Balearic Islands Coastal Observing and Forecasting System

The proposal for external users application to SOCIB Glider Facility will have to follow the enclosed template. SOCIB strongly encourages potential users to contact gliders facility (glider.access@socib.es) to discuss details of existing glider fleet, sensors, feasibility of the proposed mission, etc…

SOCIB Gliders

Application Form for External Scientific Users

SOCIB Balearic Islands Coastal Observing and Forecasting System

PART 1: User group details

Indicate if the proposing user group is best described as

☐ An individual user
x A team of two or more users

Information about the applicants (PI and project partners)

Principal Investigator (user group leader)

Title, Name and Surname:	**Dr. Simón Ruiz**
Gender:	**Male**
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Project partners
(repeat for each partner of the group)

Title, Name and Surname:	**Dra. Ananda Pascual**
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Project partners
(repeat for each partner of the group)

Title, Name and Surname:	**Mr. Daniel Rodríguez-Tarry**
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Project partners
(repeat for each partner of the group)

Title, Name and Surname:	**Dr. Eugenio Cutolo**
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PART 2: Additional information about the applicant(s) expertise

Relevant expertise of the user group (max. 200 words)

The participants in this proposal belong to the Marine Technologies, Operational and Coastal Oceanography (TMOOC) which develops its activities within the research line of Physics and Technology of the Coastal Ocean System: Observation, Prediction and Interactions. Its objective is to study the physical mechanisms that explain the dynamics of the coastal ocean system and its interactions with the coast and the open ocean in a context of global change. The variability of scales involved, from meters to thousands of kilometers and from seconds to years, and their nonlinear interactions, makes the understanding of these mechanisms a real internationally established challenge. We address this challenge combining -using a physical and mathematical background- theoretical, observational (in situ and remote) and numerical modeling approaches, particularly (but not exclusively) on the Mediterranean Sea, that becomes an ocean laboratory on a small scale, ideal to understand physical processes, to try new ideas and to support various activities in the maritime environment. It is an interdisciplinary group that holds significant external relationships with other groups, organizations and companies. The members of the TMOOC group participating in this proposal have a wide experience in the analysis of in-situ, remote sensing and modelling data to understand the dynamics of the upper ocean.

Short CV of the PI (max. 200 words)

His research focuses on dynamics of the upper ocean studying mesoscale and submesoscale processes, merging in-situ and remote sensing observations and numerical simulations. He has more than 8 years experience on the use of autonomous underwater vehicles for the study of physical processes. He has published 70 international papers, and presented more than 125 communications to international scientific meetings. Dr. Ruiz has participated in 57 regional, national or european projects, coordinating 12. He is co-leading the participation of CSIC at the ongoing Departmental Research Initiative Calypso (2018-2021 and 2021-2024), funded by the Office of Naval Research (ONR), EEUU. He has co-organized international meetings (e.g. 48th Liege Colloquium, EGU session 2018 on gliders, EGU sessions on AUVs). He has advised MsC and PhD students. He has been editor of Ocean Dynamics (Topical Collection on the 48th International Liège Colloquium on Submesoscale processes – mechanisms, implications and new frontiers) . He is editor of a Remote Sensing Special Issue on AUVs. He has been Spanish Delegate in the European Gliding Observatories Network COST action. He is also a member of the EuroGOOS glider Task Team and member of the international OceanGlider Task Team. He is a member of the Scientific Advisory Committee of DRI-Calypso initiative, funded by ONR.

A list of 5 recent, relevant publications of the user group

Aulicino G., Cesarano C., Zerrouki, M., Ruiz S., Budillon G., Cotroneo Y. (2021). On the use of ABACUS high resolution glider observations for the assessment of phytoplankton ocean biomass from CMEMS model products, Ecological Modelling, 455, 109619, https://doi.org/10.1016/j.ecolmodel.2021.109619.

Bàrbara Barceló-Llull, Ananda Pascual, Antonio Sánchez-Román, Eugenio Cutolo, Francesco d'Ovidio, Gina Fifani, Enrico Ser-Giacomi, Simón Ruiz, Evan Masón, Fréderic Cyr, Andrea Doglioli, Baptiste Mourre, John T. Allen, Eva Alou, Benjamín

Casas, Lara Díaz-Barroso, Franck Dumas, Laura Gómez-Navarro, Cristian Muñoz (2021). Fine-scale ocean currents derived from in situ observations in anticipation of the upcoming SWOT altimetric mission*, Frontiers in Marine Sciences,* 8:679844 doi: 10.3389/fmars.2021.679844.

Tarry, D.T., S. Essink, A. Pascual, S. Ruiz, P.-M. Poulain, T. Ozgokmen, L.R. Centurioni, T. Farrar, A. Shcherbina, A. Mahadevan, E. D'Asaro (2021). Frontal convergence and vertical velocity measured by drifters in the Alboran Sea, Journal of Geosphysical Research,126,4, 2169-9275, e2020JC016614, https://doi.org/10.1029/2020JC016614

Mahadevan, A., Pascual, A., Rundnick, D.L., Ruiz, S., Tintoré, J., D'Asaro, E. (2020), Coherent Pathways for vertical transport from the surface ocean to interior, Bulleting of American Meteorological Society (BAMS), 101, E1996–E2004, https://doi.org/10.1175/BAMS-D-19-0305.1.

Ruiz, S., Claret, M., Pascual, A., Olita, A., Troupin, C., Capet, Tovar-Sánchez, A., Allen, J., Poulain, P.-M., Tintoré, J., Mahadevan, A. (2019). Effects of oceanic mesoscale and submesoscale frontal processes on the vertical transport of phytoplankton. Journal of Geophysical Research: Oceans, 124. https://doi.org/ 10.1029/2019JC015034. Article.

PART 3: Detailed scientific description of the project

List the main objectives of the proposed research (max. 300 words)

Our broader objective is to improve our understanding of what shapes the three dimensional trajectories of water parcels and semi-Lagrangian objects in the surface ocean

The specific objectives are:

- Characterize the mesoscale ocean fronts in the Balearic Sea
- Contribute to better quantify and understand the vertical motion associated with ocean fronts.

Give a brief description of the scientific and/or technical background to, and rationale for, your project (max. 300 words)

Mesoscale (10–100 km) and submesoscale (0.1–10 km) ocean structures play a major role in the redistribution of properties such as heat, salt, and biochemical tracers, with a significant impact on the ocean's primary productivity (Levy et al., 2001; Ramachandran et al., 2004; Omand et al., 2015). The dynamics associated with these features result in enhanced vertical velocities and mixing, as well as stratification, on time scales that range from a few days to several months and from a few kilometers to 100 km (Klein and Lapeyre, 2009; Ruiz et al., 2009; Pascual et al., 2015;

McWilliams, 2019). A link between the weak up-/down-welling at meso (10-100 km) scales and the more intense vertical motion at submeso (1-10 km) scales could greatly enhance vertical exchange across the stratified base of the mixed layer (Ramachandran et al., 2014). The Balearic Sea is a sub-basin of the western Mediterranean, located between the Iberian Peninsula and the Balearic Islands where mesoscale and submesoscale features are present almost all the year. The cyclonic general surface circulation is controlled by the presence of two quasi-permanent fronts and their associated currents. A field experiment using two ships (RV Pourquoi Pas ? and RV Pelagia) will be performed in the Balearic Sea in February 2022. A fleet of gliders will be also deployed a few weeks before the vessels sampling in order to contextualize the oceanographic conditions. In this proposal, we are requesting the use of a unit SOCIB glider which would be deployed as part of that fleet of gliders and would contribute to better sampling the study area. This big muti-platform experiment will be done as part of the Departmental Research Initiative CALYPSO funded by the Office of Naval Research, in which, IMEDEA is a partner.

Present the proposed experimental method and working plan with detailed information on the number of gliders requested, the sensors needed, mission plan, maximum depth (200 or 1.000 m).

(max. 500 words)

The basic payload for the glider should include CTD, oxygen and FL3 sensors. The mission plan consists of performing a repeated section between the North of Mallorca and the Spanish mainland, flying from surface to 700 meters depth, surfacing every 6 or 12 hours (depending on marine traffic and the data assimilation requirements). Figure 1 below shows a tentative sampling strategy for the glider fleet, where the yellow line corresponds to the unit that is requested in this proposal. This tentative sampling is not fully fixed, the final separation between gliders and the exact waypoints of the glider mission will be defined a few weeks before the deployment based on the analysis of satellite data (altimetry, SST and ocean colour).

Indicate the type of access applied for

☐ remote	*(the measuring programme is implemented by SOCIB and the presence of the user group is not required)*
☐ partially remote	*(the presence of the user group is required at some stage)*
x 'in person/hands on'	(*the presence of the user group is required / recommended during the whole access period*)

Indicate the proposed time schedule including expected duration of access time

(max. 200 words)

The tentative time schedule is as follows:

- *Deployment: February 1st, 2022*
- *Recovery: February 14, 2022*

14 days of glider mission following the cost/day published in the SOCIB website (https://www.socib.es/files/SOCIB_External_Users_Competitive_Access_Protocol_Guidelines_update_june2020.pdf). If logistics allows to extend the mission, it would be very beneficial for the project because it would allow better assessment of the temporal variability of the ocean fronts in the study area.

Add a jpeg or pdf diagram of the idealised glider deployment track

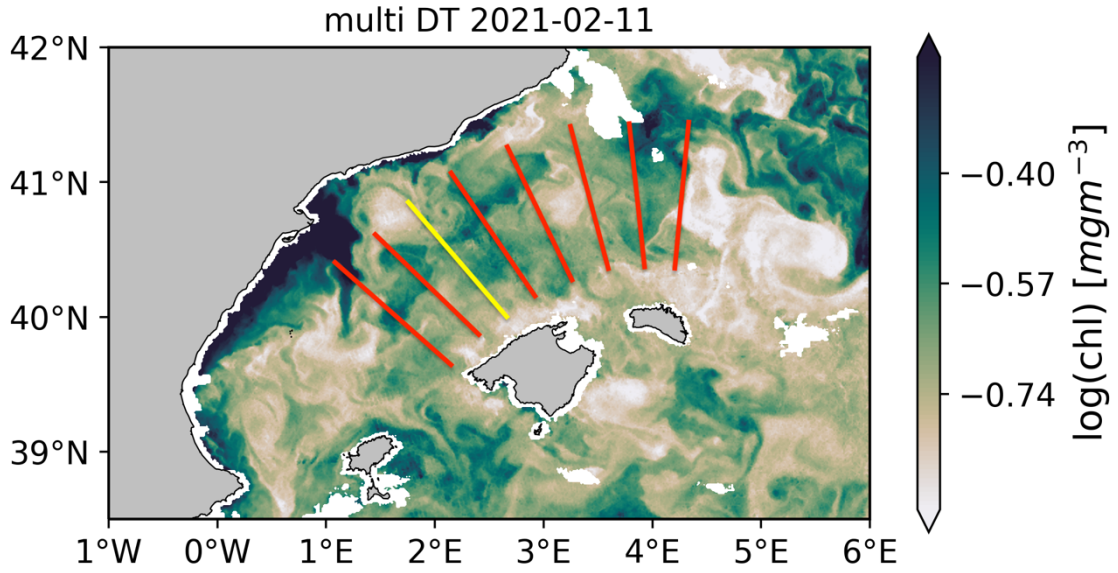

Figure 1. Image of chlorophyll corresponding to 11 February 2021. Yellow line indicates the tentative section to be performed by the glider requested in this proposal. This glider would be integrated in a fleet with 7 additional gliders.

Additional information

Is there another facility in your country similar to the one you wish to utilize?

x Yes ☐ No

If yes, please indicate your reasons for requesting access to the SOCIB glider (max. 150 words)

There is another facility in Canary Islands, Spain, but it would not make sense to request access to PLOCAN glider infrastructure (located very far away) given that SOCIB glider facility is in Mallorca, the same island where the research group is based.

Is this a resubmission of a previously rejected proposal?

☐ Yes x No

If yes, please provide the reference number and submission date of the original proposal. Briefly describe the changes made in comparison to the rejected version (max. 200 words)

Is this a continuation of an earlier successful project?

☐ Yes x No

If yes, please provide the reference number and submission date of the earlier proposal. Briefly describe the principal achievements of the earlier project and any objectives that were not fully met. (max. 200 words)

PART 4: Technical information

List of the glider instrumentation of most importance to your proposal

- G3 Slocum glider with CTD, oxygen and FL3 sensors.

List of any additional instrumentation that you have discussed and agreed with the Glider Facility

N/A

Provide details of your preferred sampling intervals, glider excursion depths and surfacing/communication intervals

- *Glider excursions depth between surface and 700 m. This target depth is tentative and could be modified after checking first hydrographic profiles.*
- *Downcast and upcast sampling.*
- *Communications every 12 hours.*

Details of your Data Management specific needs

- *Standard data processing following the SOCIB glider toolbox.*

Chose the data access and distribution (one option only)

☐ Public *(open access through the public SOCIB thredds and Coriolis portal (GDAC))*
☐ Partially public *(public SOCIB thredds (only))*
☐ Restricted *(public SOCIB thredds with authentication required)*

x Temporally restricted *(restricted during predefined period. In that case, after this period, public or partially public distribution should be chosen by the client)*
Risk Evaluation (marine traffic, fishing grounds, etc.) and Contingency Plan *Before the glider deployment, an analysis of the marine traffic and fishing grounds will be done in order to minimize the risks.*
Emergency Logistics for immediate recovery (time to action, radius of action planed, etc.) *The study area will be near Mallorca island, so a fast and small boat (https://www.socib.es/index.php?seccion=detalle_noticia&id_noticia=149) can be used for recovery in case of emergency.*

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Date of compilation 8 October 2021

Signature of the PI RUIZ VALERO SIMON - DNI 74508513J Firmado digitalmente por RUIZ VALERO SIMON - DNI 74508513J Fecha: 2021.10.18 15:27:26 +02'00'

Signature of an appropriate authorised person (e.g. Head of Department, Research Office) BASTERRECHEA OYARZABAL GOTZON - DNI 30596404X Firmado digitalmente por BASTERRECHEA OYARZABAL GOTZON - DNI 30596404X Fecha: 2021.10.18 15:07:25 +02'00'

This section reserved for the SOCIB Glider Facility

Date of proposal receipt by email _____

Assigned reference number _____

Signature of receiving officer _____