



JERICO-S3

Proposal for Transnational Access to Coastal Observatories

3rd Call
1st March 2022 – 3rd May 2022

Description of the project to be sent in pdf format to jerico.ta@marine.ie

Please consult access rules at <http://www.jerico-ri.eu> and contact the manager of the infrastructure/installation you wish to use before writing the proposal





PART 1

1. GENERAL INFORMATION

Title of the project (255 characters max.)	Frontal dynamics influencing Primary Production: Carbon Export Experiment
Acronym (20 characters max.)	FRIPP-CEE
Applying Institution	ISAC - Institute of Atmospheric sciences and Climate
Host Institution	SOCIB
Host facility(ies)	Glider

Have you or other members of your user group previously used the requested facility(ies)?	X	Yes		No
If yes, please indicate the EU Program(s), the name of the project(s) and year(s) you or other members of your user group have used such facility(ies)	<p>In past Jerico programs I have already accessed the facilities. I also successfully applied with FRIPP-Spring to the first call of Jerico-S3 program. The aim, in this experiment, is to estimate primary production during DCM and also the carbon export mediated by mesoscale and submesoscale processes at front.</p>			
If you have received transnational access support from a previous JERICO project, please list resulting publications, conference contributions, patents. List only the ones that acknowledge the support of the European Commission and JERICO	<p>Frontal dynamics boost primary production in the summer stratified Mediterranean Sea A Olita, A Capet, M Claret, A Mahadevan, PM Poulain, A Ribotti, S Ruiz, ... Ocean Dynamics 67 (6), 767-782</p> <p><u>A multiplatform experiment to unravel meso-and submesoscale processes in an intense front (AlborEx)</u> A Pascual, S Ruiz, A Olita, C Troupin, M Claret, B Casas, B Moure, ... Frontiers in Marine Science 4, 39</p> <p>Effects of Oceanic Mesoscale and Submesoscale Frontal Processes on the Vertical Transport of Phytoplankton S Ruiz, M Claret, A Pascual, A Olita, C Troupin, A Capet, ... Journal of Geophysical Research: Oceans</p> <p>Observations of a phytoplankton spring bloom onset triggered by a density front in NW Mediterranean A Olita, S Sparnocchia, S Cusí, L Fazioli, R Sorgente, J Tintoré, A Ribotti Ocean Science</p>			







2. USER GROUP DETAILS

Indicate if the proposal is submitted by

Indicate if the proposal is submitted by

☒ an individual

☐ a user group

Principal Investigator (user group leader)

First and last name	Antonio Olita				
Gender	<input checked="" type="checkbox"/> Male	<input type="checkbox"/> Female	Nationality	Italiana	
Institution	ISAC-CNR				
Address	% Dipartimento di Fisica - Università degli studi di Cagliari, Cittadella Universitaria di Monserrato				
Country	Italy				
Email address	antonio.olita@cnr.it				
Telephone	+39 3285321116				
Fax					
Previous user	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No			

User group members

Member # 1

First and last name					
Gender	<input type="checkbox"/> Male	<input type="checkbox"/> Female	Nationality		
Institution					
Address					
Country					
Email address					





Telephone			
Fax			
Previous user	<input type="checkbox"/>	Yes	<input type="checkbox"/> No

(duplicate below for each member of the user group)



3. HOST INFRASTRUCTURE

Indicate the JERICO-S3 host facility(ies) offered in Chapter 1 (Observing systems) you are interested in

(Tick more than one boxes if it is useful for your project)

	Short name	Requested access time (UA*)
<input type="checkbox"/>	Cabled observatory	
<input type="checkbox"/>	Ferrybox	
<input type="checkbox"/>	Fixed platform	
<input type="checkbox"/>	Fishing vessel	
<input type="checkbox"/>	Glider	SLOCUM GLIDER 20 days
<input type="checkbox"/>	Supporting facility	
<input type="checkbox"/>	Special equipment	

*UA: please refer to the Infrastructure description in the JERICO-S3 website

Modality of access

<input type="checkbox"/>	remote	<i>the measuring system is implemented by the operator of the installation and the presence of the user group is not required</i>
<input checked="" type="checkbox"/>	partially remote	<i>the presence of the user group is required at some stage e.g. installing and un-installing</i>
<input type="checkbox"/>	in person/hands on	<i>the presence of the user group is required/recommended during the whole access period</i>

If you wish to avail also of a support facility from Chapter 2, please fill in the table below

	Short name	Requested access time (UA*)
<input type="checkbox"/>	Supporting facilities and specialized equipment	

*UA: please refer to the Infrastructure description in the JERICO-S3 website

Modality of access

<input type="checkbox"/>	remote	<i>the measuring system is implemented by the operator of the installation and the presence of the user group is not required</i>
<input type="checkbox"/>	partially remote	<i>the presence of the user group is required at some stage e.g. installing and un-installing</i>
<input type="checkbox"/>	in person/hands on	<i>the presence of the user group is required/recommended during the whole access period</i>





Explain briefly why you think your project will be best carried out at the specified host facility(ies)	We intend to sample oceanic meso and submesoscale in an area close to the host facility. Such a site is well known by the host and also by the proponent as testified by track records of publications.
If possible, list other JERICO-S3 facility(ies) where you think your experiment could alternatively be carried out	

Is there a facility similar to one/all those you wish to utilize in your country?		Yes	X	No
If yes, please indicate your reasons for requesting access to the JERICO-S3 facility(ies) you have chosen and also exist in your country				

4. REQUEST FOR A JERICO-S3 GRANT

(tick the box)

X	Travel grant (*)
	Shipment of your equipment, if applicable

(*) travel, hotel and meals

Please provide a detailed and realistic budget for the expenses you expect to incur, including the number of people and days required. Explain clearly the role of each person for which a travel grant is requested.

Please note that a base amount of 6000 € has been set for each facility involved in a TA project. The effective grant assigned to a project will be considered case- by-case depending on the type of access, the types and number of facilities requested, the length of stay, and the costs in the visited country.

<ul style="list-style-type: none"> Travel : < 1, 1200, PI > triparound flights and other public transport means from Cagliari (Sardinia, Italy) to host facility (Balearic Is.). The most common trip is Cagliari-Barcelona-Mallorca A/R that, depending from the period, may cost 500-1000 euros in economy class. + 200 Euros per buses, trains etc. Hotel : < 1, 1000, PI > 3 stars Hotel may cost 100-200 euros per day in Mallorca and nearby *5 working days Meals : < 1, 300, PI > 60 euros per day * 5 working days. <p>total 2500 euros</p> <ul style="list-style-type: none"> Shipment of equipment : <type of carrier, costs>







PART 2

Note: This part contains material for the evaluation

1. SCIENTIFIC EXCELLENCE OF USER GROUP (maximum score: 5)

Short biography of the PI

(half a page)

Antonio Olita, Bs in Marine Biology, Ms (II level) in Remote Sensing and GIS, Doctorate in marine Ecology and management of Biological Resources, is researcher in physical and biological oceanography, expert on data assimilation and ocean data analysis @ CNR. He works on projects mainly focused on operational oceanography and regional ocean modeling, in data analysis and risk assessment. His scientific production is particularly dedicated to the physical/biological relationships at sea, with focus on mesoscale and sub-mesoscale dynamics forcings on biological processes.

Since 2013 has also been working with sea Gliders mainly through several JERICO-TNA project participations. He was engaged as co-convenor and chair of a session on gliders and AUVs at the next EGU2018 general Assembly in Wien.

He also accessed glider facilities in 2020 through the EUMR program.

In 2021 He accessed this facility within JERICO-S3 First call with the FRIPP-spring project.

Expertise of the user group in the domain of the application

(half a page)

The Proponent, under a different PI, successfully applied to a previous JERICO-TNA call (1st call) for the project named GABS, during which two glider launches were successfully accomplished. A peer reviewed paper was written and is currently under review for Ocean Science. Antonio Olita was also PI of a successive and successful proposal named FRIPP, that used gliders in an Area similar to the present proposal. During the first FRIPP project the gliders investigated the frontal dynamics influencing PP during stratification period while in the present project we propose to investigate the same dynamics but this time during bloom initiation. He also participated in other projects within JERICO-TNA, and JERICO-NEXT TNA. In particular during GABS, he investigated through a glider the onset of the bloom along the front, subject of the current proposal.

In 2018 A. Olita applied successfully for a FRIPP-2 project that was NOT performed only due to technical issues of the host due to glider navigation problems. So substantially the same project, we think still scientifically valid, with some minor modification, was proposed for this call.

He also applied successfully in 2019 for a Grant under the EUMR program for a sampling with gliders in Canary islands, successfully performed in 2020.

In 2021 He accessed this facility in the same Balearic area to investigate Production in late bloom period.





This time we will perform the experiment in the late bloom period, when stratification is already onset and we will assess the carbon export performed by submesoscale features at front by assessing POC through backscattering measures.

A list of 5 recent, relevant publications of the user group in the field of the project

- 1- Olita, A., Capet, A., Claret, M. et al. Frontal dynamics boost primary production in the summer stratified Mediterranean sea Ocean Dynamics (2017) 67: 767.
<https://doi.org/10.1007/s10236-017-1058-z>
- 2 - Pascual A, Ruiz S, Olita A, Troupin C, Claret M, Casas B, Mourre B, Poulain PM, Tovar-Sanchez A, Capet A, Mason E, Allen J, Mahadevan AJT (2017) A multiplatform experiment to unravel meso- and submesoscale processes in an intense front
- 3 - Olita, A., Sparnocchia, S., Cusí, S., Fazioli, L., Sorgente, R., Tintoré, J., and Ribotti, A.: Observations of a phytoplankton spring bloom onset triggered by a density front in NW Mediterranean, Ocean Sci., 10, 657-666, <https://doi.org/10.5194/os-10-657-2014>, 2014.
- 4 - Olita A., Sorgente R., Ribotti A., Fazioli L, Perilli A., Pelagic primary production in the Algero-Provençal Basin by means of multisensory satellite data: focus on interannual variability and its drivers, (2011), Ocean Dynamics, 61, 7: 1005-1016
- 5 - Olita, A., Ribotti, A., Sorgente, R., Fazioli, L., & Perilli, A. (2011). SLA-chlorophyll-a variability and covariability in the algero- provençal basin (1997-2007) through combined use of EOF and wavelet analysis of satellite data. Ocean Dynamics, 61(1), 89-102

2. SCIENTIFIC AND TECHNICAL VALUE OF THE PROJECT

(maximum score: 5)

Description of the project

Main objectives

(half a page)

The project aims to study, through a multisensor sea-glider mission supported by modeled and remotely-sensed data, the impact of frontal dynamics on the Phytoplankton production and distribution as inferred from fluorometric measurements during a DCM stage. Deep Chlorophyll maximum is also a good situation to estimate the role of the Mesoscale and submesoscale features on Carbon export. This is the main aim of the present project.

The specific objectives are the following:

- 1) Observe the dynamics of the front in terms of: horizontal and vertical velocities; instabilities; mixing and enhanced dynamical stratification
- 2) Study the impact of such frontal dynamics on production in a DCM condition as in Olita et al 2017.
- 3) We will try to estimate POC and carbon export from DCM to deeper layers (>200 m) promoted by vertical submesoscale and mesoscale dynamics.

Scientific background and rationale

(one page)

The proposed research is to be carried out in the Algero provencal Basin, and specifically along and across the Front separating Provencal and Algerian sub Basin named North Balearic Front. This front was sampled during the GABS project, a JERICO-TNA proposal funded during the first JERICO-FP7 call whose main objective was to investigate the intermediate water masses variability.

During GABS the glider was programmed to sample down to 1000 meters but during the operations by chance, the front was intercepted. Nevertheless, we were able to capture the bloom initiation in coincidence of the inversion of heat fluxes, and consequent shutdown of turbulent convection (Olita et al. 2014).

Subsequently, I was PI of the FRIPP project during which a glider sampled another strong front (in the Alboran sea) during the stratification period, in order to understand the impact of frontal structures on Primary Production (assessed with a method described in Olita et al. 2017) and on phytoplanktonic biomass distribution.



Further, last year, I was PI of the FRIPP-Spring experiment, where we attempted to catch the early bloom initiation. Unfortunately, we only slightly matched the initiation as the experiment was moved a little forward in the season because of technical reasons. So we decided to repeat the experiment this year, hopefully during the actual early stratification by dynamical forcing.

The present project will benefit from experiences done in past projects. It will be performed in the same area where we found frontal processes acting on biology during GABS (as in Olita et al. 2014) and the investigation will be conducted with a methodology similar to that of FRIPP (in Alboran sea) and FRIPP-spring (in the same North Balearic Front area in 2021).

More specifically, the project aims to study, through a multisensor sea-glider mission supported by modeled and remotely-sensed data, the impact of frontal dynamics on the Phytoplankton production and distribution as inferred from fluorometric, PAR (desirable) and CTD measurements during stratification period (late bloom, with DCM, Deep Chlorophyll Maximum, already onset).

The primary production (that is normally considered to be quite irrelevant during stratification But that can be relevant considering the results we obtained in Olita et al. 2017 in concomitance with frontal dynamics) will be assessed by using the methodology glider-based described in Hemsley et al. 2015 and, with some modification, in Olita et al. 2017.

The methodology consists in the application of the spectral model of Morel et al. 1991 (and successive modifications), that diagnostically estimates the production given the concentration of Chlorophyll-a (hereafter simply Chlorophyll) and PAR, weighted by parameters of production efficiency.

The equation is as follow:

$$PP = 12 \int_0^L \int_0^D \int_{\lambda_2}^{\lambda_1} Chl(Z) PAR(\lambda, Z, t) a^*(\lambda) \phi_{\mu}(\lambda, Z, t) d\lambda dZ dt$$

Where Chl is Chlorophyll concentration, PAR is photosynthetically active radiation (measured in FRIPP-spring and derived in FRIPP) while ϕ_{μ} is growth rate and a^* is the absorption per unity of Chl that can be derived by literature.

For the present proposal we will collect directly the underwater light field through a PAR sensor opportunely carried out by the glider, instead of indirectly retrieving PAR values by empirical algorithms as successfully done during the first FRIPP (Olita et al. 2017). We already used this direct approach in FRIPP-spring (2021) experiment.

Further we will estimate the CARBON export, by estimating the amount of POC, derived from backscatter measures using the approach by Cetinic et al. 2012, exported (depth > 150-200m, defined as the Euphotic layer) by mesoscale and submesoscale features acting at front (subduction).



3. QUALITY OF THE WORK PLAN (maximum score: 5)

Experimental method and work plan

Describe below the proposed method and work plan for the project

(one page)

In order to study the physical characteristics and dynamics of surface water masses across and along the North Balearic Front area (Fig.1) a SLOCUM glider, equipped with CTD , ECO-LAB FLBB, oxygen sensor and PAR, will be deployed in Spring-Summer 2023 from Mallorca Island.

The glider will sample the area during a favourable period to observe phytoplankton distribution and assess primary production in relation to frontal dynamics (for about 20 continuative days), when thermal stratification already onset.

For this reason we plan a “butterfly” sampling that will cross the front many times and increase the ability to resolve both spatially and temporally the process under investigation. The sampling, spatially, will repeat what was performed during the last FRIPP-spring experiment.

We will look for subduction events of POC that could be related to Frontal dynamics and to the observed DCM distribution. We will attempt to take a synoptic (temporally speaking) picture of the complex dynamics relating stability of the DCM, Primary production pushed by submesoscale and Carbon export also promoted by submesoscale and mesoscale processes.

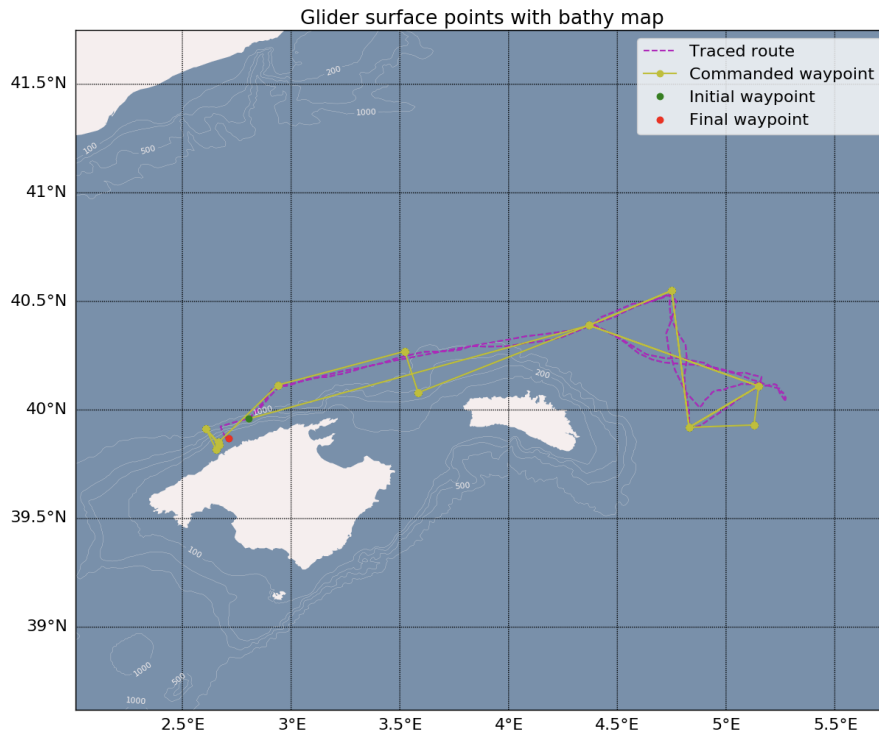


Fig.1 (past JS3_CALL_1_REF_4020_FRIPP-spring project) shows Planned (yellow) vs actual tracks of the glider flight performed in the spring 2021 experiment. A similar sampling strategy, which was successful in matching the front, will be adopted for the next sampling in the FRIPP-CEE (CARBON EXPORT EXPERIMENT).

The sampling plan can be subject to last-minute modifications due to the displacement of the frontal area or to other contingencies like sea conditions, location of CHI and SST signature just before the mission start. Glider will sample the proposed area down to 300 m depth as the focus of the experiment is on dynamics of the DCM (30-100 m) and of the bottom of the Euphotic layer (about 150-200 m) for what concerns POC estimation and evaluation of the Carbon export. Glider CTD, backscattering, and fluorometric measurements will be analysed and interpreted with the help of modelling and remotely-sensed synoptic data.



Proposed time schedule

Provide below a clear schedule for your project including interruption, restarts and expected duration of access time

(half a page)

-The experiment should last about 15-20 days, planned accordingly with sea conditions in first weeks of May-June 2023 or in another favourable period.
A visit of the PI at the host facility is also foreseen just before, or during, the experiment to better plan the sampling in the light of past experiences.

Please specify your requests regarding the use of your chosen facility's equipment/instruments/sensors, including any additional services, data or other requirements

We request the use of a SLOCUM glider equipped with CTD, ECO-FLNTU, Oxygen and, possibly, PAR and CDOM sensors. The processing chain for the PAR sensor will be developed by SOCIB personnel together with CNR-ISAC researchers before/during the launch of the glider experiment in Spring-Summer 2023.

List all material/equipment you plan to bring to the facility (if any)

Laptop



Risks, contingencies and mitigation measures

Describe below the potential risks and contingencies that might occur during the project and how do you plan to avoid, mitigate or resolve them

#	Risk / Contingency	Prevention / Mitigation / Corrective action
1	1) Human Risks are those usually linked with the use of AUVs and to sea operations conducted on RVs.	Formation about instrument use; good practices on board of the RV;
2	2) Risks related to the damage/loss of the facility	Formation about instrument use; good practices on board of the RV;
3		



4. POTENTIAL FOR SEEDING LINKS WITH INDUSTRY

(maximum score: 5)

Do you think that this proposal has potential for seeding links with Industry? If so, how?

(half page)

There are no direct links with industry.

However, a deeper understanding of relationships between (sub-)mesoscale dynamics and phytoplankton bloom would help to better foresee potential ecological shifts in a scenario of changing climate. Pelagic PP on its turn is linked with the secondary production (consumers), especially in relation to pelagic species like tunas. The deep understanding of pelagic PP mechanisms is fundamental in order to foresee possible changes in terms of secondary productivity in turn impacting on fisheries.

5. EUROPEAN RELEVANCE AND INTERESTS FOR THE SCIENTIFIC COMMUNITY

(maximum score: 5)

Describe the relevance of your proposal at the European level and the potential interests for the research community

(half page)

The scientific oceanographic community is still trying to understand how much mesoscale and submesoscale can influence the budget of Carbon sequestered by Primary production. PP itself is often underestimated by usual estimation methods. Glider-based assessment may represent a big step forward in a comprehensive understanding of PP at sea. Repeat the measurements every year can be relevant to:

- 1) Estimate production during DCM period
- 2) Assess carbon export promoted by frontal dynamics
- 3) Catching extreme events eventually linked with Climate forcing (Climate Change) that may be relevant actors of the modulation of PP, biomass production and export.





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GDPR Consent:

Personal data : I hereby understand that the JERICO-S3 project - through the Marine Institute, acting as the Work Package Leader for TransNational Access has needed to collect some of my personal information and data for the means of processing my application for Funding under the Jerico S3 project TransNational Access funding call.

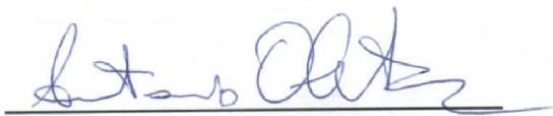
Application processing: The Marine Institute will gather and securely store your data. Access will be restricted to required personnel as well as selected qualified external evaluators who will determine successful applicants. Data will be stored on Marine Institute servers onsite at the Marine Institute, Rinville, Oranmore, Galway, Ireland for the duration of this project which should last 4 years. The data will be deleted thereafter. Your data will not be used for any other purpose without your consent.

1. Privacy Policy: *JERICO-S3 is the data controller pursuant to article 28 of the EU GDPR (EU 2016/679), – Ifremer Brest Centre, CS 10070 29280 Plouzané France, the Project Coordinator is Laurent DELAUNEY. MAIL Jerico-S3@ifremer.fr JERICO-S3: If you change your mind at any time, you can unsubscribe by contacting us at mailto: Jerico-S3@ifremer.fr. We will treat your information with respect.*
2. TYPES OF DATA PROCESSED *Personal and identification data - Personal data, any information relating to an individual, identified or identifiable, even indirectly, through reference to another piece of information, including a number of personal identification; Identifying data, personal data that includes the direct information of the interested party (such for example name, surname, e-mail address, address, number of telephone, etc ...). Defence in court - The User's Personal Data may be used for defence purposes on the part of the Owner in court or in the preparatory phases to his possible establishment, from abuse in the use of the same or the connected services by the User.*

Date of compilation

02-05-2022

Signature of the PI



Signature of an appropriate authorised person



(e.g. Head of Department, Research Office) _____

This section is reserved to the JERICO-S3 TA Office

Date of proposal receipt by email _____

Assigned reference number _____

Signature of receiving officer _____