

IMEDEA-CSIC GLIDER TASKS:



JOINT EUROPEAN RESEARCH INFRASTRUCTURE NETWORK FOR COASTAL OBSERVATORIES

WORKPACKAGE 3: *Harmonizing Technological Aspects*
WORKPACKAGE 4: *Harmonizing Operations and Maintenance*

IMEDEA Glider team ()*

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SUMMARY OF IMEDEA-CSIC TASK 3.2



WP3: Harmonizing technological aspects (DOW)

WP leader: Wilhelm Petersen (GKSS)

Task 3.2 Gliders leader: CSIC

OBJECTIVES:

- To review the current status of the existing glider fleet in operational use in European Seas.*
- To define the best technical practices for operation of a fleet of gliders*

DELIVERABLES:

- D3.2: Report on current status of gliders observatories within Europe: Task 3.2 – Report on the first workshops of gliders observatories within Europe*



SUMMARY OF IMEDEA-CSIC TASK 3.2



Tasks carried Out:

- *Workshop Gliders May 2012*
- *Glider Questionnaire*
- *Questionnaire analysis (ongoing)*
- *Report on current status of glider observatories within Europe (ongoing)*

WORKSHOP GLIDERS MAY 2012



**TITLE: GLIDER OPERATIONS IN EUROPE,
SCIENTIFIC, TECHNICAL AND OPERATIONAL
CHALLENGES. JERICO/GROOM - EGO
Glider Workshop 22nd – 23rd May 2012,
Mallorca Spain**

Objectives:

- 1) To review the current status of the existing glider fleet and glider facilities in operational use in European seas*
- 2) To identify best technical practices for operation of a fleet of gliders*
- 3) To identify the needs for a Coastal European glider observing system*
- 4) To coordinate European glider activities (mainly JERICO and GROOM projects, within the framework of EGO activities, ES0904 COST action)*

GLIDER OPERATIONS IN EUROPE: SCIENTIFIC, TECHNICAL AND OPERATIONAL CHALLENGES
JERICO/GROOM - EGO Glider Workshop
22nd – 23rd May 2012, Mallorca

Objectives:

- 1) To review the current status of the existing glider fleet and glider facilities in operational use in European seas
- 2) To identify best technical practices for operation of a fleet of gliders
- 3) To identify the needs for a Coastal European glider observing system
- 4) To coordinate European glider activities (mainly JERICO and GROOM projects, within the framework of EGO activities, ES0904 COST action)

DAY 1: Tuesday 22nd May 2012

8:45

Workshop opens - welcome and meeting objectives
P. Farcy / P. Testor / J. Timoré

9:00 P. Testor - Review

- 1.1 Scientific challenges: key hot topics, long term monitoring
 - 1.2 Environmental challenges: MFCV/GES, emergency response
 - 1.3 Gliders as a new component of a European Ocean Observing System
- 9:30 Discussion, synthesis, conclusions → Identifying gaps and needs

10:30

Coffee

10:45 T. Zerbentou - Review Cyprus

11:00 L. Bégout / P. Testor - Review France

11:15 G. Kötterwain / L. Merckelbach / A. Beszczynska-Moeller / Andreas Funk - Review Germany

11:30 R. Green / A. Alvarez / E. Maki - Review Italy

11:45 S. Olander - Review Norway

12:00 S. Ruiz / J. Timoré / C. Barrios - Review Spain

12:15 P. Knight / D. Smeed / B. Quenel / E. Dumont - Review UK

12:30 S. Petihakis - Review Greece

12:45 W. Walkowiak - Review Poland

- 2.1 Gliders: existing platforms and sensors
- 2.2 Workshops: ballasting, repairing, pressure testing
- 2.3 Ground segments: computer infrastructure (glider communications, data processing, ...)
- 2.4 Calibration facilities
- 2.5 Coastal Ships

13:00

Lunch

14:00 Discussion, synthesis, conclusions across Europe



WORKSHOP GLIDERS MAY 2012



- 35 international researchers attended

- 4 Sessions:

1. Review of present/future needs for gliders in Europe

2. Review of existing glider facilities and technology

3. Review best practices in glider operations (one glider/fleet)

3.1 Glider platforms in the lab

3.2 Glider Mission

3.3 Glider Data Management

4. Recommendations for glider contributions to an European Coastal Observatories Strategy





WORKSHOP GLIDERS MAY 2012



HIGHLIGHT OF MAJOR RESULTS:



The added value of using gliders in specific areas of coastal and open ocean and for routine monitoring at key control points was shown and discussed.

The technological complexity still provokes that a small proportion of European gliders (around 60) have been in the water at any one time

The glider community has an opportunity to propose a coordinated network of glider observations in the same way the profiling float community setup the ARGO program

Establishment of a Working Group on Data Management to study the Organization, Formats, QC procedures.

The EGO website is a good platform for sharing information and making visible the activities of European partners. It was suggested that all participants record their gliders deployments on the website even if the RT or DM data are not yet available.

GLIDERS QUESTIONNAIRE



JERICO/GROOM GLIDER QUESTIONNAIRE

To provide information for:

- 1) JERICO Glider deliverable WP3.2 -
- 2) Work being undertaken in other glider related initiatives within JERICO, GROOM and EGO COST Action

JERICO
JERICO Glider Questionnaire 2012

Purpose
To provide information for

1. JERICO Glider Report WP3.2 - Review and best practices
2. Work being undertaken in other glider related initiatives within JERICO, GROOM and EGO COST Action

Deadline
It would be appreciated if the survey could be completed by 15/07/2012

How long will the survey take?
We anticipate that it will take 45 minutes.
You can save the survey and come back to complete it later.

Background
The procedure within JERICO has been to establish the current status of the coastal observing systems platforms in the European Seas (e.g. Ferry Boxes, Fixed Platforms, Gliders) and to define for each the best technical practices for operation through a questionnaire and a workshop. This is the JERICO questionnaire for gliders, however it will also support other glider related work being undertaken in Europe under GROOM and EGO COST Action.

JERICO WP3. 3.2 Gliders: Review current state of existing systems in operational use in European seas. To define technical best practices for compatible, robust and cost effective systems. To define best technical practice for the operation of a fleet of gliders, methodology/work description to test and harmonise the general strategies for glider operation in coastal and shallow areas including the implementation of tools for path planning analysis to consider environmental conditions.

Next >>

Load unfinished survey Exit and clear survey

Powered by

GLIDERS QUESTIONNAIRE



HIGHLIGHT OF MAJOR RESULTS:

Completed by 16 institution operating gliders (partners from JERICO and GROOM projects)

Country	Institute	Completed	Comments
France	CNRS	yes	
	IFREMER	yes	
	ENSTA	yes	
	IRD	no	Not covered under another survey, 1 glider
GERMANY	GEOMAR	yes	
	AWI	yes	
	HZG	yes	
	WTD 71	yes	
GREECE	HCMR	yes	
ITALY	OGS	yes	
	NURC/CMRE	yes	
NORWAY	NACO	yes	
POLAND	IOPAS	no	They don't have already any glider
SPAIN	IMEDEA	yes	
	PLOCAN	yes	
UK	MARS (NOC-POL)	yes	
	SAMS	yes	
	UEA	no	
CYPRUS	OG-UCY	yes	
BELGIUM	VITO	yes	

GLIDERS QUESTIONNAIRE



53 questions

July-September 2012

- ***PART 1: Review of **existing glider operations*****
- ***PART 2: Review of **glider facilities and technology*****
- ***PART 3: Review of **best practices for mission preparation of gliders*****
- ***PART 4: Review of **best practices for glider data management and global costs of operations*****
- ***PART 5: Review of **best practices for future glider operations and technology*****

GLIDERS QUESTIONNAIRE



53 questions

July-September 2012

- ***PART 1: Review of existing glider operations***
 - Number of missions/year and duration (in days) of missions still very variable due to high diversity of experiences.
 - Main working areas: North Atlantic, Mediterranean, Cape Vert, etc
 - Open ocean and coastal areas (not only coastal)
 - Most operations with 1 glider until 2011, and later multi-platform integrated studies (moorings, drifters, satellite, etc.)
 - Scientific challenges and long term monitoring focus

GLIDERS QUESTIONNAIRE, *PART 2: Review of glider facilities and technology*



53 questions

July-September 2012

- *PART 1: Review of existing glider operations*
- ***PART 2: Review of glider facilities and technology***
- *PART 3: Review of best practices for mission preparation of gliders*
- *PART 4: Review of best practices for glider data management and global costs of operations*
- *PART 5: Review of best practices for future glider operations and technology*

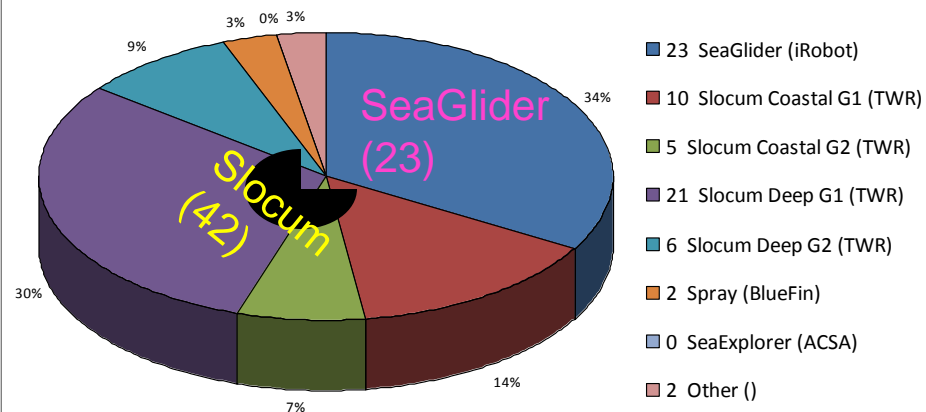
GLIDERS QUESTIONNAIRE, *PART 2: Review of glider facilities and technology*



HIGHLIGHT OF MAJOR RESULTS:

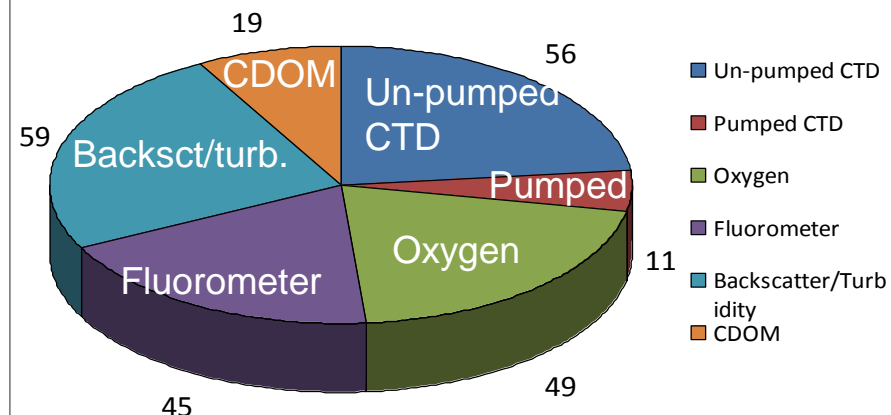
Glider fleet type

European Glider Fleet Composition by Model and Type
(Total of 69 units)



Sensors

Most Significant Sensors in Europe (239 Total)

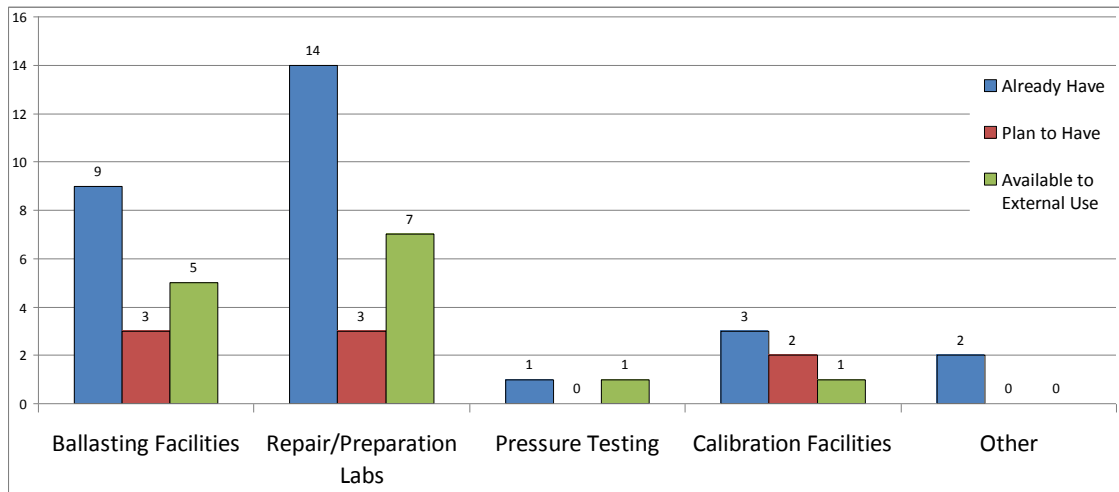


GLIDERS QUESTIONNAIRE, *PART 2: Review of glider facilities and technology*



HIGHLIGHT OF MAJOR RESULTS:

Laboratories and Facilities



Ballasting facilities, laboratories

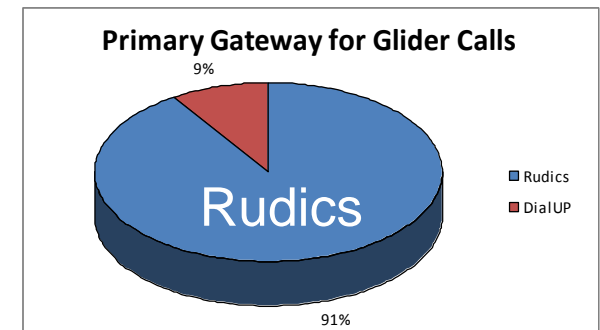
repair/preparation laboratories

Pressure testing

Calibration facilities

Control room

IT Facilities

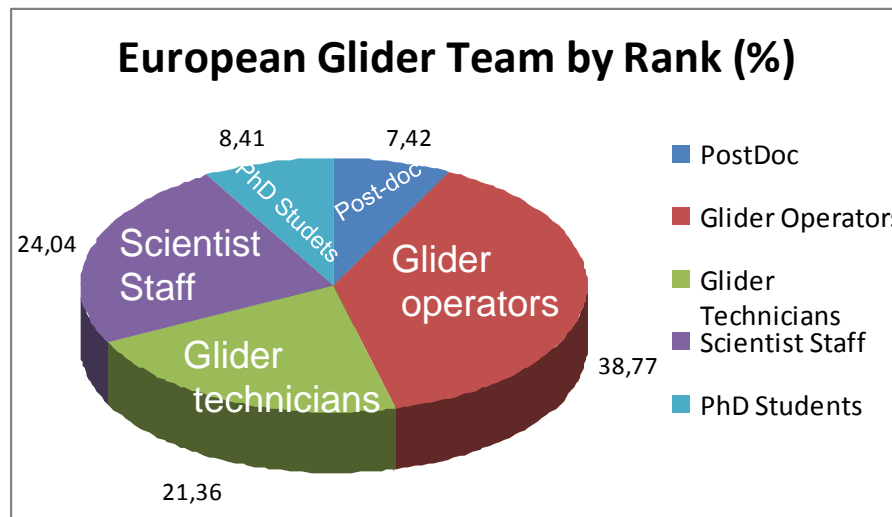


GLIDERS QUESTIONNAIRE, *PART 2: Review of glider facilities and technology*



HIGHLIGHT OF MAJOR RESULTS:

Glider Teams



GLIDERS QUESTIONNAIRE



53 questions

July-September 2012

- ***PART 1: Review of existing glider operations***
- ***PART 2: Review of glider facilities and technology***
- ***PART 3: Review of best practices for mission preparation of gliders***
- ***PART 4: Review of best practices for glider data management and global costs of operations***
- ***PART 5: Review of best practices for future glider operations and technology***

GLIDERS QUESTIONNAIRE, *PART 3: Review of best practices for mission preparation of gliders*



- Glider missions **checklist and protocols** used only by **50% of users**
- Pre-mission preparation of **5 days**
- Pre-mission team in lab: **2 people**
- Major bottlenecks: ballasting and batteries refurbishment
- **Sensor calibration mostly by manufacturers** (every 12 months)
- Mission definition by PI, mission planning and operations by Glider team leader
- Most challenging operation: **ship recovery**
- **No path planning tools yet**
- Different problems observed by users for Slocum or Seagliders
- **Bio-fouling** has shown to be a problem by 30% users. Topic starting...

GLIDERS QUESTIONNAIRE




53 questions

July-September 2012

- ***PART 1: Review of existing glider operations***
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- **GLIDERS QUESTIONNAIRE, PART 4: Review of best practices for glider data management and global costs of operations**



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- 
- QC and Validation still need to be implemented for RT. Around 50% of groups apply QC and V procedures for DM. → Data management GROOM meeting (next week, 10-12 October, Paris)
 - In-situ QC: mostly ship-borne CTD casts, nearby platforms (i.e. moorings).
 - Most common procedures are: removal of anomalous values, pressure filtering and salinity correction. All of them in DM.
 - NetCDF is the most extended data format although others are used such as manufacturer proprietary format, plots only and/or ASCII. Still few RT contributions to Coriolis and EGO.
 - Groups begin to rely their public outreach and communication to own WWW site, although there is a lot yet to be done

- **GLIDERS QUESTIONNAIRE, *PART 4: Review of best practices for glider data management and global costs of operations***



- 'Ocean state characterization and variability' is the top routinely usage of gliders. Occasional assimilation into forecasting models and no contribution to marine products for leisure and commercial applications have been also remarked
- Very few groups have provided information about their budgets and running costs. There are not enough samples to extract conclusions yet.

GLIDERS QUESTIONNAIRE



53 questions

July-September 2012

- ***PART 1: Review of existing glider operations***
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- ***PART 4: Review of best practices for glider data management and global costs of operations***
- ***PART 5: Review of best practices for future glider operations and technology***

- **GLIDERS QUESTIONNAIRE, PART 5: Review of best practices for future glider operations and technology**



- Higher **reliability** of performance and **reduction on costs** are the preferred improvements to see applied in future glider versions.
- Groups seem to be willing to **acquire higher technical skills to be more autonomous in glider maintenance and refurbishment**. European support centers would also be very welcomed.
- The services more often needed to support national/European glider operations are: (1) Scientific/Technological Forum and Data Management Centers by European Infrastructure and (2) Technical Services (i.e. calibration) and Glider Pool by National Infrastructure
- **Lower importance** and/or priority is given to Links with Manufacturers, Multi-platform Interface for Piloting and Advise on Safety Issues.

- **GLIDERS QUESTIONNAIRE, *PART 5: Review of best practices for future glider operations and technology***



- Desired specific **technological advances for the next 5 years** are related to (1) more capable and faster sensors/Payload, (2) a better battery technology, even rechargeable, and (3) adaptability to harsh environments (ice, strong currents, density stratification,...)
- **Key topics gliders will help address in the next 5 years** have been highlighted: Pollution and Biological Monitoring (Coastal Waters), Modelling/Forecasting and Seasonal Variability (Open Ocean) and the Interactions, Transports and Related Dynamics between (Both)
- **Key contributions to the Coastal Observatories over the next 5 years:**
 - increase and complete data sets (Long Monitoring)
 - feed models
 - tools for mesoscale and sub-mesoscale studies, eddy-mean flow interactions and deep water formation, amongst others

- **GLIDERS QUESTIONNAIRE, PART 5: Review of best practices for future glider operations and technology**



- European future funding should be invested, according to the groups, in the creation of centralized glider centers for renting, maintaining, piloting and calibrating available to any suitable user, all serving under a general protocol framework.
R+D is also a selected preference, specially on power cells and developing European glider technology



REPORT ON CURRENT STATUS OF GLIDER OBSERVATORIES



REPORT BASED ON

- *Workshop GLIDER OPERATIONS IN EUROPE: SCIENTIFIC, TECHNICAL AND OPERATIONAL CHALLENGES (Mallorca, May 2012)*
 - *Presentations*
 - *Chairman reports*
 - *Notes*

- *JERICO/GROOM GLIDER QUESTIONNAIRE*
 - *Preparation*
 - *Preliminary analysis*

Deliverable GROOM: detailed analysis of questionnaire, focused towards designing / establishing a EU glider infrastructure

REPORT ON CURRENT STATUS OF GLIDER OBSERVATORIES



REPORT INDEX

1. Introduction

- 1.1 Summary and purpose, source of content, region/labs covered*
- 1.2 Scientific, environmental and emergency response challenges*
- 1.3 The role of gliders as a new component of Ocean Observing Systems*

2. Review current status of glider observatories in Europe

- 2.1 Glider observatories/labs*
- 2.2 Gliders and sensors*
- 2.3 Physical infrastructure*

3. Review current status of glider operations in Europe

- 3.1 Glider Missions (2010/2011)*
- 3.2 Key finding obtained with gliders*
- 3.3 Glider Operations*

4. Glider Data

- 4.1 Current situation (lack of a general strategy, survey responses)*
- 4.2 Details of data management from 3 good examples*
- 4.3 Proposed coordinated strategy for glider data management (Sylvie plan)*

5. Cost of glider fleet/observatories 2011

6. Conclusions

- 6.1 Review of any issues or gaps in coverage (sensors/locations/gliders/support etc)*
- 6.2 Recommendations (scientific/management) for glider contributions to a European Coastal Observatories Strategy*



SUMMARY OF IMEDEA-CSIC TASK 4



WP4: Harmonizing Operation and Maintenance Methods (DOW)

WP leader: George Petihakis (HCMR)

Task 4.3: END TO END QUALITY ASSURANCE

SubTask 4.3.3 Gliders (CSIC, OGS, CEFAS)

SubTask 4.3.4 Running Costs (CEFAS, HCMR, NIVA, CSIC, OGS, NERC (POL, NOCS), MI, HZG, AZTI, MUMM)

OBJECTIVES:

- To describe best practices in all phases of the system (pre-deployment test, maintenance, calibration, etc.)*
- To adopt common methodologies and protocols*
- Move toward the harmonization of equipment which will help in reducing maintenance and calibration costs*



SUMMARY OF IMEDEA-CSIC TASK 4



WP4: Harmonizing Operation and Maintenance Methods (DOW)

DELIVERABLES WITH IMEDEA-CSIC CONTRIBUTION:

-D4.4:

Report on best practice in operation and maintenance: Task 4.1 - Report on best practice in conducting operations and maintaining of different systems

-D4.5:

Report on running costs: Task 4.3 - Report on running costs of observing systems

ACTIONS CARRIED OUT:

Questionnaire prepared and distributed


Index and content for ST 4.3.3

Report on current status of gliders observatories within Europe (WP3.2)

Gliders and next EGU 2013




THANK YOU



European Geosciences Union General Assembly 2013


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OS4.5

Recent advances in ocean physics and biogeochemistry from autonomous underwater vehicles

Convener: Pierre Testor 
Co-Conveners: Simón Ruiz , Agnieszka Beszczynska-Möller 

In his impressive "science fiction" article published in *Oceanography* in 1989, Henry Stommel anticipated a revolution in ocean observing capabilities, brought by the development of new mobile platforms and sensing systems. Looking back at Stommel's article, we can now marvel at how much of what followed he had predicted. During the last years, one could witness growing activities with floats, gliders, and other AUVs throughout the world. Modern autonomous underwater vehicles allow to characterize the water column from both physical and biological points of view, across a continuum of space and time scales. Being able to periodically send the collected data via satellite telemetry to land stations, they provide observations which can be analysed in near-real time. These new autonomous platforms have significantly changed the way how experiments and observations, in both the coastal and open oceans, are carried out today.

This session provides an open forum for interdisciplinary discussions of the latest advances in oceanographic applications of autonomous underwater vehicles. We welcome contributions on all aspects of the scientific analysis of data collected with such platforms on the coastal, regional, basin, or global scales. Topics for this session include physical and biogeochemical variability of the ocean, ocean processes on different spatial and temporal scales (from ocean turbulence to basin-wide circulation), and interactions between the ocean, atmosphere and land. We also invite contributions on data management and integration, Observing Systems Simulation Experiments, and development of new instrumentation and sensors.

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Call for papers: 10 Oct



SUMMARY OF IMEDEA-CSIC TASK 4



4.3.3 Gliders Best Practices INDEX, in line with questionnaire:

1. Glider Technologies

- *Slocum*
- *Seaglider*
- *Spray*
- *Others*

2. Glider Infrastructure

- *Laboratory*
- *Slocum Glider*
- *Ballast tank*
- *Pressure chamber*
- *Calibration*
- *Storage*
- *Seaglider*
- *Communications*
- *Control room*
- *Data Center*
- *Vehicles and Vessels*



SUMMARY OF IMEDEA-CSIC TASK 4



4.3.3 Gliders Best Practices INDEX (Cont.)

3. Glider Platforms in the Laboratory

- Platform maintenance
- Sensor maintenance
- Sensors and instruments calibration

4. Glider Missions

- Planning
- Definition
- Deployment Techniques
- Recovery Techniques
- Piloting
- General safety

5. Glider Data Management

- Glider Data Retrieval (Real Time & Delay Mode)
- Glider Data Archiving
- Data Processing and Quality Control

6. Glider Data Dissemination and Outreach

7. Training Materials, Courses and more Information

8. Glider Cost Analysis