TOSCA
Cruise Plan

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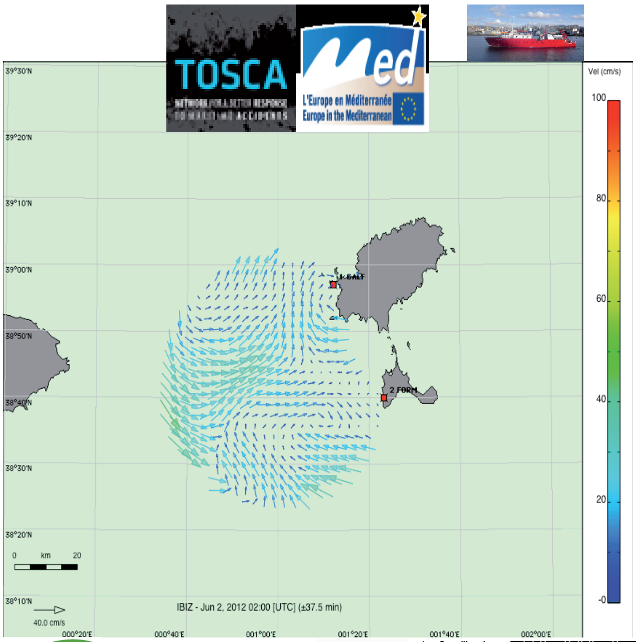
October 25-29 2012



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Contents

This cruise is designed to provide "*in situ*" data for TOSCA project in the Baleric Sea area. The experiment involves three Spanish institutions (IMEDEA-UIB, IIM-CSIC and SOCIB) with the collaboration of SASEMAR, TEI Piraeus and OGS.

1 Objectives

The TOSCA system developed in CP4 will be applied in the Balearic Sea experiment in a virtual crisis. Search and Rescue (SAR) exercises will be performed by using drifters with appropriate drogues to simulate a drifting body and/or a dummy provided by SASEMAR. Oil spill events will be simulated using especially designed drifters. Performance skill of the operational TOSCAv1.0 tool will analysed during the experiments.

The objective of this regional experiment is therefore.

- First to validate the model components (met-ocean data and the Lagrangian module) developed in TOSCA
- To test the service functionalities implemented at that time ,ıı.e. TOSCAv1, met-ocean models, and data (Hf-radar, buoys, etc.).
- Identify gaps and/or poorly resolved physical processes in order to improve the available tools
- Realize a "*visrtual crisis*" experiment merging all available tools (met-ocean) and data (drifters, CTD, HF-radar and glider). This will increase our knowledge on the different components of the system.

2 Introduction

The area of study correspond to the Ibiza channel. The Balearic Channels are important passages for the meridional exchange between the cooler, more saline waters of the northern basin and the warmer, fresher waters of the southern (Algerian) basin of the western Mediterranean. The Northern Current carries northern waters from the Gulf of Lions southward along the continental slope in the Balearic Sea. This current bifurcates as it reaches the northern end of the Ibiza Channel. The main branch proceeds southward and crosses the sill carrying cool and salty water into the Algerian Basin, while the minor one is retroflected cyclonically and returns to the north- east forming the Balearic Current that crosses the continental slope of the islands (see Pinot et al. ,2002 for more details) . This latter current is also fed by warmer, fresher southern waters from the Algerian Basin, which flow northward through both channels. Therefore, the channel is a highly dynamical area where many different quasi permanent currents interact. Besides, the domain is partially covered by the High-frequency(HF) Radar operated since August 2012 by SOCIB (Figure 1).

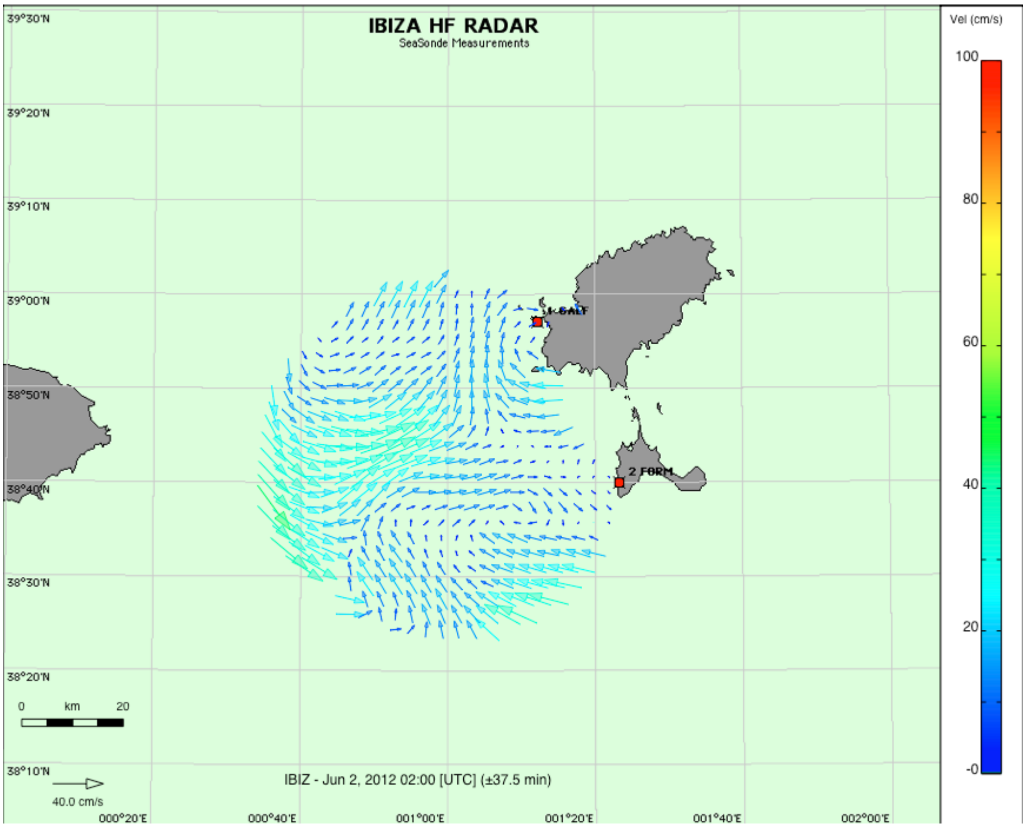


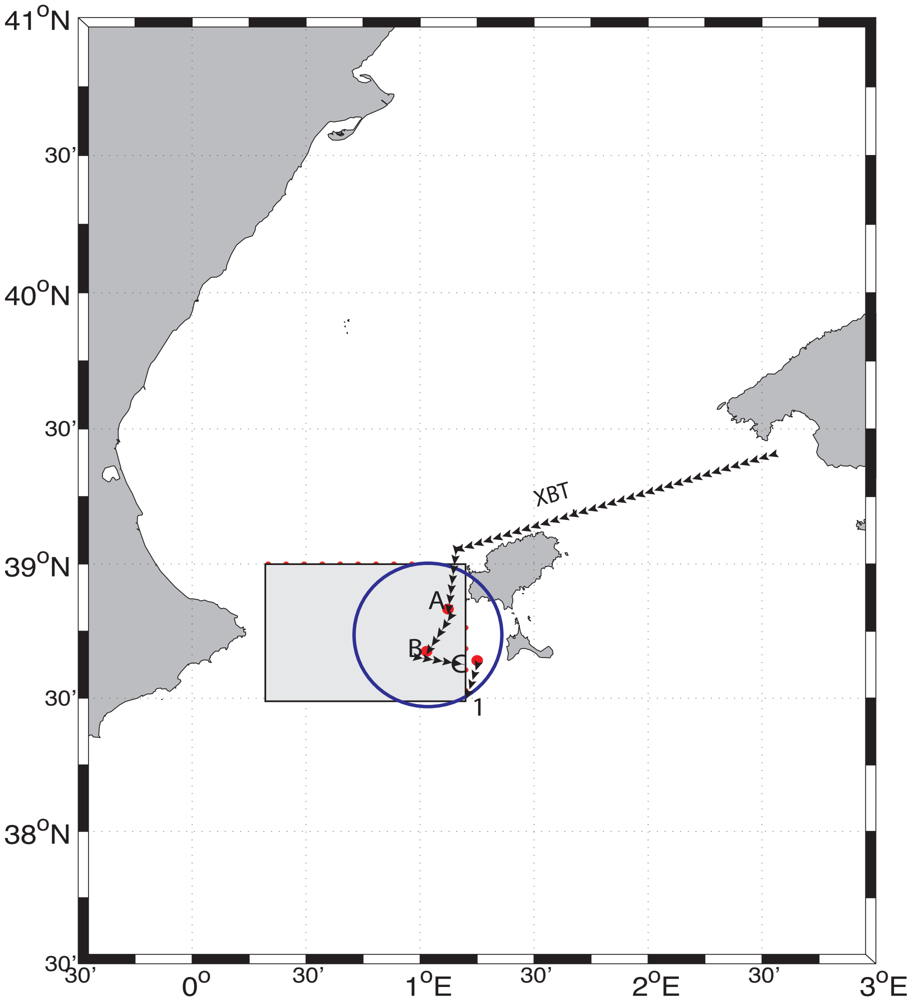
Figure 1: Snapshot of surface currents measured by the HF-Radar.

This instrument propagates a vertically polarized HF signal at the ocean surface resulting in scattered radar electromagnetic waves (Bragg scattering) . By using 2 or more antennas looking at different viewing angles the radial velocity components can be summed obtaining the total surface velocity. The radar provides the 60' averaged eulerian surface currents . HF-radar technology provides a relative low man supervised technology providing continuous data. The shortcoming of this technology is that some subjectivity is added in the post processing in order to get the final current maps. One of the objectives after the cruise is to reduce possible errors derived from the post processing.

On the other hand, Lagrangian drifters are widely used for tracking ocean currents. Drifters provide the inferred Lagrangian velocity by a dynamic positioning via GPS and have been widely used as proxies of oil spills or floating objects on the ocean surface. Trajectory from drifters have recently applied in conjunction with HF-Radar (and numerical models) in order to improve the quality of observations.

In the frame of Med TOSCA Project an Oil spill and Search and Rescue operational system has been developed. The numerical component of the system implemented in the Western Mediterranean Sea, provides the forecast of a possible oil spill or SAR scenario using met-ocean data. These met ocean component in the Western Mediterranean Sea is the so-called WMEd model which is the ROMS model forced with the HIRLAM meteorological predictions. The numerical component provides operationally the ocean currents and the near surface wind velocities in a 72 hours horizon.

The TOSCAbalex (TOSCA balear experiment) is planned for October 25$^{\text{th}}$-October30$^{\text{th}}$ in the R/V Garcia del Cid (CSIC). The are of study is a box between longitudes 0^o 20' E and 1^o 20' E and latitudes 38^o 10' N and 39^o 20' N (box in Figure 2).



The area covered by the Hf-Radar is displayed by the blue circle. The cruise consist in the acquisition of three different set of data and two operational experiments. The data to be acquired is basically:

1. CTD. A total of 78 CTD casts grouped in 7 transects perpendicular to the main flow. The CTD grid spacing is ≈ 8.5 km in order to study submesoscale dynamics.

2. XBT's. Two XBT transects during the transits from the Port of Palma to the study site (See Figure 1).

3. Lagrangian drifters ⟶ 7 Iridium drifters (3 MLI, 2 Albatros, 2 Tosca) and 6 GSM (4 Albatros + 2 Tosca). Eventually 1-2 CODE drifter from OGS.

4. ADCP. During navigation.

5. Glidder. On the CTD transect of 39^o N a Slocum glider will measure T-S profiles between October 25^{th} to October 30^{th}.

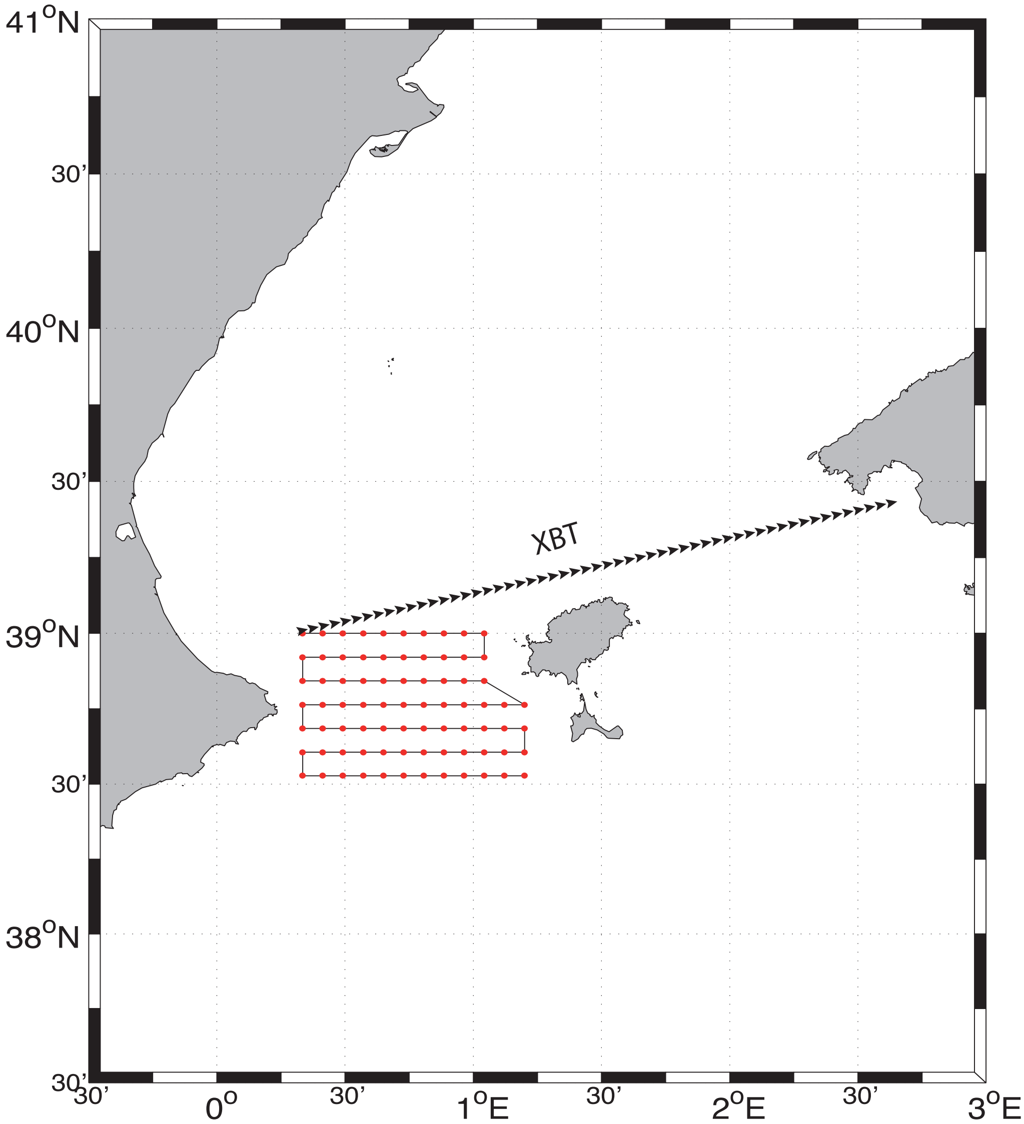
6. HF-Radar coverage in the blue circle marked on Figure1.

Besides, the WMED operational model will be run on the CTD domain (black rectangle in Figure 1) during the cruise. Data from the experiment will be used off-line to initialized the numerical component. Before the cruise the different available satellite images (as well as possible satellite tracks coinciding in time and space) will be analyzed.

3 Cruise plan

- The cruise leaves the Port of Palma on October 25th at 00.00 on transit to the south-West of Ibiza. During the transit, XBT will be launched 5 miles.
- At ≈ 7 miles south of Es Vedra (38^o 50' N, 1^o 5' E. At this point (Position A on Figure 2) where two GSM Albatros drifters will be deployed (with the small drogue).
- The ship will navigate to the South up to the point 38^o 35' N, 1^o E where two MLI Iridium ballasted drifters will be deployed (Position B on Figure 2) .
- The third drifter-group deployment will be south west of Formentera Island (38^o 35' N, 1^o 17' E) where two Albatros-MLI ballasted drifters will deployed (Position C on Figure 1).
- After drifters deployment the CTD cruise will start on CAST 1 (Appendix 1). A total of 78 CTD casts sperated 8 km (Figure 3), will be done at depths ranging from 150 m to 1100 m (Appendix 1).
- After CAST 78 the ship will return to the Port of Palma launching during the transect another set of XBTs spaced 5 miles.

During the experiment, the Spanish Search and Rescue Agency (SASEMAR) will eventually participate with the available media (maritime and/or aerial). The possibility of deploying a virtual spill with SASEMAR facilities (*e.g.* rice shell or fish oil) are are still under study.



41°N
30'
40°N
30'
39°N
30'
38°N
30'
30'
0°
30'
1°E
30'
2°E
30'
3°E
XBT

4 Personnel involved

Participant	Birth date	DNI/PASSPORT
Alejandro Orfila Forster (AO)*	06/09/1970	43069431E
Ananda Pascual Ascaso (AP)*		XX
Simón Ruiz Valero (SR)*		XX
Emilio García Ladona (EG)		XX
Amaya Álvarez Ellacuría (AA)		XX
Juan M. Sayol España (JS)	10/02/1987	20845326N
Lionel Renault (LR)	19/12/1980	Y0666922M)
Benjamín Casas Perez (BC) 03/07/1972	31264588K	
Lucio Bellomo (LB)	22/06/1983	AS 2552557

4.1 Turns and roles

	Morning (08.00-16.00)	Evening (16.00-00.00)	Night (00.00-08.00)
CTD/XBT	AP-EG-LB	AA-LR	AO-JS
ADCP	LB-BC	SR-LR	AO-JS
DRIFTERS	BC-EF-AP	AA-SR	AO-JS

4.2 TODO

Drifters. Benjamin Casas & Amaya Alvarez

Eventually between 12-20 Iridium drifters and 4 GSM.

- Check Albatros GSM drifters (GSM cards with Miguel Martinez Ledesma).
- Check Albatros GSM drogues.
- Check Albatros Iridium drifters (with Daniel Roig)
- Check Albatros Iridium ballast
- Initialize on October 18^{th} Albatros Iridium contract.
- Check MLI Iridium drifters (with Irene Lizarran-Carlos Castilla)
- Check MLI Iridium ballast (with Irene Lizarran-Carlos Castilla)
- Initialize CLS contract on October 15^{th} (with Irene Lizarran and Carlos Castilla)
- Check TOSCA-Tei Pireus drifters (with Alejandro Orfila) (they should be at Imedea before October 10^{th})
- Check ICM drifters (with Emilio GarcÃa Ladona)
- SOCIB repository and on real time visualization (with Kristian Sebastian)
- Data on board. Recovery of drifters.
- Fungible needs?

XBTs. Emilio Garcia-Ladona

- Check XBts
- Load to the ship
- Coordinate first launching w/ A. Orfila and J.M. Sayol (First turn).

ADCP. Simon Ruiz

- Check ADCP performance (w/ Arturo castellon)
- Check and coordinate ADCP technician (w/Arturo Castellon)
- ADC data storage (disk?).

Satellite tracks. Ananda Pascual

- Check track
- Check new launch

Modelling. Lionel Renault

- Prepare area for on and off line modelling
- Met/ocean data on board?
- Modelling storage needs?

Glidder track. Alejandro Orfila

- Check glider launch (with glidder facility)
- Data on board

CTD. Alejandro Orfila, Simon Ruiz, Emilio Garcia Ladona

- CTD record
- CTD data storage
- Post-processing.

APENDIX 1. CTD LIST

Number	mboxlongitude	latitude	depth (m)
Section#1			
1	1.1167	38.5556	221
2	1.0426	38.5556	456
3	0.9685	38.5556	533
4	0.8944	38.5556	547
5	0.8204	38.5556	732
6	0.7463	38.5556	866
7	0.6722	38.5556	749
8	0.5981	38.5556	685
9	0.5241	38.5556	442
10	0.4500	38.5556	179
11	0.3759	38.5556	102
12	0.3019	38.5556	87
Section#2			
13	0.3019	38.6296	81
14	0.3759	38.6296	110
15	0.4500	38.6296	154
16	0.5241	38.6296	399
17	0.5981	38.6296	673
18	0.6722	38.6296	778
19	0.7463	38.6296	820
20	0.8204	38.6296	702
21	0.8944	38.6296	357
22	0.9685	38.6296	264
23	1.0426	38.6296	264
24	1.1167	38.6296	105
Section#3			
25	1.1167	38.7037	108
26	1.0426	38.7037	193
27	0.9685	38.7037	261
28	0.8944	38.7037	438
29	0.8204	38.7037	733
30	0.7463	38.7037	860
31	0.6722	38.7037	847
32	0.5981	38.7037	806
33	0.5241	38.7037	563
34	0.4500	38.7037	239
35	0.3759	38.7037	258
36	0.3019	38.7037	114
Section#4			
37	0.3019	38.7778	81
38	0.3759	38.7778	187
39	0.4500	38.7778	535
40	0.5241	38.7778	703
41	0.5981	38.7778	798
42	0.6722	38.7778	820
43	0.7463	38.7778	849
44	0.8204	38.7778	737
45	0.8944	38.7778	579
46	0.9685	38.7778	339
47	1.0426	38.7778	149
48	1.1167	38.7778	119

Section#5			
Number	mboxlongitude	latitude	depth(m)
49	1.1167	38.8519	121
50	1.0426	38.8519	224
51	0.9685	38.8519	463
52	0.8944	38.8519	626
53	0.8204	38.8519	743
54	0.7463	38.8519	768
55	0.6722	38.8519	701
56	0.5981	38.8519	721
57	0.5241	38.8519	603
58	0.4500	38.8519	271
59	0.3759	38.8519	136
60	0.3019	38.8519	106
Section#6			
61	0.3019	38.9259	121
62	0.3759	38.9259	157
63	0.4500	38.9259	360
64	0.5241	38.9259	655
65	0.5981	38.9259	805
66	0.6722	38.9259	797
67	0.7463	38.9259	848
68	0.8204	38.9259	790
69	0.8944	38.9259	665
70	0.9685	38.9259	452
71	1.0426	38.9259	158
72	1.1167	38.9259	120
Section#7			
73	1.1167	39.0000	156
74	1.0426	39.0000	389
75	0.9685	39.0000	634
76	0.8944	39.0000	776
77	0.8204	39.0000	875
78	0.7463	39.0000	957
79	0.6722	39.0000	977
80	0.5981	39.0000	922
81	0.5241	39.0000	780
82	0.4500	39.0000	722
83	0.3759	39.0000	289
84	0.3019	39.0000	173