed off the Mallorca coast in presence of two scientists from University of Naples “Parthenope” (Italy). Unfortunately, on Sept 3rd it was necessary to recover SDEEP01 due to the pump wrong functioning. On Sept 15th a second deployment has been performed by SOCIB-IMEDEA technicians after 12 days spent in the labs to repair and verify the hydraulic circuits. From this date SDEEP01 has started its first route along the SARAL satellite track for a successful 36 days cruise down to the Algerian Current edge and back to Mallorca. As expected, during this period the glider has monitored ocean physical and biological features from surface to 975m depth performing one deep CTD, O2 sensor and fluorimeter cast every 4Km. Supervised by the excellent SOCIB-IMEDEA data processing team, ABACUS group has progressively acquired sub-sampled near real-time data along the entire mission.

Additionally, during the return leg, a butterfly route has been inserted trying to sample an eddy, at East-side of initially programmed route, evidenced by the AVISO altimetry and ratified by two SOCIB SVP drifters. The eddy was monitored along its main axes (Figure 1), while two surface drifters trapped into the eddy provided surface data. Water masses trapped into the eddy, mean radius, rotational speed, and track from origin to dissipation are going to be studied using AVISO maps and SDEEP01 data (Figure 2). Finally, on Oct 20th SDEEP01 has been recovered by SOCIB-IMEDEA team for the download of the mission full resolution datasets and the maintenance operations necessary to adapt the vehicle to the new target water's hydrographic conditions (re-balasting, re-

calibration, complete check-up). Snapshots of data collected along the 36 days mission for the monitored parameters is reported in Figure 3. The results of the first analysis and the complete plan of the post-processing operations on the collected data are going to be discussed through the forthcoming ABACUS debriefing to be held at SOCIB-IMEDEA (Mallorca) during the last week of Jan 2015.

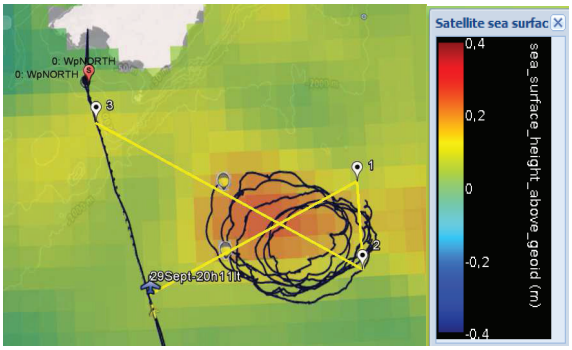

Figure 1: Glider (yellow line) and drifters tracks (round black line) and overimposed Sea Surface Height from AVISO.
Numbers indicate the glider waypoints added to implement a butterfly like trace meant to perform two diametral-opposed sections of the mesoscale structure.

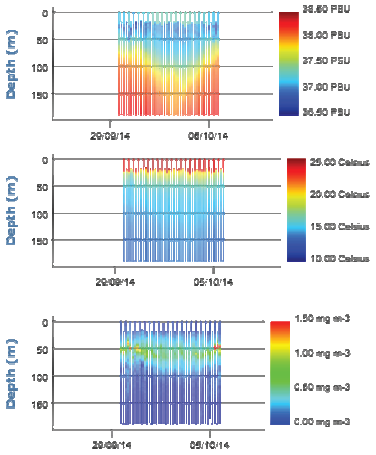

Figure 2: Main properties of surface sea water along the eddy butterfly-like transect. From top to bottom: salinity, temperature and chl-A concentration.

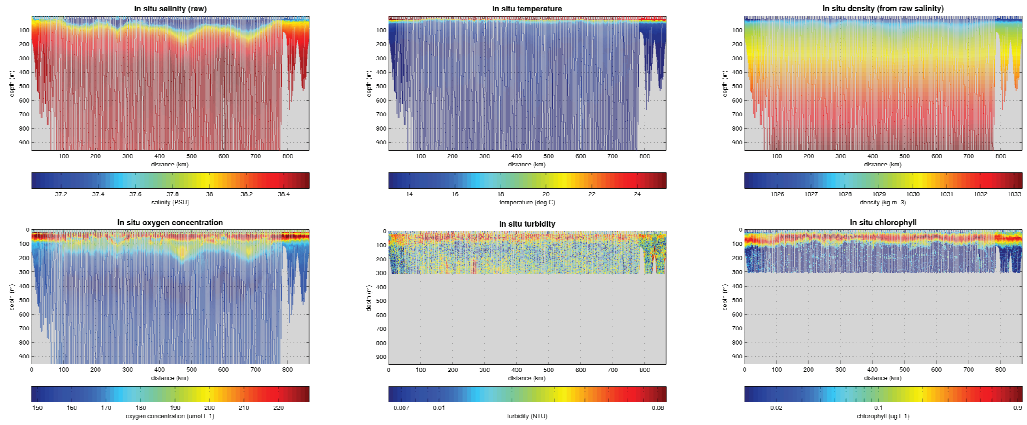

Figure 3: Main oceanographic data collected by SDEEP01 during its first mission (36 days). From top left to bottom right: salinity, temperature, density, oxygen concentration, turbidity and Chl-a concentration.

On Nov 3rd the second SDEEP01 ABACUS mission started. This time the glider track was scheduled to have an overflown by SARAL-ALTIKA satellite twice along two neighbor ground tracks (#229 and #773 respectively). Unfortunately, this deployment has been aborted due to spontaneous resets occurred during the first days of water works that would make the glider to reinitialize and to enter the autonomous hold-position mission while still underwater. SDEEP01 has been recovered 16nm of the Porto Colom harbour in a perfectly executed operation and has been revised with the support of the manufacturer. On Nov 18th, once the problem has been solved, the second mission has been re-started aiming at having the glider overflown by SARAL-ALTIKA satellite twice, on Nov 26th and Dec 12th, in two neighbor ground tracks (#773 and #229 respectively). These objectives have been perfectly

accomplished thanks to the planned "W" shaped track that resulted very useful to maximize the synoptic sampling between glider and altimetric satellite (Figure 4). The vehicle has been precisely recovered by SOCIB's field-team on Dec 19th after 32 days at sea along the two transects from Mallorca to the Algerian Basin and back. Snapshots of near real time data collected along this second mission are shown in Figure 5. Complete datasets are under processing and will be shortly available.
As stated before, the results of the ongoing analysis will be discussed during the forthcoming ABACUS debriefing. WE expect to focus on two main topics dealing with (i) a satellite/glider data comparison to assess the ocean description capabilities of multiplatform missions and (ii) an analysis of the Algerian basin circulation involving the complex interactions due to the eddies presence and persistence in the study area. Ship-based and mooring information collected during SOMBA project as well as MODIS sea surface temperature and Chl-a maps observed during ABACUS project will be analyzed too. Finally, we hope and expect to establish soon a close collaboration with the other scientific team which have developed research activities in the same study area in the framework of TNA-JERICO projects.

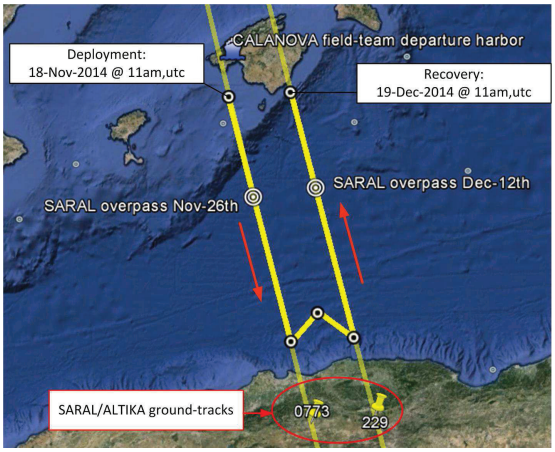

Figure 4: The 32 days "W" shaped track (yellow line) followed by SDEEP01 between Mallorca and the Algerian Basin during the second mission. Glider has been overflown by SARAL-ALTIKA satellite twice, on Nov 26th and Dec 12th, in two neighbor ground tracks (#773 and #329 respectively). Deployment (Nov 18th) and recovery (Dec 19th) dates are also shown.

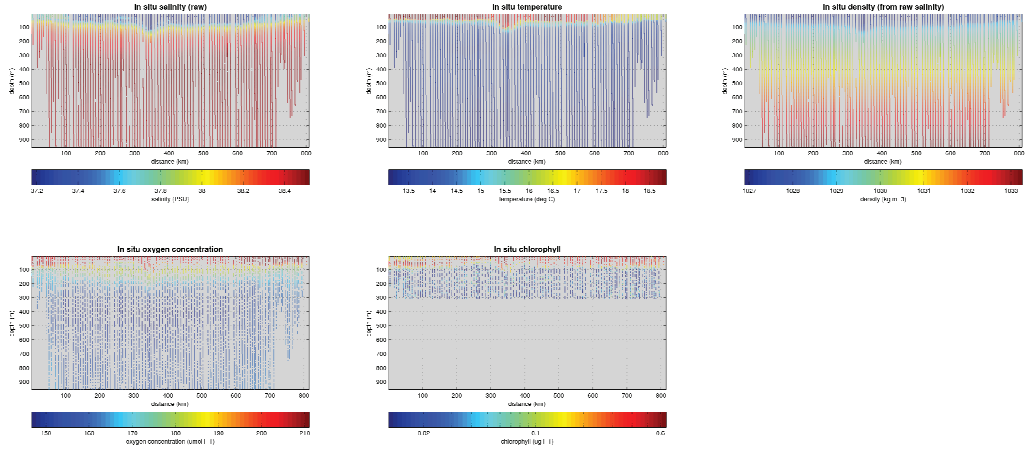

Figure 5: Main oceanographic near real time data collected by SDEEP01 during its second mission (32 days). From top left to bottom right: salinity, temperature, density, oxygen concentration and Chl-a concentration.

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Guidelines for the TNA Project Report

This report is due within one month after the completion of the JERICO TNA project by the User Group Leader (P.I.) and should be submitted to the **JERICO TNA Office** (**jerico.tna@ismar.cnr.it**) and the **Scientific Site Coordinator** at the hosting facility with a copy to the **JERICO Coordinator** (**jerico@ifremer.fr**).

An online "user group questionnaire" has also to be completed by each **Group Leader** of a user-project supported under JERICO as soon as an experiment has come to an end - you will find it here: **http://cordis.europa.eu/fp7/capacities/questionnaire_en.html#fnote**.

NOTES:

Refunding of the TA reimbursement will be processed as soon as the JERICO TNA Office, the Scientific Site Coordinator and the JERICO Coordinator will received this report. Part of the information collected with this report will be used to fill in the European Commission MS Access database. Following article 4.4.2, the User Group PI will be asked by the JERICO Coordinator to update it at the reporting deadlines.

Notes for the compilation

(1) It is the reference number assigned to the proposal by the TNA-Office.
(2) It is the user-project identifier and must be unique under the grant agreement and for its lifetime. The length cannot exceed 20 characters.
(3) Title for the approved proposal. The length cannot exceed 255 characters.
(4) Name of the installation/infrastructure accessed with this project. If more than one installations/infrastructures are used by the same project, please list them in the box.
(5) Specify starting and end date of the project (including eventual preparatory phase before the access).
(6) Fill with the full contact of the Principal Investigator (user group leader).
(7) List the full users team (name and affiliation) that made direct use (physically or remotely - please specify) of the installation/infrastructure under the direction of the group leader.
(8) Write the short-term, medium and long-term objectives of project. Use no more than 250 words.
(9) Describe briefly the main achievements obtained and possible impacts, as well as possible difficulties encountered during the execution of the project. Use no more than 250 words.
(10) Describe any plan you have to disseminate and publish the results resulting from work carried out under the Transnational Access activity in JERICO: scientific articles, books - or part of them -, patents, as well as reports and communication to scientific conferences, meetings and workshops. Highlight peer-reviewed publications. Users supported under the transnational access activity are encouraged, as far as possible, to make available on open repositories their publications. Acknowledgement to EC and JERICO is requested following article 4.5 of the “End-User“ Agreement.
(11) Indicate the number of users involved in the activity (the P.I. plus the users described at point 6), the amount of access to the installation/infrastructure and the length of in-person stay at the installation or the operator laboratory (e.g. for preparing the experiment).
(12) See Annex, First column.
(13) See Annex, Second column.
(14) Describe in detail results and main findings of your experiment at the present stage.

Annex of the TNA Project Report - User-Project Scientific fields

Main field	Scientific description
Physics	Astronomy/Astrophysics/Astroparticles Atomic & molecular physics Condensed matter physics High energy and particle physics Nuclear physics Plasma physics Quantum electronics & optics Other - Physics
Chemistry	Chemistry
Life Sciences & Biotech	Food quality & safety Agriculture & Fisheries Medicine Veterinary sciences Molecular & cellular biology Other - Life Sciences & Biotech
Earth Sciences & Environment	Global Change & Climate Observation Ecosystems & Biodiversity Natural Disaster & Desertification Marine Science/Oceanography Water Science Hydrology Other – Earth Science Other – Environment
Engineering & Technology	Aeronautics Space New production processes Nanotechnology & Nanosciences Transport Other - Engineering & Technology
Mathematics	Mathematics
Information & Communication Technologies	IST for citizens, businesses & organizations Trust & Security Communication & Networks Computing & software technologies Components & Micro-systems Knowledge & interface technologies Other – ICT
Material Sciences	Knowledge based multifunctional materials Other - Material Sciences
Energy	Sustainable energy systems Fusion Other – Energy
Social Sciences	Economics Political Sciences Educational sciences Law Demography Other - Social Sciences
Humanities	Arts Hystory Languages Other – Humanities