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
☒ A team of two or more users

***Information about the applicants (PI and project partners)***

**Principal Investigator (user group leader)**


Dr. Jacopo (name) Chiggiato (surname),
Gender: Male
Institution: Consiglio Nazionale delle Ricerche,
Department: Istituto di Scienze Marine
Address Arsenale Tesa 104, Castello 2737/F, 30122 VENEZIA
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email jacopo.chiggiato@ismar.cnr.it
Telephone (+39) 041.2407.945
Website www.ismar.cnr.it


**Project partners**
*(repeat for each partner of the group)*


Dr. Katrin (name) Schroeder (surname),
Gender: Female
Institution: Consiglio Nazionale delle Ricerche,
Department: Istituto di Scienze Marine
Address Arsenale Tesa 104, Castello 2737/F, 30122 VENEZIA
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Mr. Mireno (name) Borghini (surname),
Gender: Male
Institution: Consiglio Nazionale delle Ricerche,
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## PART 2: Additional information about the applicant(s) expertise

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

Dynamic processes influencing the water mass characteristics and distribution, interannual variability of the physical and biogeochemical properties of mediterranean water masses, the propagation of perturbations from the eastern to the western Mediterranean and their influence on dense water formation processes via multiplatform data integration and numerical modelling.

***Short CV of the PI (max. 200 words)***

Jacopo Chiggiato: Laurea (M. Sc. equiv.) in Environmental Science (1998), University of Venice. Ph.D. in Numerical Modelling for Environmental Protection (2004), University of Bologna. Amongst several experiences after the Ph.D., he was Scientist at the NATO Undersea Research Centre (2009-2011). He is Research Scientist CNR-ISMAR since 2012 and member of the Advisory Board of the Institute (2016-2018 and 2019-now). Research interests are data analysis and numerical modelling in coastal meteorology and oceanography, air-sea interactions, atmosphere-ocean coupled systems, climate variability of regional oceans and R&D in operational oceanography. He authored and co-authored more than 60 papers in refereed International Journals JCR (google scholar profile: https://scholar.google.it/citations?user=5_A4NKEAAAAJ&hl=it ) and organized/participated to several sea trials in the Mediterranean Sea. Associate Editor for the Journal of Operational Oceanography, Taylor and Francis Group, Associated Editor for Frontiers in Marine Science. Scientific Achievement Award 2014, issued by the Science and Technology Organization of the NATO on research using underwater gliders. Member of the Steering Committee of the Boundary Ocean Observing Network (BOON) of the OCEANGLIDERS initiative.

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

Testor et al., 2019. OceanGliders: A Component of the Integrated GOOS. Front. Mar. Sci. 6:422. doi: 10.3389/fmars.2019.00422

Tintorè et al., 2019. Challenges for Sustained Observing and Forecasting Systems in the Mediterranean Sea. Front. Mar. Sci. 6:568. doi: 10.3389/fmars.2019.00568

Schroeder, K. et al. 2017. “Rapid Response to Climate Change in a Marginal Sea.” Scientific Reports 7(1).

Schroeder, K., Chiggiato, J., Bryden, H. L., Borghini, M., Ben Ismail, S. (2016) Abrupt climate shift in the Western Mediterranean Sea Scientific Reports 6 Article Number: 23009;

Alvarez, A., Chiggiato, J., Schroeder, K. (2013) Mapping sub-surface geostrophic currents from altimetry and a fleet of gliders Deep-Sea Research Part I: Oceanographic Research Papers, 74: 115-129;

## PART 3: Detailed scientific description of the project

***List the main objectives of the proposed research***

***(max. 300 words)***

Following the successful collaboration between CNR-ISMAR and SOCIB since 2017, with several SMART missions completed, we plan to continue in order to sustain a long-term repeated transect Menorca-Sardinia to monitor medium-to-long-term variability of surface and intermediate water masses. The transect is now

officially included in the OceanGliders program (see Testor et al., 2019 above) and meant to be sustained over years. The OceanGliders Program, glider component of the Global Ocean Observing System (https://www.goosocean.org/ ) and effectively part of a (building-up) long-term operational observing system of the European waters. Data from the missions are open and downloadable by any interested scientist through SOCIB data server, as well as from the OceanGliders website.
We also intend to perform an investigation of turbulence structures in the Western Mediterranean by means of a microstructure profiler (MicroRider) mounted on the glider.
The glider will be able to reach the transitional layer between intermediate and deep water, which is subject to the effects of the WMT and where thermohaline staircase are likely to form. These features are of special interest when observed with a microstructure profiler. Unfortunately, in past missions several technical issues with the MicroRider prevented to collect data and upcoming missions will hopefully allow for collecting microstructure data.

***Give a brief description of the scientific and/or technical background to, and rationale for, your project***

The Mediterranean Sea has been identified as a hot spot for climatic change, i.e., a region most impacted by ongoing warming trend and increase in extreme events. What makes the Mediterranean Sea very useful for climate change research is that it behaves like a miniature ocean (Bethoux, 1999, Schroeder et al., 2012) with a well-defined overturning circulation and time scale much shorter than for the global ocean, with a turnover of only several decades. Change can happen fast, on the time scale of a human lifetime. The Mediterranean is therefore a potential model for global patterns that will be experienced in the next decades worldwide not only regarding ocean circulation, but for the marine biota as well (Lejeusne et al., 2010). The Mediterranean Sea provides a laboratory-type environment for documenting changes within it and for understanding the role of key processes involved making inferences on processes occurring also at the global scale. Evidence of warming trend in the region has been already documented by the scientific community, in particular for the surface layer (Bethoux et al. 1990) as well as deep layer (Rixen et al., 2005). In addition to long-term trends, Schroeder et al (Sci. Rep., 2016) reported an abrupt shift in terms of temperature, salinity and density in the deep Western Mediterranean. This shift, originally called “Western Mediterranean Transition”, is actually moving the basic physical properties of the Western Mediterranean from an old equilibrium to a new, different, one. The warming and salinification, with faster increase than in the past, is also present in the intermediate waters, with signals coming from the eastern Mediterranean that are now propagating into the western Mediterranean (Schroeder et al, Sci. Rep. 2017).

We propose to perform a two-way mission along the transect Sardinia-Mallorca, with deployment and recovery by SOCIB in Spanish waters. The glider will perform dives down to 1000m collecting CTD and microstructures data. Piloting will be done by CNR-ISMAR, with expert check by SOCIB. Resulting CTD data will be processed and quality controlled by SOCIB and eventually released to the community via open data servers

***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).***

We propose a mission twice a year, one in spring 2022 and one in autumn 2022 along the transect Palma – Oristano. We provide the glider (1000m) with standard CTD and equipped with a microrider. This application is associated to the previous repeated missions since 2017.

It is requested only complementary services, i.e.:

- Support of SOCIB personnel during missions (co-piloting, CNR to manage and lead the glider piloting, SOCIB to provide support and back-up on-mission and in pre-mission preparation of mission scripts, liaison on way points for glider recovery and launch).
- Real Time and Delayed Mode (full dataset) data processing of the glider data using the SOCIB operational system, mission visible in DAPP and data available in THREDDS

***Indicate the type of access applied for***

X 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)*

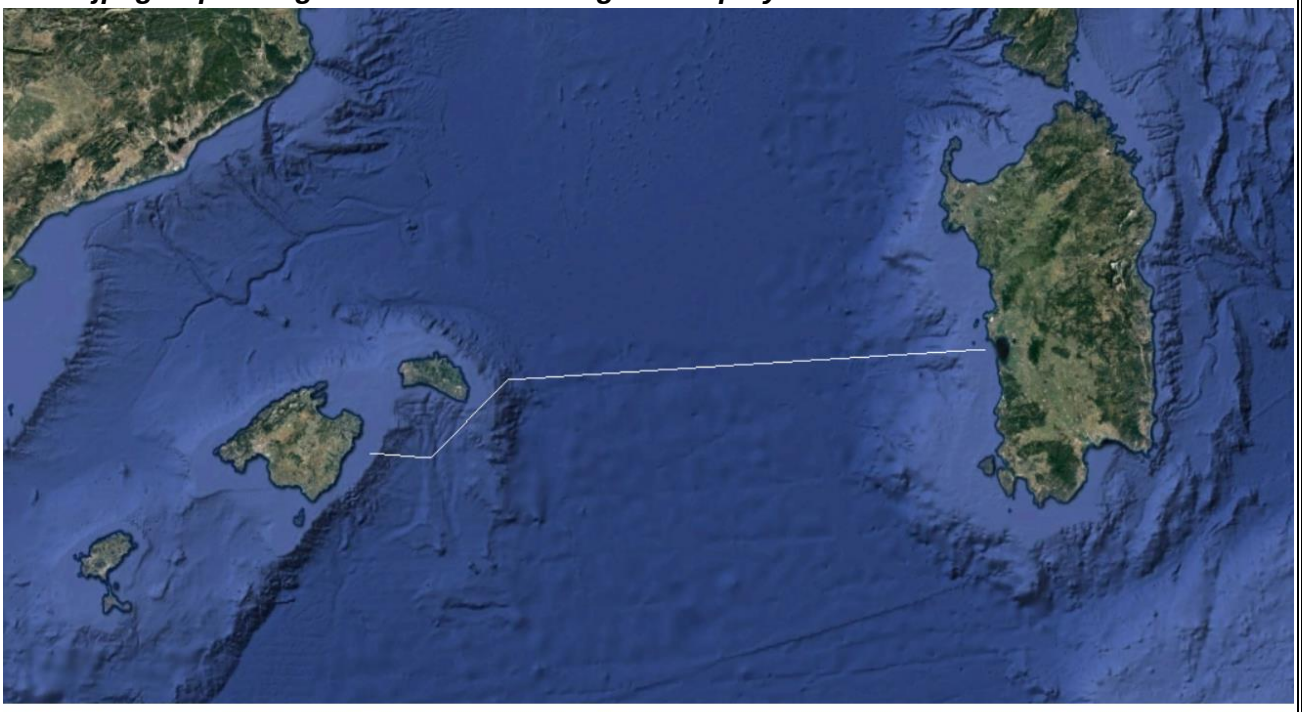
☐ 'in person/hands on' (*the presence of the user group is required / recommended during the whole access period*)

***Indicate the proposed time schedule including expected duration of access time***

***(max. 200 words)***

March/April 2022: Palma – Oristano - Palma (some 30 days)
October/November 2022: Palma – Oristano - Palma (some 30 days)

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



## Additional information

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

☐ Yes X No

| |
|---|
| ***If yes, please indicate your reasons for requesting access to the SOCIB glider (max. 150 words)*** |
| ***Is this a resubmission of a previously rejected proposal?***<br><br>☐ Yes ☒ 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?***<br><br>☒ Yes ☐ No |
| ***If yes, please provide the reference number and submission date of the earlier proposal. Briefly describe the principle 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***<br><br>**Scientific-oriented survey undertaken by CNR's Glider**<br><br>- Glider equipped with Lithium batteries (Teledyne, 11 V)<br>- Glider equipped with Rockland's microrider<br>- Other scientific sensors: CTD |
| ***List of any additional instrumentation that you have discussed and agreed with the Glider Facility***<br><br>- Glider equipped with Lithium batteries (Teledyne, 11 V)<br>- Glider equipped with Rockland's microrider<br>- Other scientific sensors: CTD |

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

This will be addressed in a later time

***Details of your Data Management specific needs***

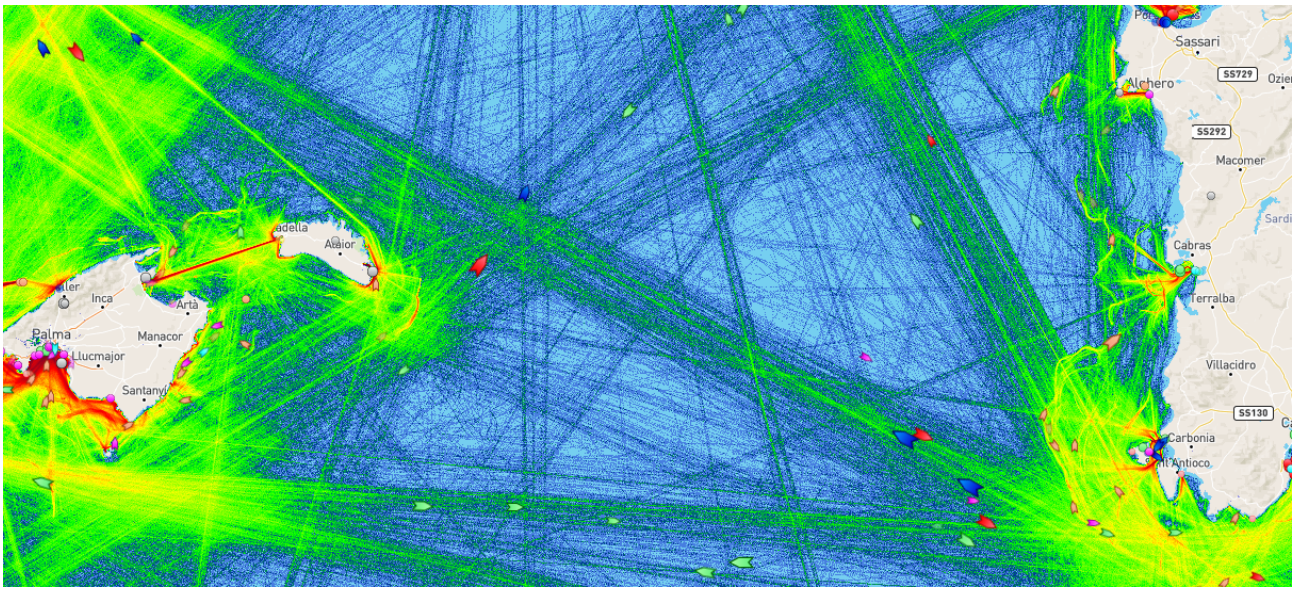
Real Time and Delayed Mode (full dataset) data processing of the glider data using the SOCIB operational glider data processing system, this implies that the mission will be visible in DAPP and data available in THREDDS data archive in L0 (raw), L1 (processed) and L2 (vertically gridded profiles) data formats.

***Chose the data access and distribution (one option only)***

X 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)*
☐ 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***

| # | **Risk / Contingency** | **Prevention / Mitigation / Corrective action** |
|---|---|---|
| 1 | Risk of ship collision | Avoid the most intense traffic lines of cruisers (see figure below)<br>Consider to reduce the number of surfacings |
| 2 | Risk of instrument loss | Expert piloting |
| 3 | Bad weather conditions | Careful check of weather forecasts and subsequent real time adjustments to the mission if needed |
| 4 | Risks due to fishing activities | Avoid intensively exploited fishing grounds.<br>Consider to reduce the number of surfacings |
| | | |
| | | |
| | | |




AIS marine traffic density in the area: avoid as much as possible surfacing near Oristano and when turning southward from Menorca to reach Palma

***Emergency Logistics for immediate recovery (time to action, radius of action planed, etc.)***

Emergency Logistic for immediate recovery should be handled by SOCIB while the glider is in the westernmost approx. 30% of the whole transect between Sardinia and the Balearic Islands. The remaining 70% of the transect will be handled by CNR-ISMAR.

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Date of compilation 08/11/2021

Signature of the PI

Signature of an appropriate authorised person
(e.g. Head of Department, Research Office) _____

***This section reserved for the SOCIB Glider Facility***

Date of proposal receipt by email _____

Assigned reference number _____

Signature of receiving officer _____