

Review of existing glider facilities and technology in Spain

2010



2005



SOCIB Balearic Islands Coastal Observing and Forecasting System

2010

JERICO/GROOM/EGO Workshop
22-23 May, 2012 Mallorca, Spain

Content (following agenda requirements)

- Gliders
- Workshops
- Ground segments
- Calibration facilities
- Coastal Ships

Slocum:

3 IMEDEA

2 SOCIB

1 PLOCAN



Seaglider:

0 IMEDEA

2 SOCIB

1 PLOCAN



Spanish Glider Fleet:

10 units

Spray:

0 IMEDEA

0 SOCIB

1 PLOCAN



New Facilities

Since 2011:
New glider
laboratories



New Facilities: Since 2011



Glider Pressure Chamber: 2012

General specifications:

Manufacturer:

- KW Designed Solutions (UK)

Main Parts

- Pressure Chamber
- High Pressure Hand Pump (with 150mm analog gauge)
- Support Frame
- Purge Line Connection

Directive Compliance

- European Pressure Equipment Directive (PED) 97/23/EC
- European Machinery Directive (EMD) 2006/42/EC

Media

- All fluids but those Explosive, Flammable, Toxic and Oxidising

Operation Mode:

- Manual only

Technical specifications:

Materials

- Carbon Steel variety (European EN 10204:3.1b certified)
- Standard Rubber shore 70 (O-ring)

Working Pressure:

- 100 bar (1,450 psi)

Volume:

- 250 Liters (66 Gallons)

Dimensions

- 750x2460 mm (external)
- 400 x 2000 mm (internal)

Overall Weight:

- 1300 Kg (2866 Pounds)

Security Pressure Relief Valve cracking at

- 110 bar (CE marked)



SOCIB Coastal ships



Coastal Research Vessel
(24 m LOA – 1.200 km coastline
in the Islands)



SOCIB 920
ZODIAC Hurricane

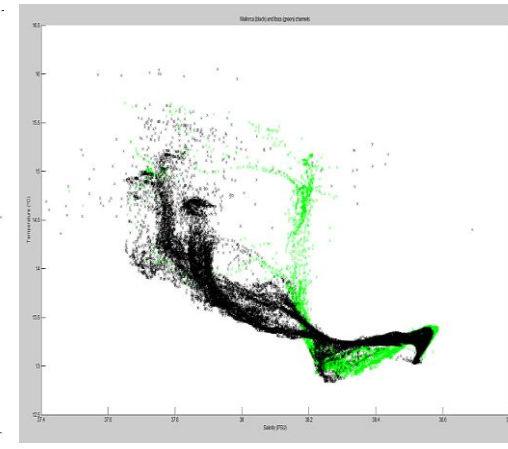
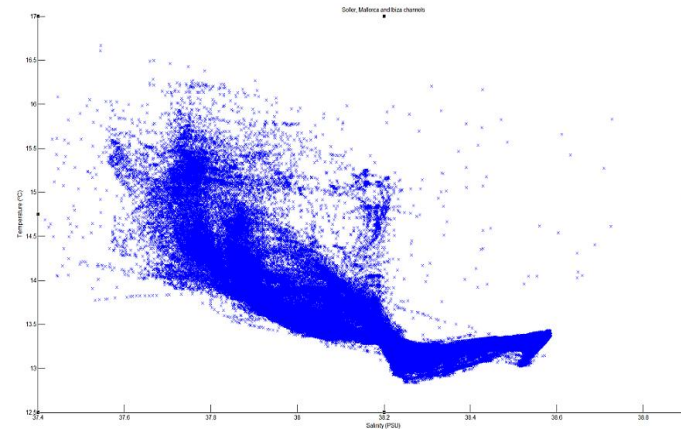
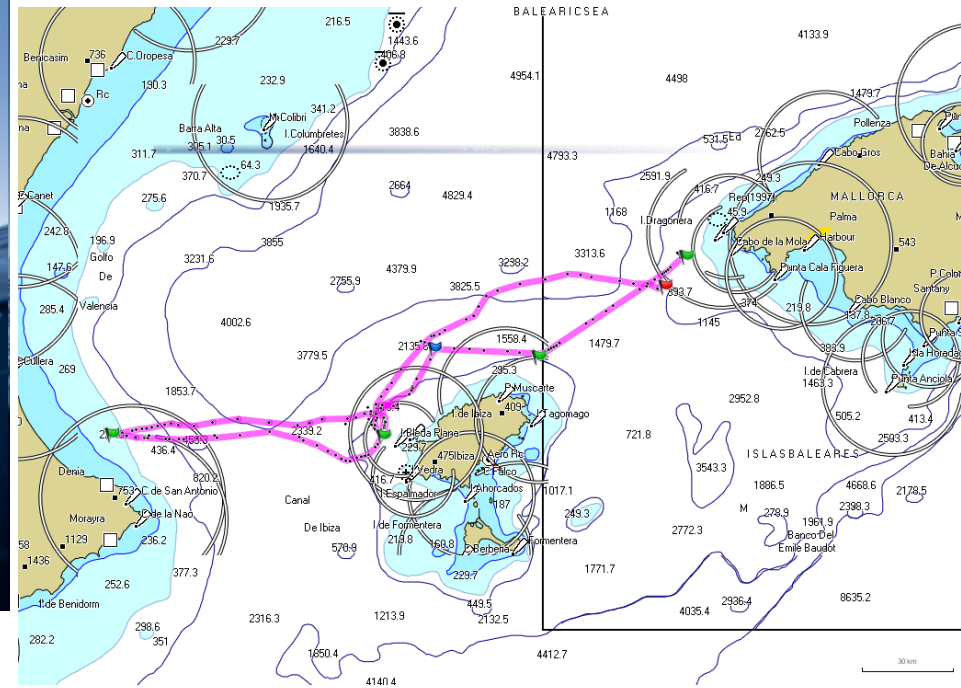
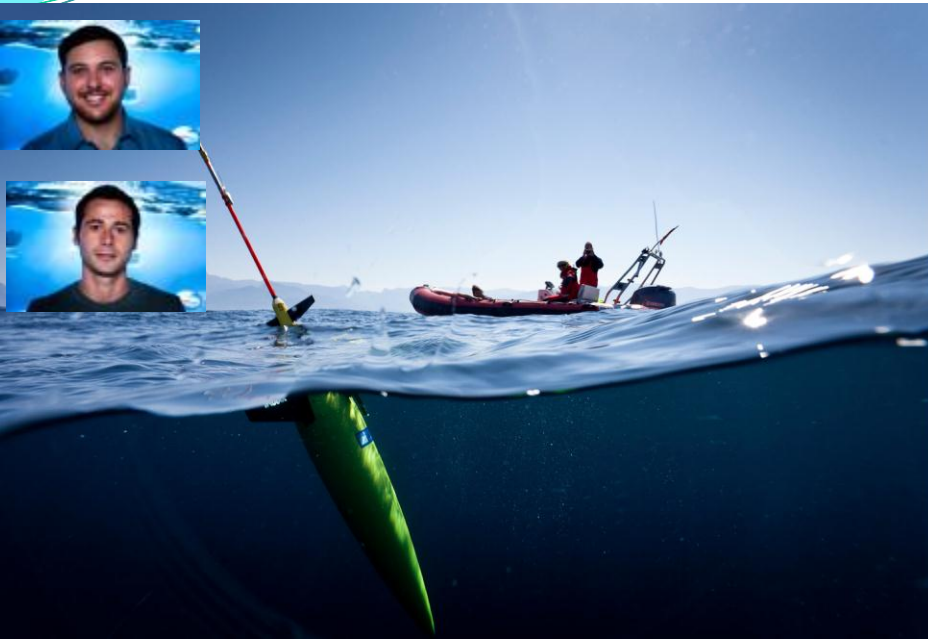
Seaglider First Tests

March 2012



Seaglider First Scientific Mission

March-April 2012



Web-Based Services

Including data processing:

- Profiles identification
- Spikes
- Thermal lag
- Averaging

Glider Application - Mozilla Firefox

apps.socib.es/gapp/

SOCIB Balearic Islands Coastal Observing and Forecasting System

IMEDEA

Glider Panel

Load Deployments >>

Glider	Deployment	End Date
Current Deployments		
Imedeia Coastal 00	squad050	2012/05/24
Imedeia Deep 02	canal132	2012/05/21
Completed Deployments		
Imedeia Deep 02	PerformanceTest...	2012/04/05
Socib Deep 00	PerTestsJan2012	2012/03/16
Socib Deep 00	PerformanceTest...	2012/01/30
Socib Deep 00	PerformanceTest...	2012/01/30
Imedeia Deep 00	PerformanceTest...	2012/01/06

Overview

Deployments GUI - Mozilla Firefox

apps.socib.es/gapp/

SOCIB Balearic Islands Coastal Observing and Forecasting System

IMEDEA

Deployments panel

Deployment name	Platform type
Current	
Canales-May2011 (deep02) Older	
IDate: 2012-05-08T22:00:00+00:00	
EDate: N/A	
Drifter SVP 003	Surface drifter
Completed	
Apev profiler drifter 005	Profiler drifter
Drifter SVP 001	Surface drifter
Drifter SVP 002	Surface drifter
Drifter SVP 004	Surface drifter
Drifter SVP0002	Surface drifter
Drifter SVP0003	Surface drifter
SKEEP 002	Older
IDate: 2012-03-12T09:00:00+00:00	
EDate: 2012-04-27T10:46:28+00:00	

Overview

Distance: Layers: Adjust map

lon: 1.1726 lat: 38.4215

Additional information

End date	Last call time	Port density	Last N days	Charts
N/A	2012-05-17 05:18:03 (-30 days, 0-19 hours and 0-39 min.)	30	41	Show
N/A	2012-05-16 22:47:48 (0 days, 16 hours and 55 minutes ago)	30	46	Show
2012-04-27 10:46:28	Deployment finished			

TEST mission params form

Mission name: TEST Deployment: 2011-12-01 13:55:00 000000000 - Canales-Dec2011

Max waypoints distance: 2 Max deployment time: 123123 *Pitch degrees: 2 *Book craft: *Book vehicle:

2012-05-11 12:00:00.0002

Layer: Trans. Opacity

Bathymetry

Currents Show

Density Show

AIS

Transect for variable dens at 2012-05-11T12:00:00.0002

Transect for sea water potential density

#	Next	Times	Lat	Lon	Depth
1			38.4147	1.8297	0.0
2			38.4202	1.1321	0.0
3			38.0632	1.0002	0.0
4	3		38.0687	0.2861	0.0

sea_water_potential_density (kg (m⁻³))

distance along transect (arbitrary units)

Datos de mapa ©2012 Google, Tele Atlas - Términos de uso

Legend

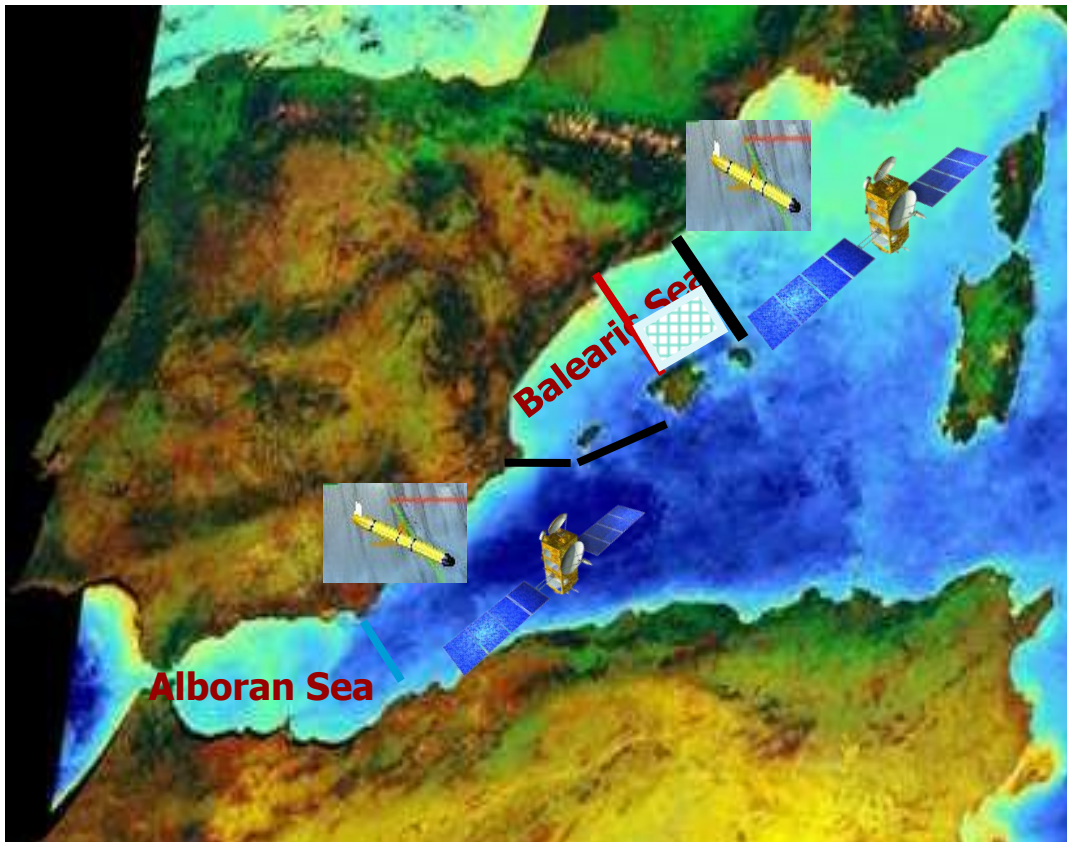
Icon	Explanation
	Glider Current Position
	Glider Previous Position
	Start Position
	Next Waypoint

(double click to see the list of calls)

Deployment Name	Time Since Last Call	Last Lat
squad050	3h:22m:26s	39.2591
canal132	4h:20m:03s	38.9788



IMEDEA-CSIC missions (2005-2010)



- Sustained glider observations along 773 ENVISAT track
- Simultaneous sampling (2 gliders) of Balearic channels in collaboration with Ifremer
- Eastern Alboran Sea, along Jason-1/Jason-2 track
- Multi-sensor experiment (glider, drifters, ship, satellite)

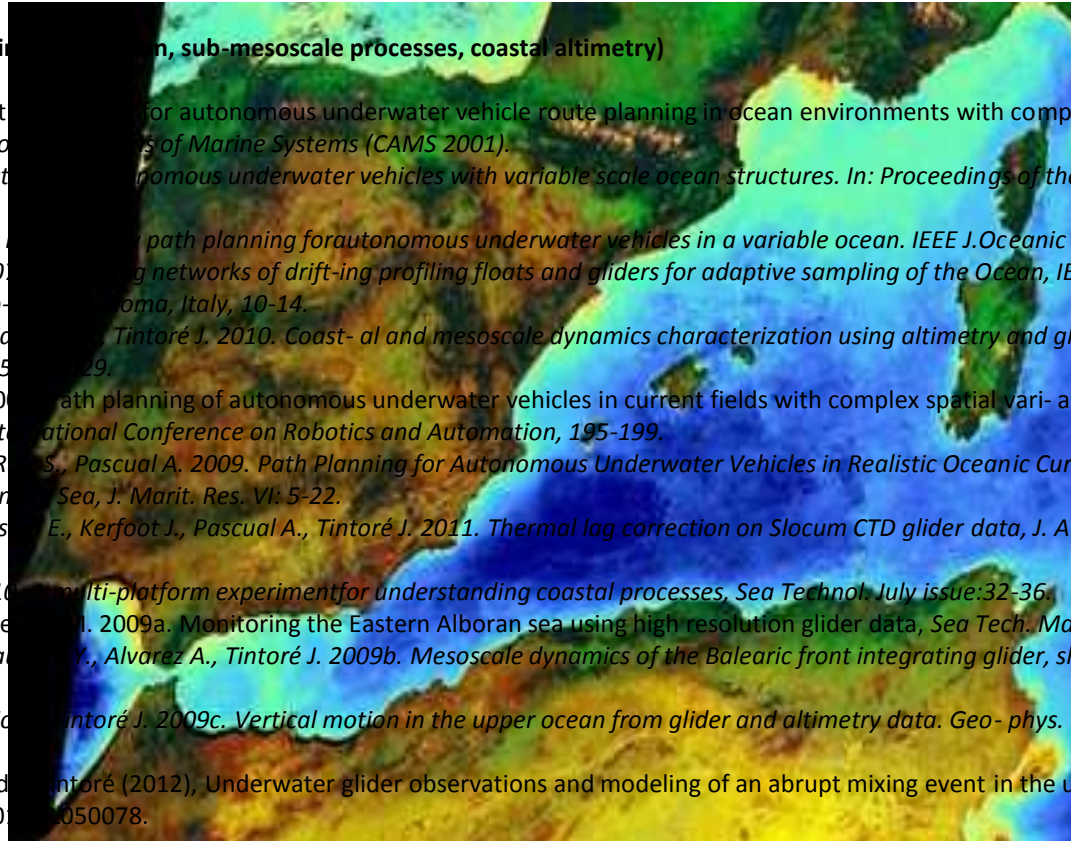
From 2005 to 2010 : IMEDEA has collected 17000 full CTD profiles

Glider for Research: (path planning, ocean, sub-mesoscale processes, coastal altimetry)

- Alvarez A., Caiti A. 2001. A genetic algorithm for autonomous underwater vehicle route planning in ocean environments with complex space-time variability. In: *Proceedings of the IFAC Conference on Control, Diagnosis and Safety of Marine Systems (CAMS 2001)*.
- Alvarez A., Caiti A. 2002. Interacting autonomous underwater vehicles with variable scale ocean structures. In: *Proceedings of the IFAC World Conference Systems*.
- Alvarez A., Caiti, Onken R. 2004. Path planning for autonomous underwater vehicles in a variable ocean. *IEEE J. Oceanic Eng.*, 29: 418-429.
- Alvarez A., Garau B., Caiti A. 2005. Drifting networks of drift-ing profiling floats and gliders for adaptive sampling of the Ocean, *IEEE International Conference on Robotics and Automation*, Bologna, Italy, 10-14.
- Bouffard J., Pascual A., Ruiz S., Falcó M., Tintoré J. 2010. Coastal and mesoscale dynamics characterization using altimetry and gliders: A case study in the Balearic Sea, *J. Geophys. Res.*, 115: C02029.
- Garau B., Alvarez A., Oliver G. 2005. Path planning of autonomous underwater vehicles in current fields with complex spatial variability: an A* approach. In *Proceedings of the 2005 IEEE International Conference on Robotics and Automation*, 195-199.
- Garau B., Bonet M., Alvarez A., Ruiz S., Pascual A. 2009. Path Planning for Autonomous Underwater Vehicles in Realistic Oceanic Current Fields: Application to Gliders in the Western Mediterranean Sea, *J. Marit. Res.* VI: 5-22.
- Garau B., Ruiz S., Zang G.W., Hesse B., Kerfoot J., Pascual A., Tintoré J. 2011. Thermal lag correction on Slocum CTD glider data, *J. Atmos. Ocean. Tech.* 28: 1065-107.
- Pascual A., Ruiz S., Tintoré J. 2010. A multi-platform experiment for understanding coastal processes, *Sea Technol.* July issue:32-36.
- Ruiz, S., Garau, B., Martínez-Ledezma, J. 2009a. Monitoring the Eastern Alboran sea using high resolution glider data, *Sea Tech.* March issue: 29-32
- Ruiz, S., Pascual, A., Garau B., Falcó M., Alvarez A., Tintoré J. 2009b. Mesoscale dynamics of the Balearic front integrating glider, ship and satellite data. *J. Mar. Syst.* 78: S3-S16.
- Ruiz, S., Pascual A., Garau B., Pujol M., Tintoré J. 2009c. Vertical motion in the upper ocean from glider and altimetry data. *Geo-phys. Res. Lett.* 36: L14607, doi:10.1029/2009GL0385
- Ruiz, S., L. Renault, B. Garau, and Tintoré (2012), Underwater glider observations and modeling of an abrupt mixing event in the upper ocean, *Geophys. Res. Lett.*, 39, L01603, doi:10.1029/2011GL050078.

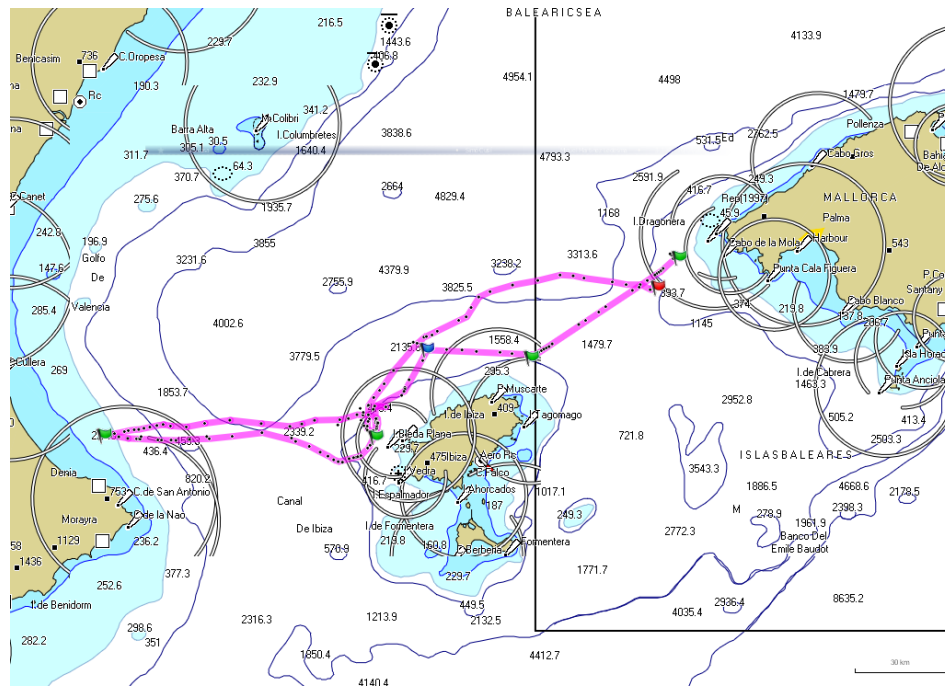
•Paper accepted;

Bouffard, J., Renault, L., Ruiz, S., Pascual, A., Dufau, C., Tintoré, J., 2012. Sub-surface small scale eddy dynamics from multi-sensor observations and modelling, *Progress in Oceanography*



From 2011 onwards: SOCIB leads operational glider activities in the Balearic channels.

- Semi-continuous gliders transects: 6 months in 2011 ; 2 months in 2012
- About 1000 profiles



Glidors for operational oceanography and for research:

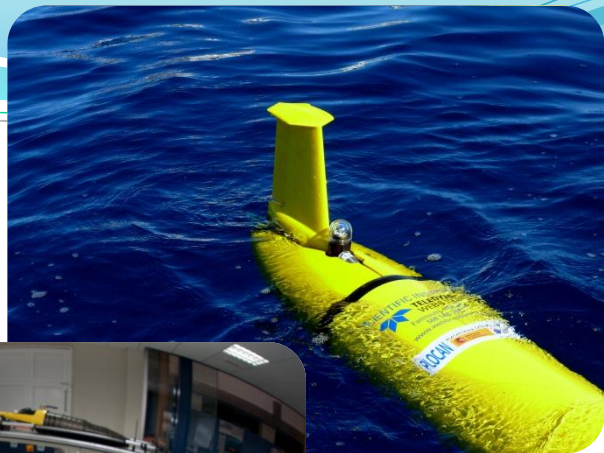
- Initial work for glider data assimilation in ROMS: Collaboration with NURC

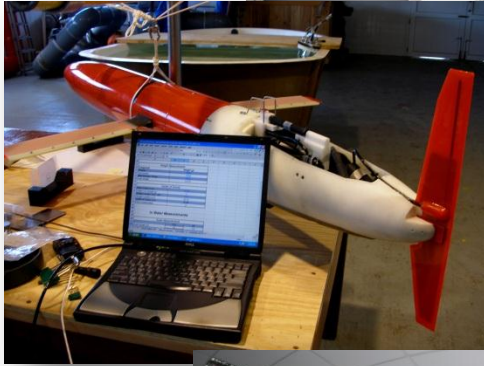


- Research: Heslop et al., 2012 (to be submitted to GRL) – High frequency variability in the Ibiza channel

PLOCAN

consorcio



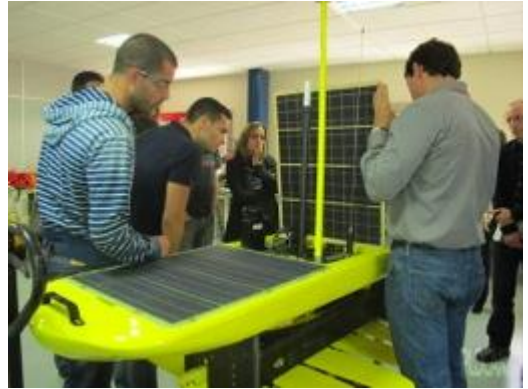


- **Glider Technology: Slocum, Spray and Seaglider**
- **Ballasting area.**
- **Dedicated mechanical and electronics glider lab.**
- **Boat for deployment and recovery.**
- **Direct and easy sea access.**
- **Control room.**





TRAINING



**WAVEGLIDER Demo
Liquid Robotics.
VULCANO Mission.
PLOCAN
headquarters.
May 2012.**

GLIDER MISSIONS-”Challenger One”



**TELEDYNE
WEBB RESEARCH**
A Teledyne Technologies Company

THE STATE UNIVERSITY OF NEW JERSEY
RUTGERS



UNIVERSIDAD DE LAS PALMAS
DE GRAN CANARIA



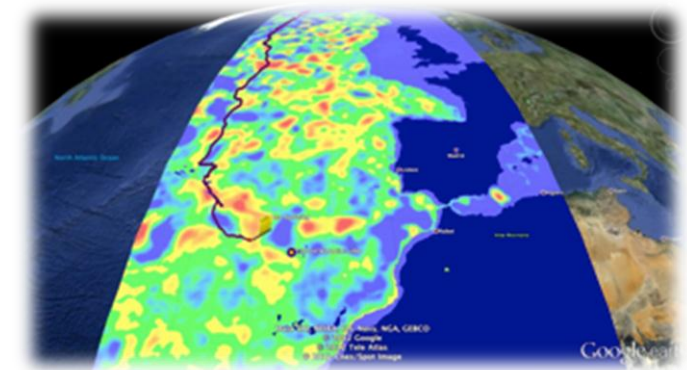
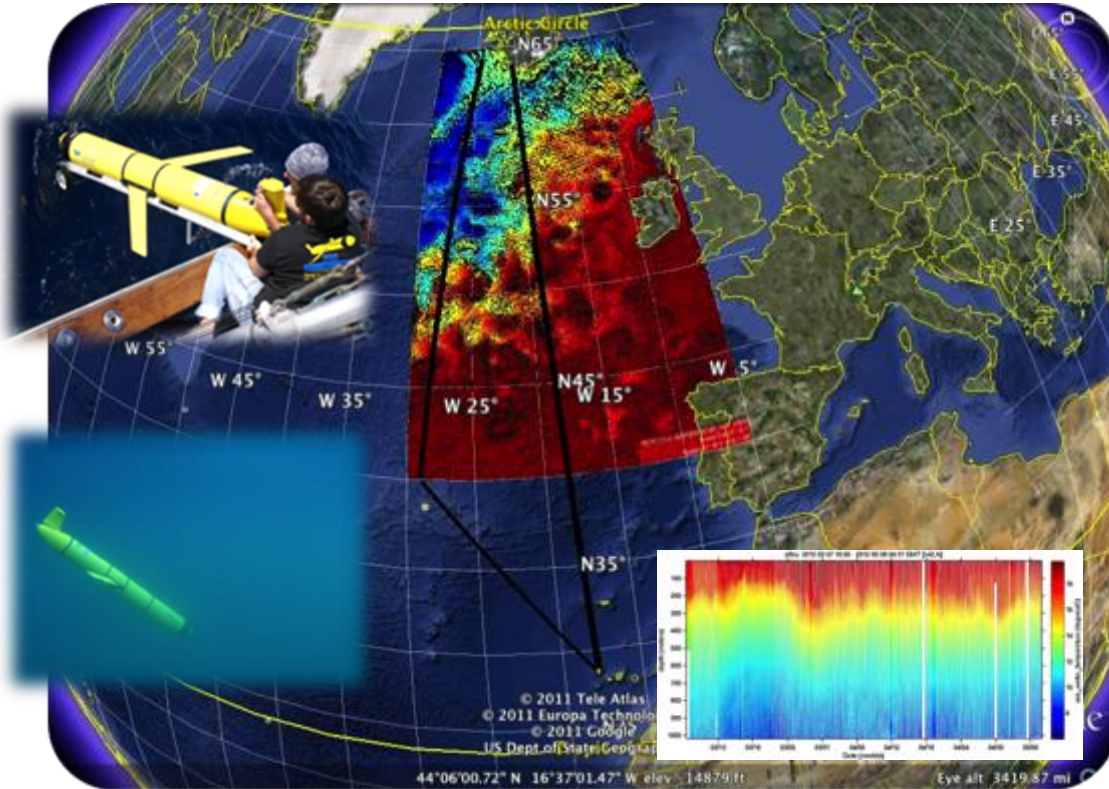
CAMPUS
ATLÁNTICO
TRICONTINENTAL
CANARIAS
2010/2015



Salvamento
Marítimo



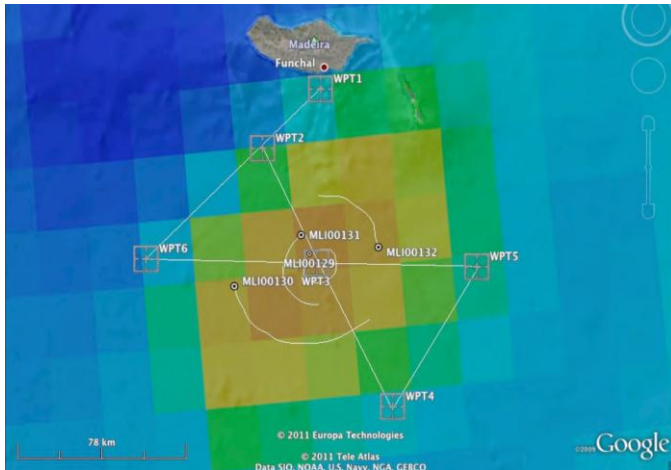
PORTOS DA MADEIRA



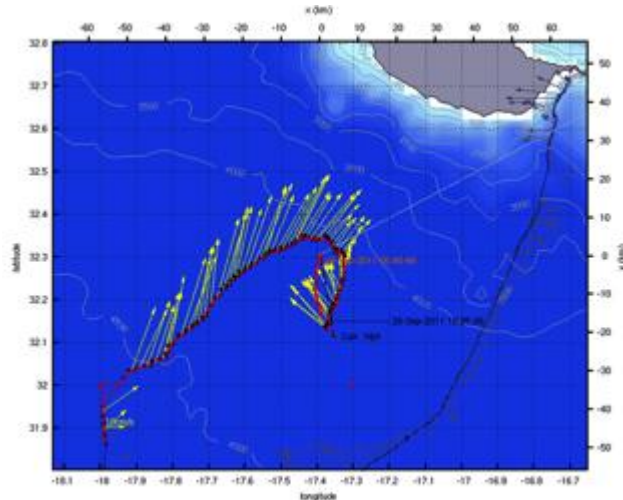
- Slocum G2 Glider
- Deploy: 23rd June 2011 (Reikiavik)
- Recovery: 22nd May 2012 (Gran Canaria)
- Aprox. 2950 Nm.



GLIDER MISSIONS-INCOVBIO

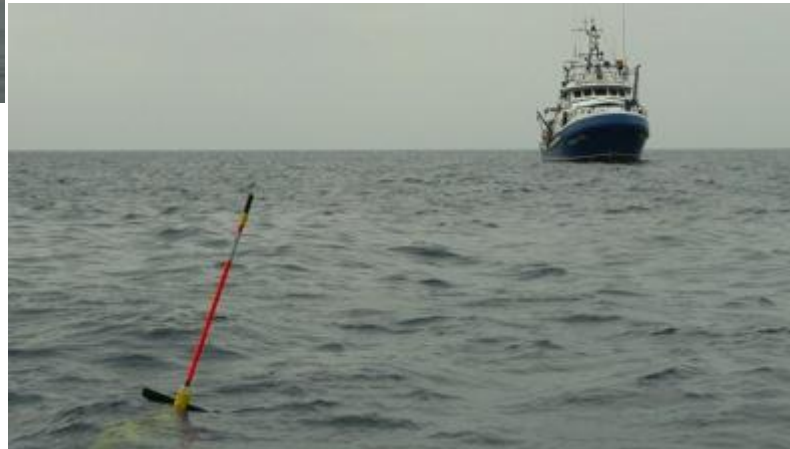
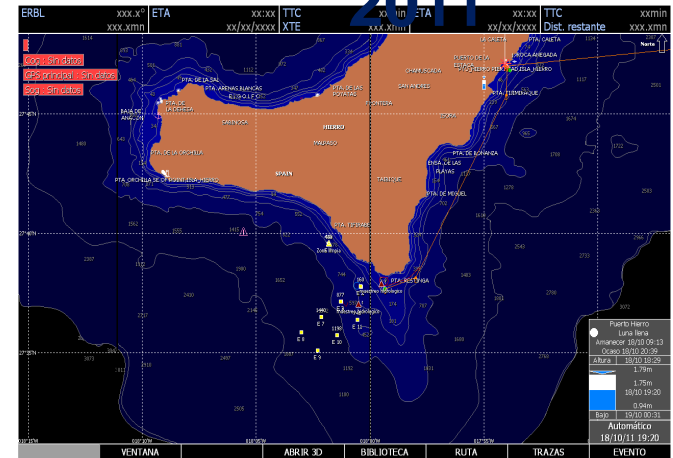


- Slocum G2 Glider
- Madeira (PT)
- Deployment: 12th September 2011
- Recovery: 29th September 2011



GLIDER MISSIONS-El Hierro October

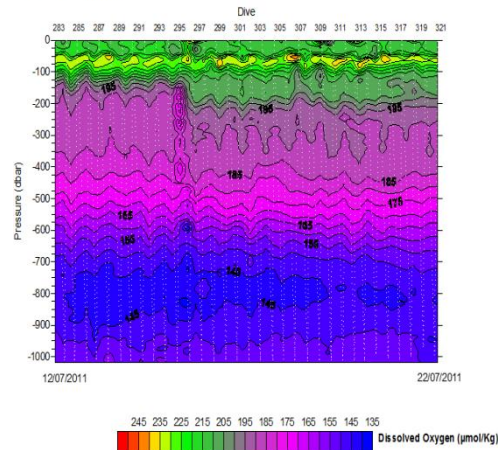
2011



MISSIONS- ESTOC 2011-2012



29°N Section



ESTOC permanent glider monitoring program (Slocum, Spray and Seaglider)



Thank you

