WP4 and WP1: Science strategy in JRAPs

Ingrid Puillat (Ifremer)
jerico@ifremer.fr

JERICO-NEXT HF Radar Workshop
San Sebastian, Spain, 11 march 2016

JERICO-NEXT: Quicklook

Important figures

- Duration: Sept. 2015- Aug. 2019, 4 years
- EU funding: 10M€
- Consortium: 34 partners, 910 MM
- Organisation: 9 WPs + STAC + Label committees (3)
- Coordination: Ifremer: **jerico@ifremer.fr**
- 66 deliverables, 63 milestones

JERICO-NEXT: Quicklook

LIST of WPs

- WP1 - Integrated Science Strategy and Governance from local to European Scales (**COVARTEC**, CNRS-EPOC)
- WP2 - Harmonization of technologies and methodologies - technical strategy (**OGS**, HZG)
- WP5 - Data management (**HCMR**, EuroGOOS)
- WP8 - Outreach, communication and engagement (**Blue Lobster,** CEFAS)
- **WP6** - Virtual Access (**CEFAS**)
- **WP7** - Transnational Access to Coastal Observatories (**CNR-ISMAR**)
- WP3 – Innovations in Technology and Methodology (**HCMR**, Ifremer)
- WP4 - Valorisation through applied joint research (**Ifremer**, CNRS-EPOC)

Networking Activities **Transnational Activities** **Joint Research Activities**

JERICO-NEXT: Quicklook

…The JERICO mind…

- **The JERICO-NEXT community**

  “ We cannot understand the complexity of the coastal ocean if we do not understand the coupling between physics, biogeochemistry and biology.”

→ **new technological developments for continuous monitoring of a larger set of parameter**

→ **a priori definition of the optimal deployment strategy**

- **JERICO-NEXT focus**

  - interactions between physics, biogeochemistry and biology

  - not restricted to pure technological aspects : include fundamental scientific considerations

WP1 : Integrated Science Strategy and Governance from local to European Scales

D. Durand- Covartec (NO)
A. Grémare - CNRS-EPOC (FR)

WP1 : Tasks and organisation

- **Task1.1: Literature review** (S. Painting, **CEFAS**) M1-M18
  - main environmental issues and threats and how they are presently tackled through European organizations, initiatives and projects
- **Task 1.2: Science strategy** (A. Grémare, **CNRS**) M1-M42
  - To tackle key scientific questions about how best to observe physical, chemical and biological parameters in European waters and the adequacy of present observation strategies to meet key scientific and societal challenges in the coastal ocean
  - Science committee – follow-up
- **Task 3 & 4** (C. Arvanitidis, **HCMR**; J. Tintore, **SOCIB**) M1-M42
  - Specific interactions with other relevant European and international ocean observing systems and infrastructures that provide complementary observations of biological (task 1.3) and /or physical, chemical (task 1.4) parameters
- **Task 1.5** (P. Gaughan, **MI**) M18-M42
  - Strategy towards sustainability. To look at long term financial and legal governance structures for the sustainable implementation of JERICO-NEXT infrastructures
- **Task 1.6** (P. Farcy**, Ifremer**) M24-M48
  - Roadmap for the future and the JERICO label

Task 1.2: Science strategy

… Societal challenges …

- **key environmental challenges and service and/or policy requirements** on:

MSFD

1) pelagic biodiversity,
2) benthic biodiversity,
3) chemical contaminant occurrence and related biological responses,
4) hydrography and transport,
5) carbon fluxes and carbonate system,
6) operational oceanography.

WP4 : *Valorisation through applied joint research*

I. Puillat – Ifremer (FR)
A. Grémare - CNRS-EPOC (FR)

WP4 Main objectives & organisation

Objectives

- a synthesis of the project
- built upon activities in other WPs,
- gathering the consortium
- around applied **J**oint **R**esearch **A**ctivity **P**rojects (**JRAPs**) according to the 6 JERICO scientific areas
- to put forward the added value of JERICO-NEXT

WP4 Main objectives & organisation

- Coordination: I. Puillat, Deputy coordinator: A. Gremare (CNRS)
- Expected effort: 162 Men months
- 6 JRAPs in line with the 6 JERICO scientific areas:
  - JRAP-1 on pelagic biodiversity (B. Karlson, SMHI)
  - JRAP-2 on benthic biodiversity (A. Grémare, CNRS)
  - JRAP-3 on chemical contaminant occurrence and related biological responses (L. Nizzetto, NIVA)
  - JRAP-4 on hydrography and transport (A. Rubio, AZTI)
  - JRAP-5 on carbon fluxes and carbonate system (L. Laakso, FMI)
  - JRAP-6 on operational oceanography (B. Mourre , SOCIB)

JRAPs in WP4

JRAP #	lead	Partners	Sites
1	B. Karlson, SMHI	SMHI, CEFAS, CNRS-LOV, CNRS-Univ Litt, CNRS-MIO, Deltares, Ifremer, NIVA, RWS, SYKE, VLIZ, and DAFF	Northern Baltic, Kattegat-Skagerrak, Eastern Channel and Southern North Sea, Bay of Biscay, Ligurian Sea, Benguela Current
2	A. Gremare, CNRS-EPOC	CNRS-EPOC, HCMR, Ifremer-Benthos, CNRS-UBO	Gironde estuary, Aegean Sea , Brest estuary
3	L. Nizzetto, NIVA	NIVA, HZG, IMR, IRIS, CEFAS	North Sea, Norwegian Sea (possibly Baltic and Biscay Bay)
4	A. Rubio, AZTI	AZTI, Ifremer, CNR-ISMAR, CNRS-MOI, CNRS-LEGOS, CMCC, HZG	SE Bay of Biscay, NW Med. sea, German Bight
5	L. Laakso, FMI	FMI, SYKE, NIVA, SMHI, HZG, HCMR, CNR , CNRS -SBR	Baltic Sea, Med Sea, Norwegian Shelf, Barents Sea, North Sea, West channel, Bay of Biscay
6	B. Mourre, SOCIB	SOCIB, IH, AZTI, CMCC, CNR, FMI, HCMR, IMR	Ibiza Channel, Adriatic Sea, South Bay of Biscay, Aegean Sea, Portuguese Nazare Canyon area, Baltic Sea, Norwegian Sea

STAC Advice after the KO meeting

- Give a proper place to technology development but avoid overflow from WP3 to WP4 and emphasize the important work of WP2/WP5: data quality is the ultimate yardstick!
- Make an effort to well identify the user communities, which much important for VA/TNA. Create 'Jerico extended family' using VA / TNA strategically for this
- Focus JRAPs on 'useful knowledge production' for a better and real integration between disciplines (physics to biology) and extrapolation from the shelf to the coastal seascape (links with models and upscalling problems).
- Formalise products at # levels
- Contribute to the definition of Essential Ocean Variables (EOV) adapted to the coastal systems.

Time line until Aug. 2017

Time Line	MS/D/WS	Actions	WPs	Validation criterias
Sept.15 (M1)	MS43	Presentation of JRAP projects during KO meeting. Presentation of WP4 activities and time schedules agreed with WPs and partners. Actions with WP1 & 8 planed.	WP4, WPs	Reported in a KO meeting report
Mar. 16 (M7)	MS4	Strategic guidelines for the implementations of the JRAPs…. OI London 15 march	WP1,	Guidelines communicated to and
May 16 (M9)	D4.1	Present approaches to monitor European coastal seas (Covartec)		
Sept. 16 (M13)	D4.2	Progress report #1 (Ifremer)		
Feb. 17 (M18)	MS44/ **WS#1**	**WP4 Workshop#1:** Presentation of JRAP progress, highlighting links with other WPs .	WP4, WPs	Reported in WP4 workshop#1
Aug. 17 (M24)	**D4.3**	**D4.3 Progress report #2 (Ifremer)**	**WP4**	

How to reach the deadline?
Process set up after the KO meeting

KO meeting

- STAC: more integration
- Presentation of deadlines

Oct. 2015-Jan 2016

- Survey: integration vs funding
- Strategy: first description, brainstorming, commonalities in place and time (ppt)
- Data survey (WP5)

Jan-Mar 2016

- Debriefing of the surveys
- Template of D4.1 and organisation of it
- First draft D4.1

March 2016

- Debriefing of JRAP inputs
- Presentation during the Joint WP4 & 1 workshop 15 March in London

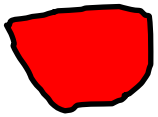
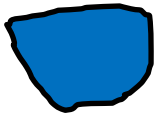
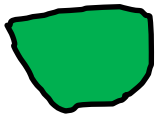
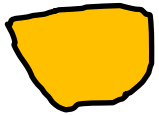
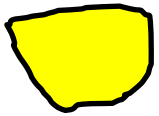
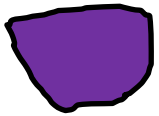
April May 2016

- D4.1 Version 2 the 15 April
- D4.1 version 3 the 15 may
- Presentation of the final version : SC meeting 23-24 may, Brussels, sending to EC

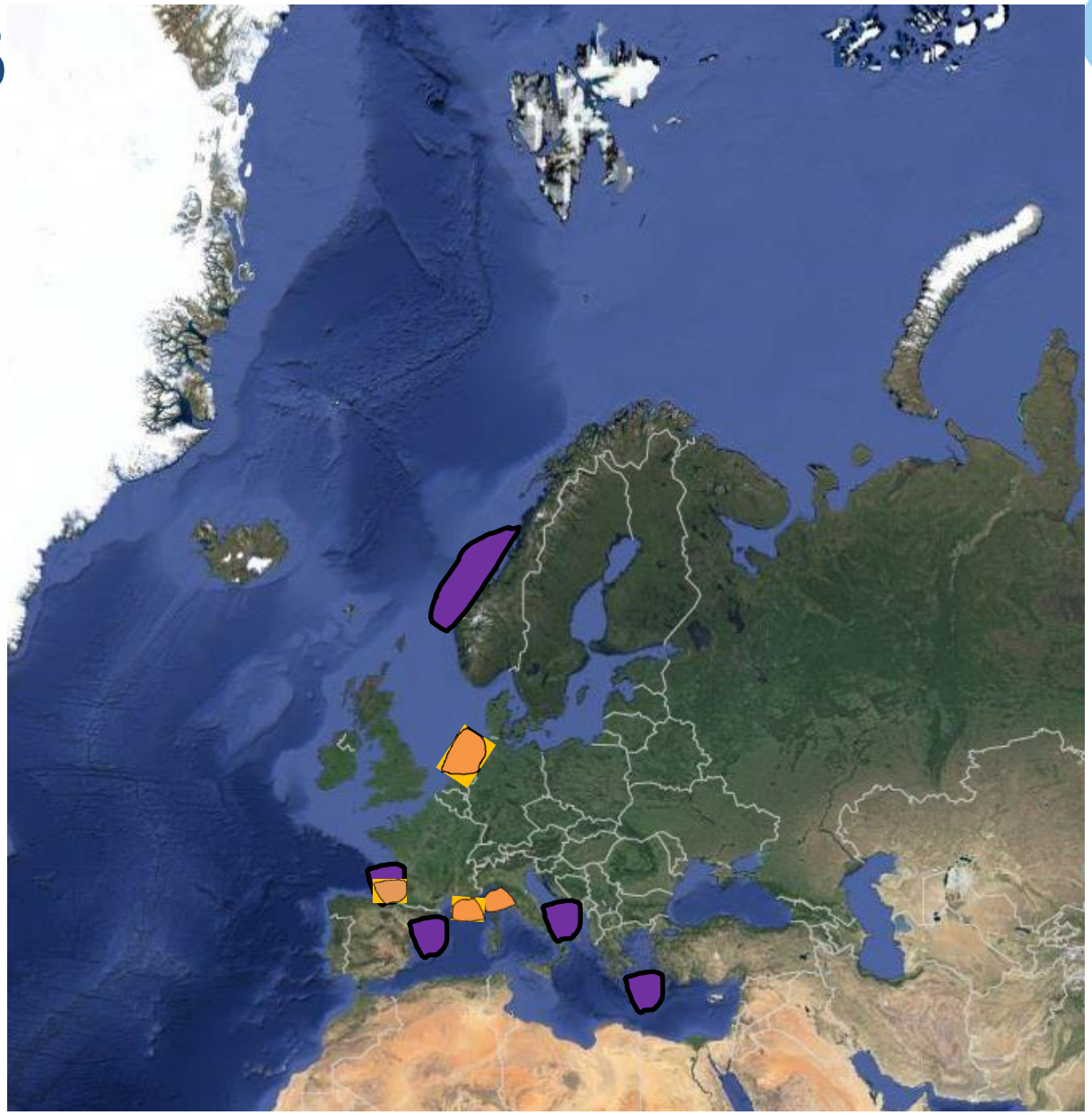
Debriefing after the first surveys

- Consensus: no funds reallocation in each JRAPs to organise an integrating activity
- Commonalities in time an place are not sufficient to make science intagration, need to go further ahead…
- Template of D4.1 adapted to answer and populated
- WP5 gathered most of the data surveys.

JRAPs: dates and periods

	Area	Route	Fixed	Calibration/other activity
•JRAP #1				A
•JRAP #2				A
•JRAP #3				A
•JRAP #4				A
•JRAP #5				A
•JRAP #6				A

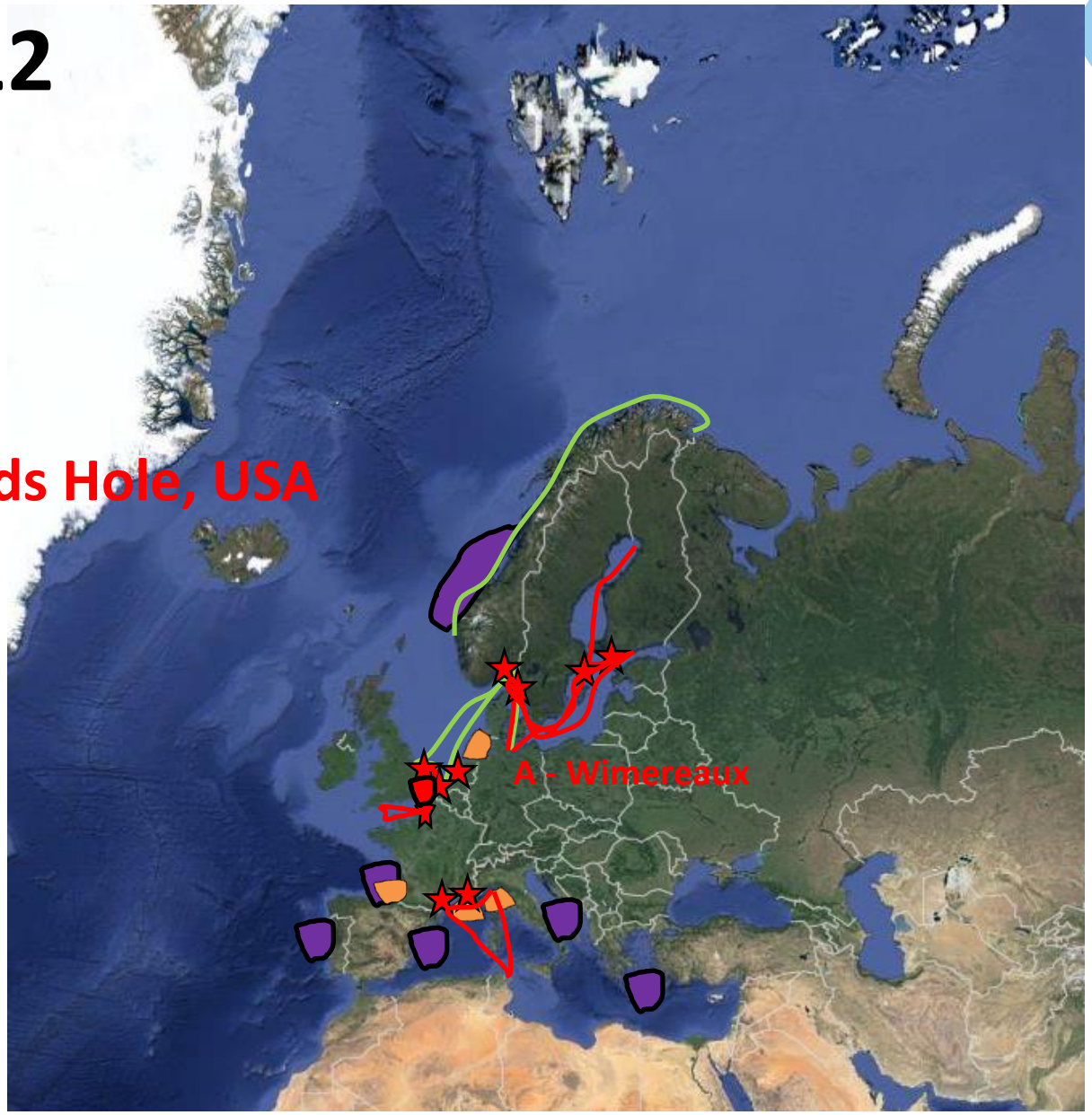
M1-6



JRAP#1
JRAP#2
JRAP#3
JRAP#4
JRAP#5
JRAP#6

M7-12

A – Woods Hole, USA



JRAP#1
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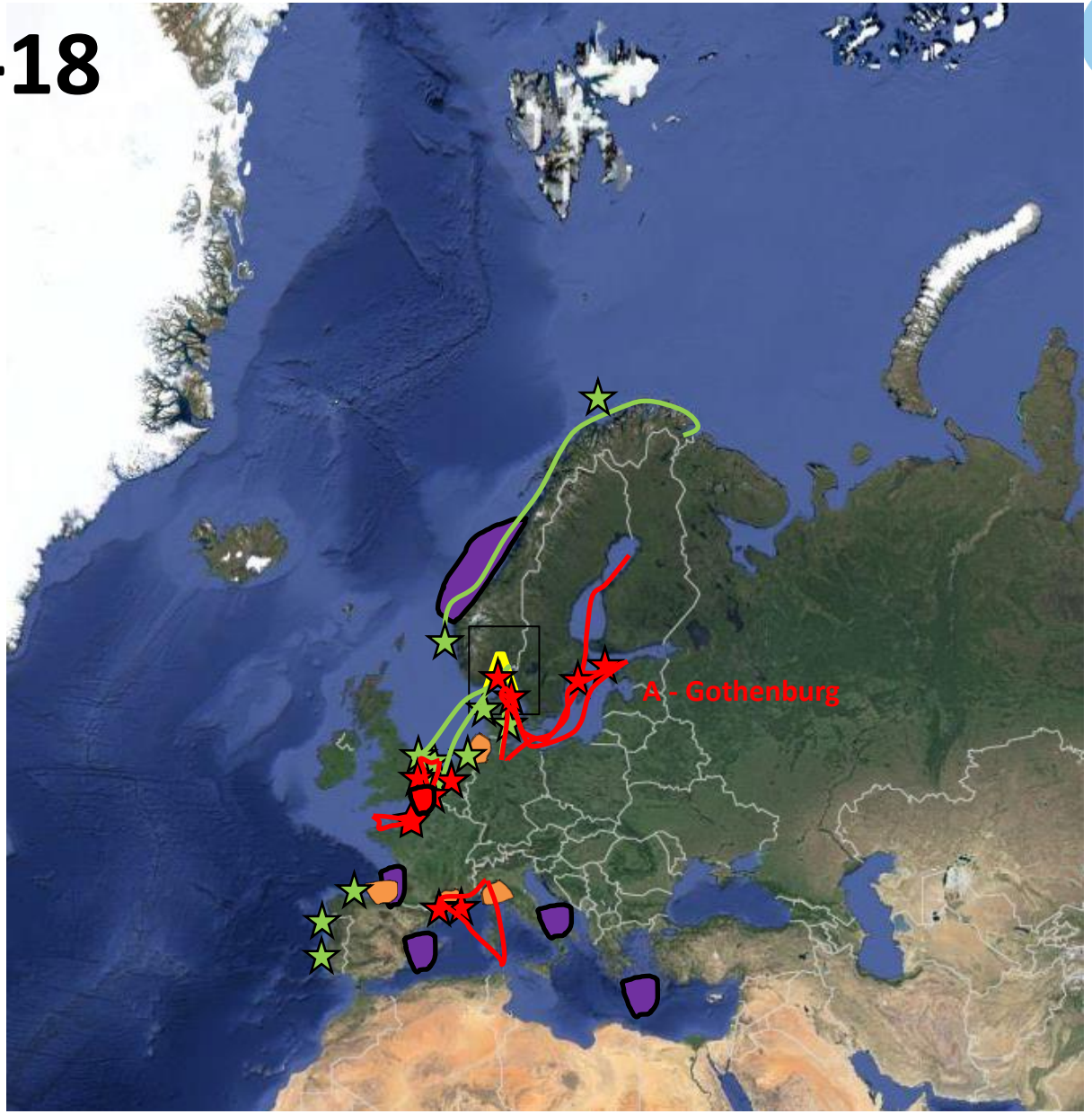
JRAP#3
JRAP#4
JRAP#5
JRAP#6

M13-18



JRAP#1
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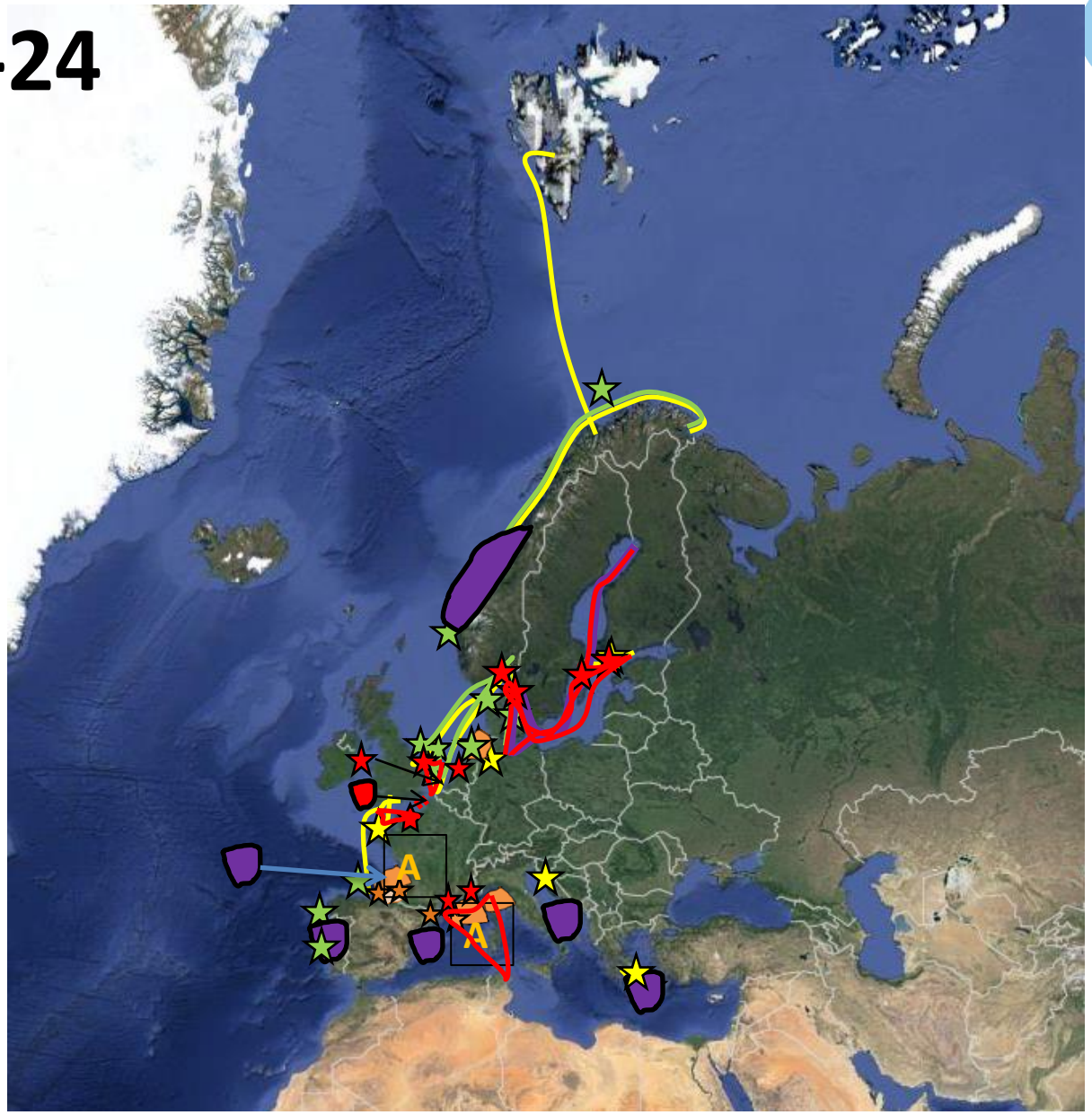
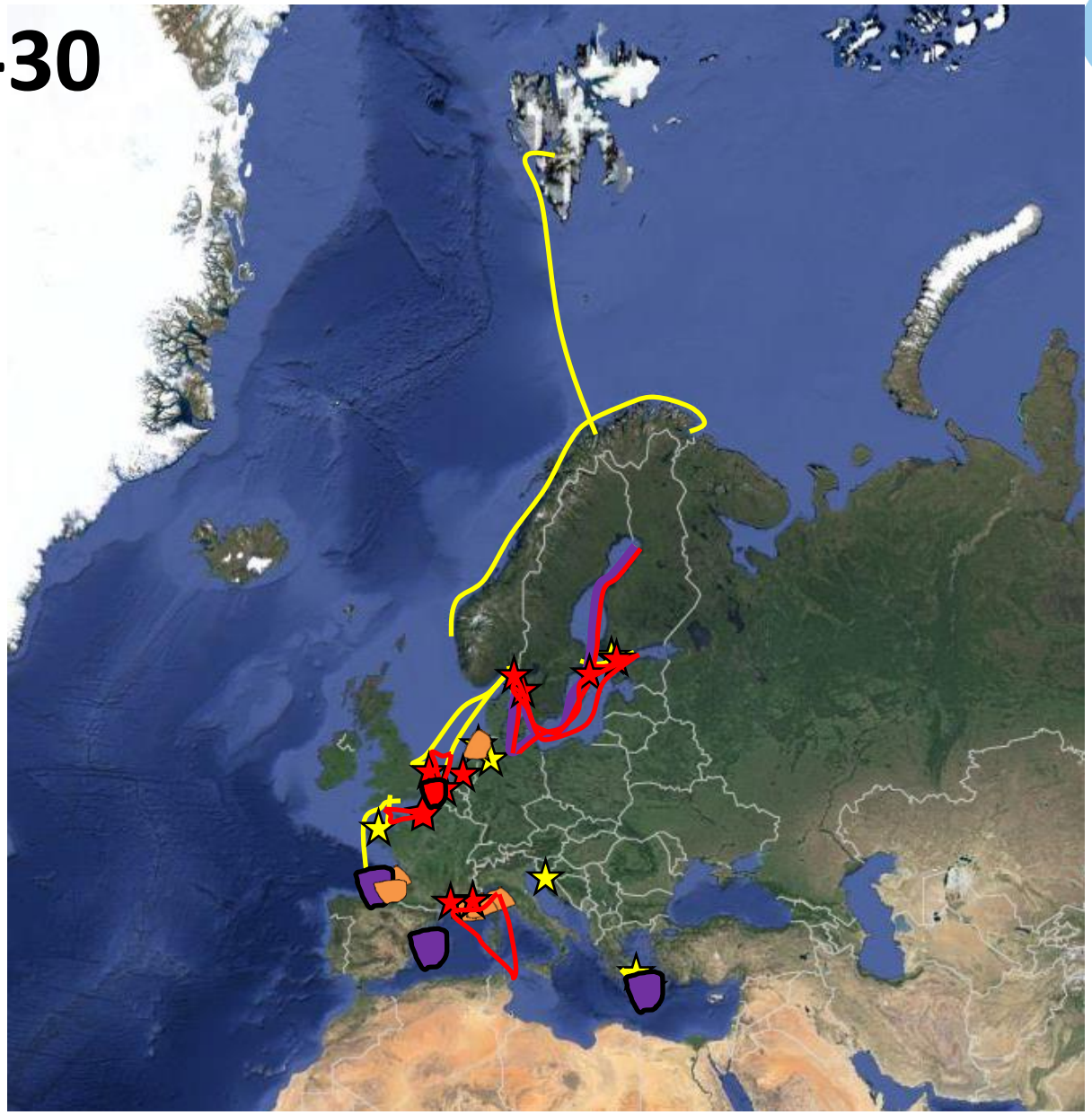
JRAP#6

M19-24



JRAP#1
JRAP#2
JRAP#3
JRAP#4
JRAP#5
JRAP#6

M25-30



JRAP#1
JRAP#2
JRAP#3
JRAP#4
JRAP#5
JRAP#6

D4.1, version 1, General Debriefing

- Important heregeneity in the level of given information
- Often the scientific questions were too general: go more toward details
- We know that societal/policy questions are not the only main driver for some specific areas/activities: don't hide the truth behind. There is more science in some places, and more societal questions in some others.
- Give more details about the sampling: maps, frequency etc.

Research projects are expected, not enganging you when the true life will swallow them!

D4.1, version 1, JRAP #4 specific Debriefing

- **The text is of good quality and fit the overall objectives of WP4.**

- To our knowledge, there might be some wave buoys moored in the Bay of Biscay that are currently not mentioned. Could you add something about that? Localization?

- Please clarify cross-cutting and links with JRAP 3. As well actions planned in JRAP 6 (i.e. coupling gliders and moorings) seem to rely on the same infrastructure than in this JRAP.

In that sense, could you clarify the links and complementarity with JRAP 6? It is mentioned that some joint analyses between JRAP4 and 6 are to be performed. Could you elaborate on this and clarify the complementarity and interdependency between the two JRAPs.

D4.1, version 1, JRAP #4 specific Debriefing

- There are to our point of view, more MSFD descriptors than currently listed, that JRAP 4 could contribute to assess.

- Expected progress beyond the state of the art could be a more specific, since they are already pretty well presented all along the rest of the JRAP description.

- In London we expect to have a discussion between JRAP-3, 4 and 6 on the coupling hydrodynamics/contaminants in term of physical (JRAP-4) and biochemical processes (JRAP-3), and modelling/forecasting capability (JRAP-4 and 6). The BoB could be an ideal co-location for integrating the 3 JRAPs. To be discussed

Thank you for your attention,
& Thanks to them!!!

JERICO-NEXT team, sept. 2015

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654410.

JERICO-NEXT

JOINT EUROPEAN RESEARCH INFRASTRUCTURE NETWORK FOR COASTAL OBSERVATORIES

HORIZON 2020

JRAP#4 : 4D characterization of trans-boundary shelf/slope hydrodynamics and transport

Anna Rubio, AZTI, arubio@azti.es

JRAP INTRODUCTION

i. Coordination, partners

Coordinator	**AZTI-Tecnalia**
Involved institutions	AZTI-Tecnalia, IFREMER, CNR-ISMAR, CNRS, CMCC, HZG
Expected effort	24 MM
Involved JERICO_NEXT Infrastructures (links to TNA, WP7)	HF radar, Offshore buoys, coastal profilers with MASTODON moorings (thermistors), gliders, underwater imaging systems + OSSEs to define best sampling strategy

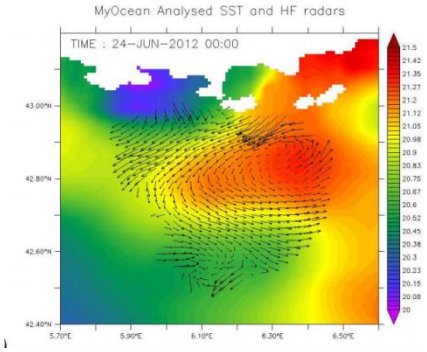
JRAP INTRODUCTION

ii. Main objectives, related scientific and societal questions

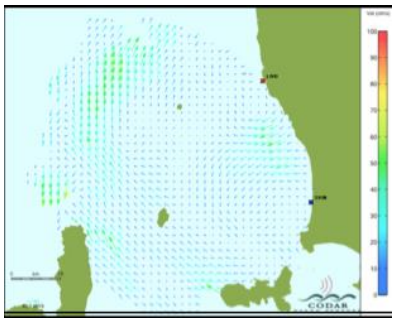
- 4D characterization of shelf/slope circulation and its time variability year-round in three trans-boundary areas, through the joint analysis of multiplatform data of surface currents and hydrology (HF radars, drifters, satellite imagery …) and information from the water column (drifters, moorings, gliders, satellite altimetry, coastal profilers…).

- Quantifying transport by ocean currents and its potential impact on the distribution of floating matter (plankton or other pelagic organism, marine litter…) in line with MFSD main descriptors (7,10 and 2).

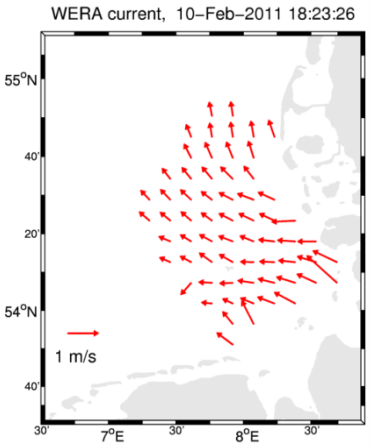
HF radar and SST NW Med Toulon



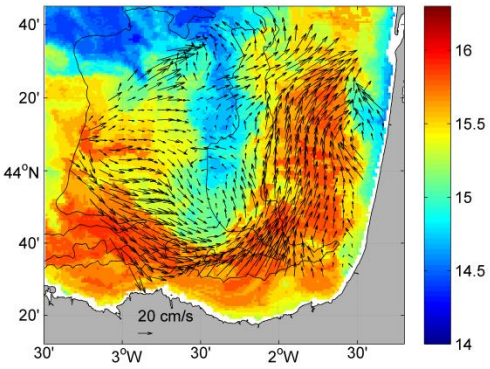
HF radar NW Med Toscana



HF radar German Bigth

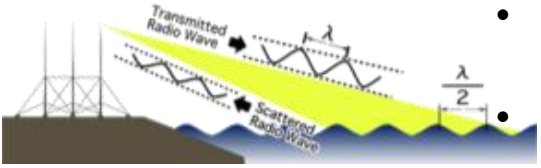


HF radar and SST SE BoB



JRAP INTRODUCTION

ii. Main objectives, societal questions



JRAP #4

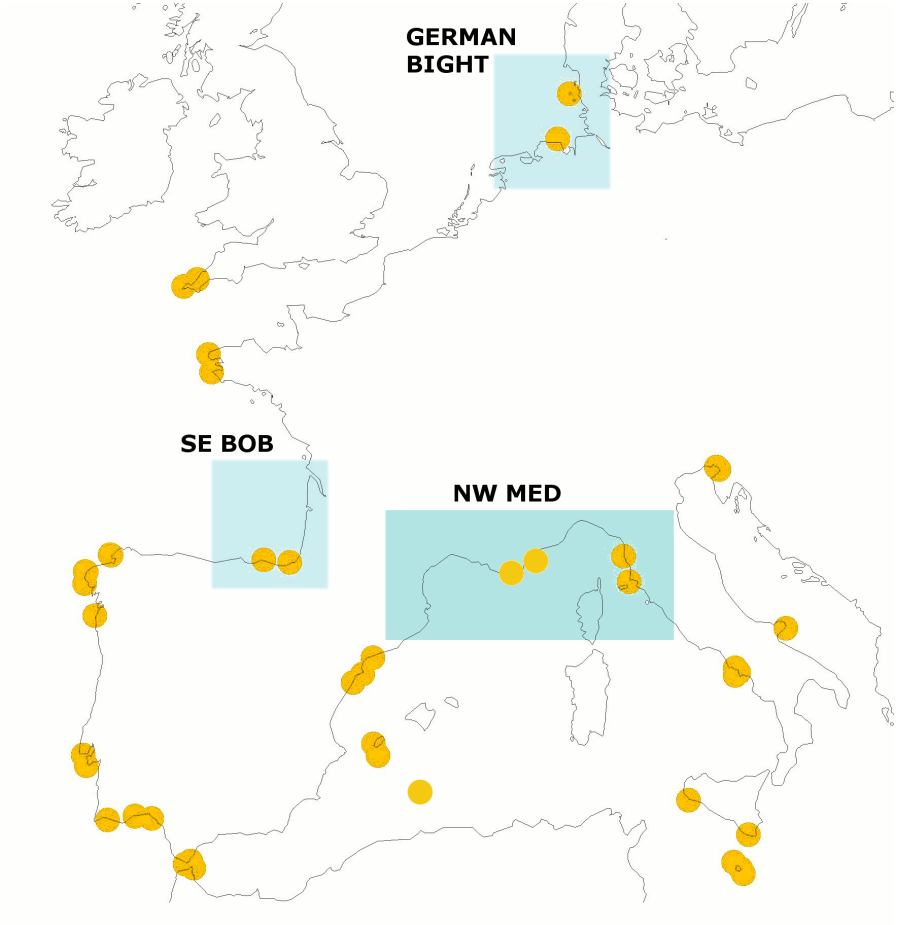
The JRAP#4 aims to contribute to assess the following MFSD descriptors:

- D7 (*Permanent alteration of hydrographical conditions*). JRAP#4 will allow for the continuous monitoring of hydrographic conditions.
- D10 (*Properties and quantities of marine litter*): Marine litter is advected or drifted by marine currents. JRAP#4 will provide information about hydrodynamics and derived transport to infer the spatial distribution (e.g. convergence areas and coastal arrivals) of this not-desirable material.
- D2 (*Non-indigenous species introduced by human activities*): Ocean changes (e.g. ocean warming) induced by the climate change (partly induced by human activities) could be the reason of the arrival of non-indigenous species (including gelatinous organism,s such as the Portuguese man-of-war *Physalia physalis*), with low swimming abilities and whose spatial distribution is highly depending on hydrodynamics

JRAP#4 will also provide inputs for other JRAPs, focused on other descriptors (e.g. JRAP#1, dealing with pelagic biodiversity, which will require information about hydrographical and hydrodynamical conditions and spatiotemporal changes)

SCIENTIFIC STRATEGY

- 3 STUDY AREAS: SE Bay of Biscay, Mediterranean, German Bight
- Demonstration based on HISTORICAL DATA and NEW OBSERVATIONS (SCALES: hourly, > 1 year)
- Observing System Simulation Experiments (*Task 3.7*), used to objectively propose optimization in existing observing network (new HFR antennas, different fixed stations position). Their application will depend on technical and economical criteria



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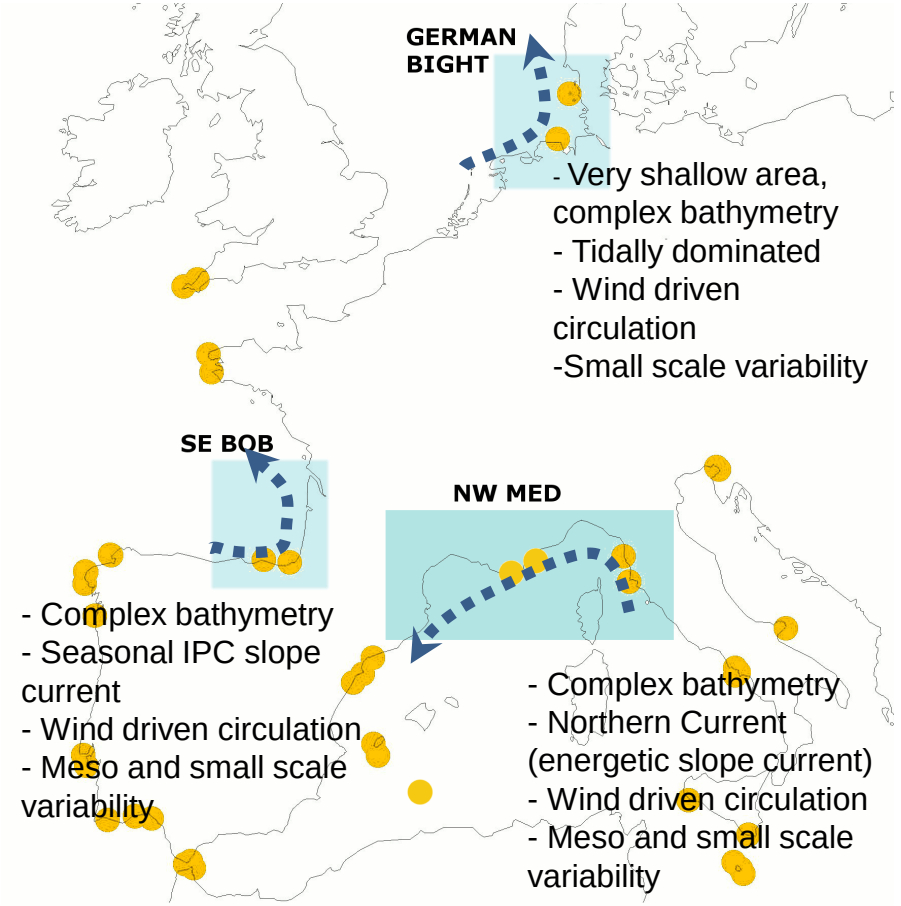


ORGANISATION

T.1 PREPARATION (T4.1.1 - review; 4.1.2 - analysis of nature runs, T4.1.3 discussion of best sampling, 4.1.4 Report to D4.1)

T.2 ONSITE IMPLEMENTATION (4.2.1 - MASTODON, 4.2.2 - HFR, 4.2.3 Extended OSSES, 4.2.4 Auxiliary instruments, 4.2.5 data proce.)

T.3 DATA ANALISYS (4.3.1 Data processing, 4,3,2- Data analysis, 4.3.3. Syntesis and difussion)

END for JRAPs

ii. 48 months time line

		CROSCUTTINGS						
M		WP1	WP2	WP3	WP4 / JRAPs	CC WP5	Specific comment and/or attention to pay	DS and MS
1	sep-15	Joint workshop WP1/WP4 (task 1.2.1)		**3.7.2 (nature runs and OSSES)**	**4.6 - JRAP#6.1 Nature runs**			MS43 (KOM)
5							2HFR CNR-ISMAR	
6		Scientific Committee					**NATURE RUNS READY**	
7		Strategic guidelines for the JRAPs						MS4
9	may-16							**D4.1 JRAPS scientific and monitoring strategy**
10				3.2.1 and 3.2.2 (HFR) and 3.3a (MASTODON)		5.6 (HFR QA/QC)		
12					4.6 RUNS with DA to perform OSSEs - (M12-M40)			D3.11, **D4.2. JRAPS progress (Wp2 andWP3 outcomes)**
18	feb-17	**presentation of JRAPs progress**					**FIRST OSSES RESULTS READY** Feedback for optimal scientific strategy	D1.2 iteration 1, D3.12, MS44 (WP4 workshop 1)
19						5.7 (gliders calibration /data collection)	HF RADAR SE BOB	
20						all tasks in wp5	EXTENSION CNR-ISMAR HFR network and possible complementary observations	
23							MASTODON and DRIFTERS SE BOB	
24	**aug 2017**			**HFR network design + current retrieval algo (D3.1, D3.3)**		all tasks in wp5: data available	HFR + MASTODON SE BOB	D3.1, D3.4, D3.10, **D4.3 JRAP progress (attention to WP5)** MS16
29	jan 2018	1.6: recommendations for improvement						
36	aug 2018					Define how data is delivered to WP5		**D4.4 First results of JRAPS par region (results to WP8, data to WP5)**, MS45 (WP4 workshop 2)
38								Profile coastal water and Mastodon2D D3.5
43	mar-19							D4.5 FINAL RESULTS
44								D1.2 (Scientific strategy)
46			MS46	**Infraestructures final assessment (D3.4)**				MS46 (final WP4 worskshop)

JRAP #4

NEW ON SITE DEPLOYMENTS

WP4 meeting; Mallorca, 29 Sept. 2015

PHASES / TASKS	Start/End	Description
P 4.1 PREPARATION T4.1.1 State of the art concerning hydrodynamics and methods T4.1.2 Analysis of nature runs T4.1.3 Discussion of best sampling strategies T4.1.4 Report JRAP#4 Science Strategy to D4.1	Sep 2015/ May 2016	i. Review using literature/past work at each study area to identify the key points to be considered for 4D estimates ii. Review on methodologies for 4D transport estimations and forecasts (link with TASK 3.2.3 led by CNR-ISMAR) iii. Analysis of the capacity of existing infrastructures to resolve the key processes, reference for demonstrating value-added provided by JERICO_NEXT developments iv. Case by case definition on the planned sampling strategy and the strategy for OSSES to future definition /evaluation of the sampling strategy in order to reach accurate 4D estimates (and the ability to validate them) v. Joint identification of metrics/strategy to asses accuracy of 4D estimations and forecasts and of Lagrangian diagnostics (in relation with MSFD)
P 4.2 ONSITE IMPLEMENTATION T4.2.1 MASTODON T4.2.2 HF RADAR T4.2.3 Analyses of OSSES T4.2.4 Auxiliary instruments T4.2.5 Data processing & analysis	Jun 2016/ Dec 2017	i. JERICO-NEXT infrastructures deployment: MASTODON moorings, HF radar ii. Deployment of auxiliary instruments : Drifters (& gliders) iii. Update of JERICO-NEXT infrastructures: HFR / others. iv. Recovery of JERICO-NEXT and other infrastructures v. Collection of (new and historical)data for multidisciplinary approaches vi. Data collection from deployments; Harmonization of all the outputs. Data analysis for each area and multidisciplinary approaches.
P4.3 DATA ANALISYS T4.3.1 Data processing T4.3.2 Data analysis T4.3.3 Synthesis and diffusion	Jan 2018/ Aug 2018	i. Data analysis for each area and multidisciplinary approaches. ii. Share of the results of each subarea. iii. Integrated synthesis of the results: Output for WP1; Publication and/or presentation in scientific forums of the main results of circulation and transport in trans boundary areas and implications (MFSD and other EU marine policies)
JRAPs END		

RISK AND GAPS

- Risks:
  - Delay in OSSES since several new deployments will depend on them
  - Delay in the deployment of instruments and availability of new data (mostly at the SE BoB where they are starting later)
  - Lack of data from new or existing systems
  - Needed close cooperation with other WPs. Inputs of WP3 (3.2 –HFR, 3.3 MASTODON, 3.7 OSSES) are key for scientific and technical advances in JRAP#4
  - Diversity of processes in study areas
- GAPS
  - The use of numerical model outputs is not explicitely planned for the study of 4D transport

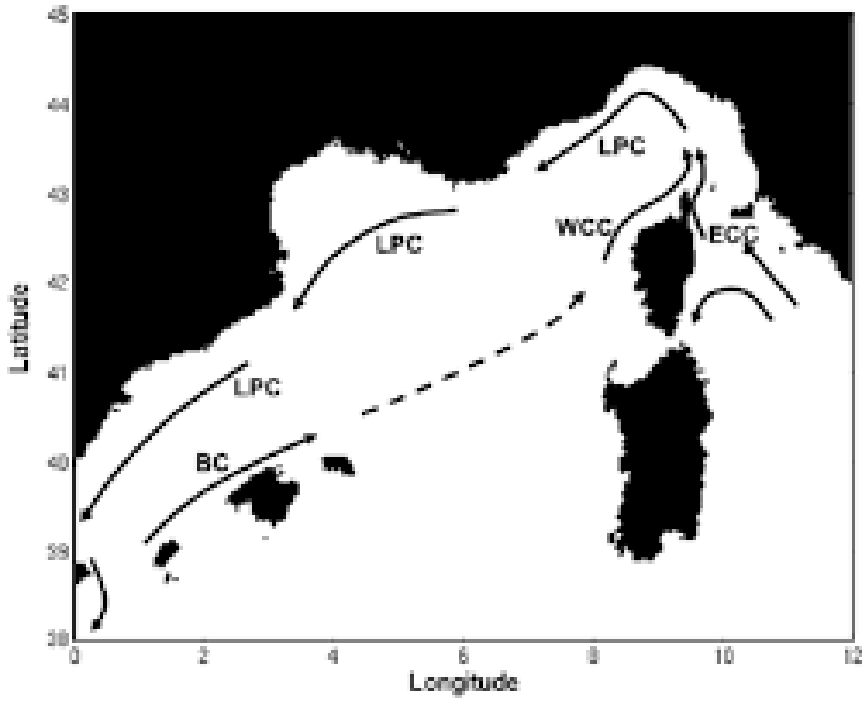
JRAP#4 – STUDY AREAS
North West Mediterranean Sea

Presenter: email

Contributor(s):

JERICO-NEXT HF Radar workshop / San Sebastian / SPAIN / 9th – 11th March 2016

Overview of the study area + background



- Main Feature: Northern Current
- It originates in the Ligurian Sea and flows westward along the Italian- French- Spanish coasts
- Main goal: estimating 4d transport. Transport from surface and water column currents relevant to: oil spills, pollution, biological quantities

Main processes and time/space scales expected in HF radar surface velocities in the region

- Mesoscale menders – geostrophic dynamics;

L meand = 30-40 km; T meand = 10-20 d, 3-6 d; Lz = main thermocline, 200-300 m

- Wind response – ageostrophic dynamics;

T synoptic = 3-5 d, Lz = Ekman layer, 10-30 m (?)

- Submesoscale instabilities – ageostrophic dynamics

T = 1-3 day; Lz = mixed layer, 10-50 m (?)

- Residual currents from inertial motion in presence of fronts. – ageostrophic dynamics

T = 1 day, Lz = mixed layer, 10- 50 m

Main activities in JERICO_NEXT (related ongoing work, new deployments, data analysis, timeline)

- Identify main processes and scales for transport and applications resolved by Hf radars

- Identify appropriate methods to project surface velocity at selected scales in the water column:

  - Data assimilation (DA) methods

  - "fusion" methods with other data in the water column. Possible approach: a) horizontal mode decomposition to separate processes (OMA?); b) vertical projection using stratificaton information from hydrographic data

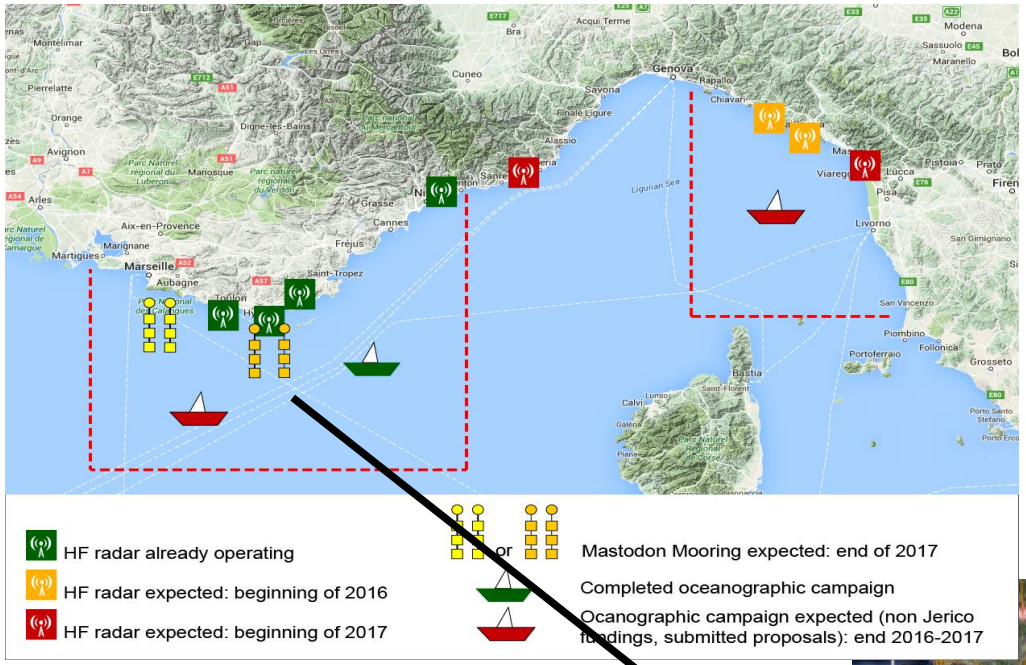
- **Ongoing activities**

- DA: Collaboration with CMCC in the framework of WP3.7 to develop an ensemble Kalman filtering (EnKF) using a regional NEMO model at high resolution

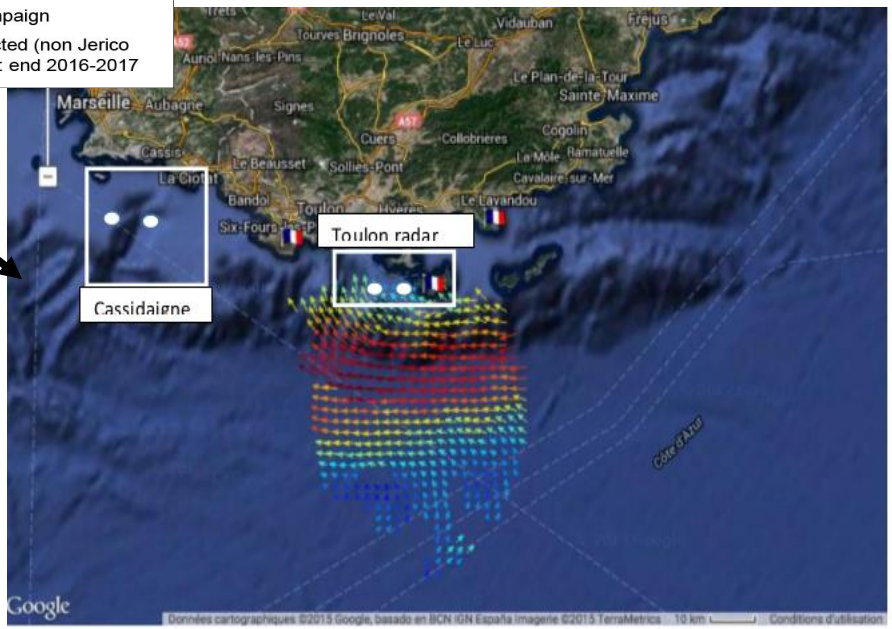
- Analysis of historical data to quantify/test processes and scales. Data from the TOSCA experiment: HF radar, glider sections, drifters.

- Selection of specific scale processes. Expected:
- Geostrophic mendering
- Wind response
- Inertial residual

Data and instrumentations



Mastodon sites of deployment actually in discussion...



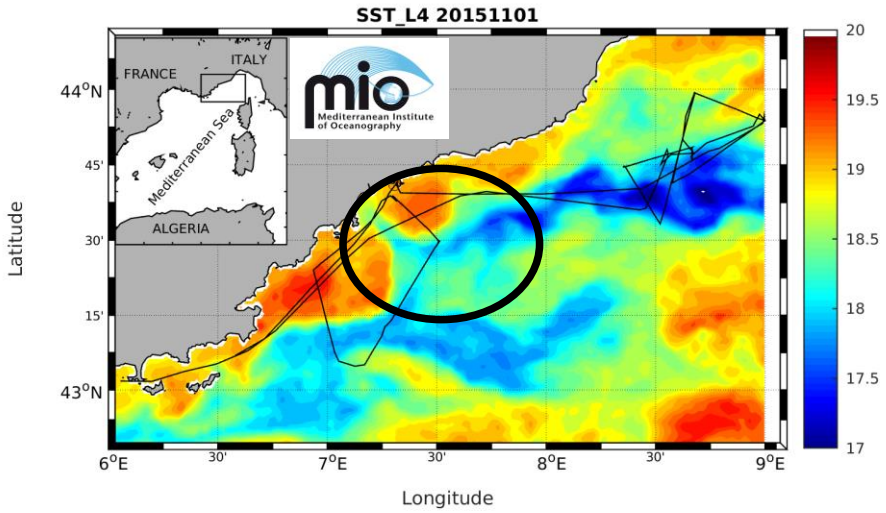
White dots : possible locations of the MASTODON temperature lines

Opportunities for crosscuttings with other WPs, JRAPS and within JRAP#4

- Collaboration with WP3.7 (CMCC) for DA, WP3.2 for method development
- Collaboration with JRAP6 for DA
- Possible collaboration with JRPA1, JRAP2 for applications to biological, pollutant transport. Depending on additional measurements in synergy with other projects...

OSCAHR campaign
Observing Submesoscale Coupling At High Resolution
October 29 – November 6 2015

→ joint use of MVP-CTD-LOPC and continuous flow cytometer (JRAP#1) in and near the Nice HFR area



Risks analysis and mitigation measurements.

Delay in new installations (permits, memorandum of understanding…)

Radio Frequency Interference

Timing for WP3.7 collaboration and OSSE, Wp3.2 for MASTODON

Additional biological and pollution data depending on additional funding

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654410.

JRAP#4 – STUDY AREAS
SE BOB (IFREMER & AZTI)

Presenter: A. Rubio email: arubio@azti.es

Contributor(s): AZTI's team, G. Charria, P. Lazure, P. de Mey

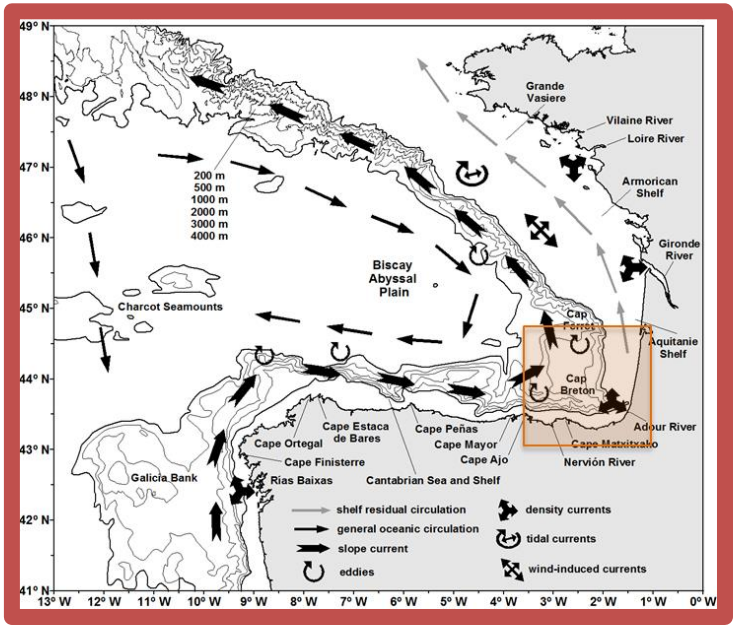
JERICO-NEXT HF Radar workshop / San Sebastian / SPAIN / 9th – 11th March 2016

OUTLINE

1. Overview of the study area & background
2. Main activities in JERICO_NEXT (related ongoing work, new deployments, data analysis, timeline)
3. Opportunities for crosscuttings with other WPs, JRAPS and within JRAP#4
4. Risks analysis and mitigation measurements.

JRAP#4 - SE BoB

1. Overview of the study area / background



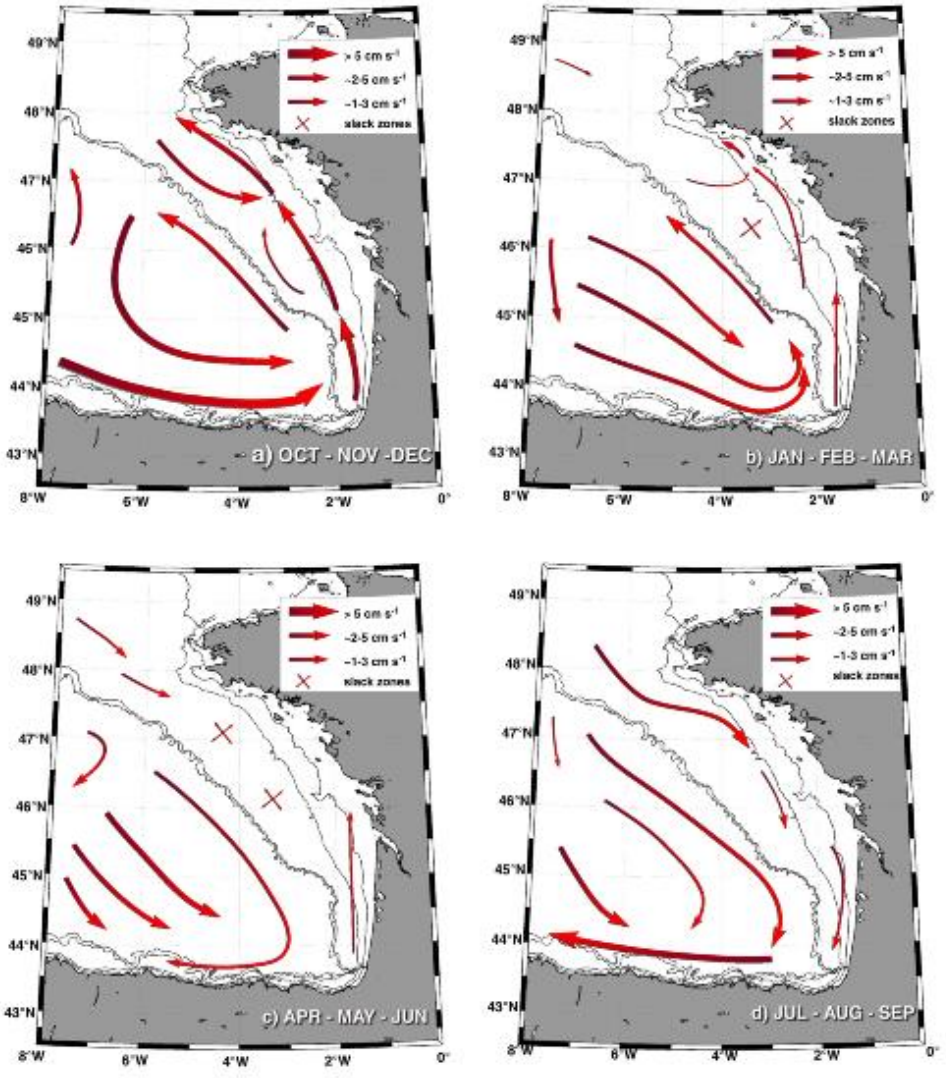
Main characteristics of the BoB circulation (Ferrer et al., 2009; modified from ***Koutsikopoulos and Le Cann, 1996****)*

Slope currents / IPC (Frouin et al., 1990, Haynes and Barton, 1990, Pingree and Le Cann, 1990, 1992, Charria et al., 2013, Esnaola et al., 2013)

Mesoscale variability and eddies (Peliz et al. 2003, van Aken, 2002, Pingeree and Le Cann 1990, 1992, García Soto el al., 2002, Serpette et al., 2006, Caballero et al., 2008, 2014, 2016*)

Wind induced circulation (Fontán et al., 2013, 2015, Solabarrieta et al., 2015, Kersalé et al., 2016)

Tides, inertial currents & internal waves (Le Cann, 1990; Rubio et al. 2011, Lazure et al., 2014)

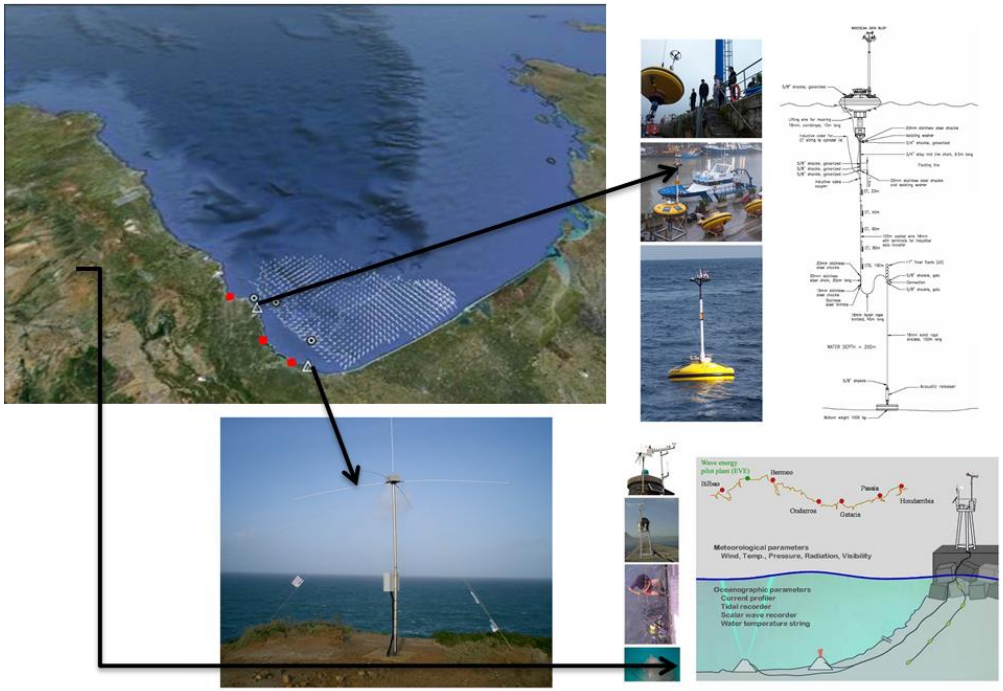


*Schematic representation of the seasonal circulation in the Bay of Biscay. The arrow thickness is proportional to current speed (****Charria et al., 2013****).*

1. Overview of the study area / background

euskalmet
agencia vasca de meteorología
euskal meteorologia agentzia

OFFSHORE BUOYS
Operational since 2007

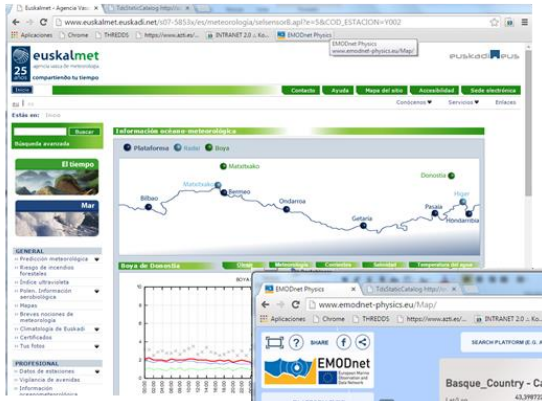


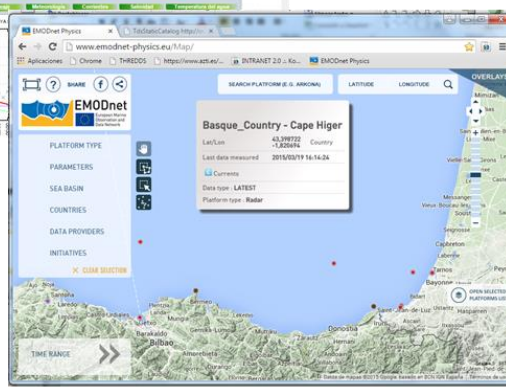
HF RADAR
Operational since 2009

COASTAL STATIONS
Operational since 2001-2003

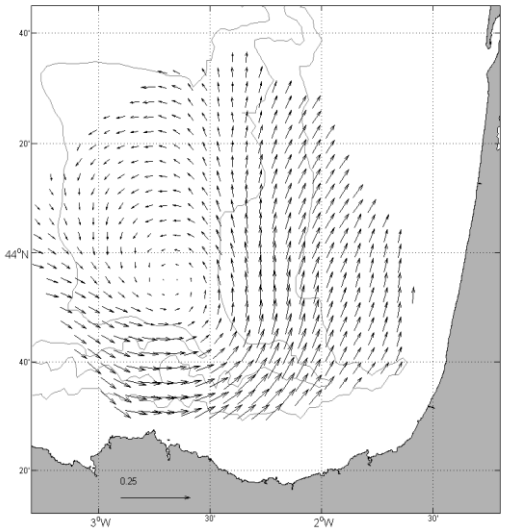
Operational products available:

OUR THREDDS:
http://oceandata.azti.es/thredds/OP_DATA.html
EUSKALMET web:
http://www.euskalmet.euskadi.net/
EMODNET portal:
http://www.emodnet-physics.eu/Map/



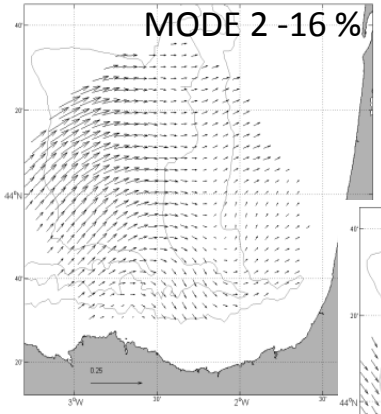


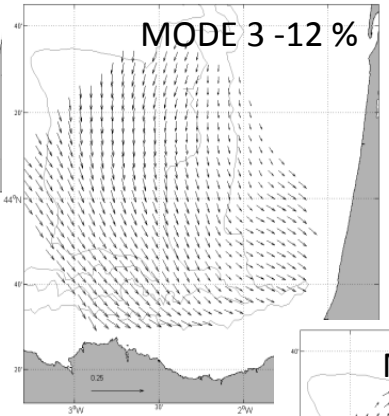
1. Overview of the study area HFR –related recent research

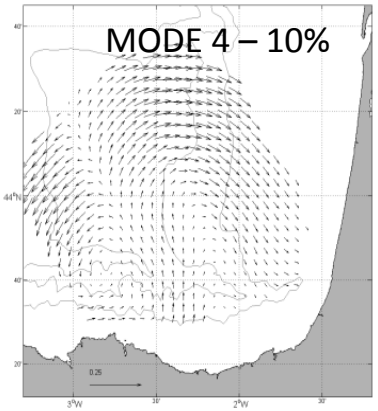


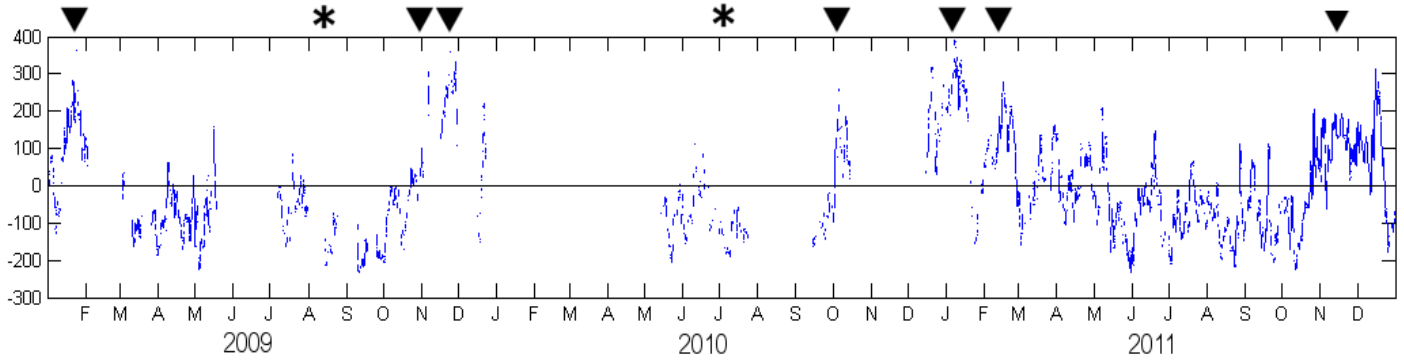
MODE 1 EOF analysis to low pass (t> 48 h) currents

30 % variance









* L. Solabarrieta, A. Rubio, S. Castanedo, R. Medina, A Fontán, M. González, V. Fernández, G. Charria and C. Hernández, "Surface water circulation patterns in the southeastern Bay of Biscay: New evidences from HF radar data". CSR 2014.

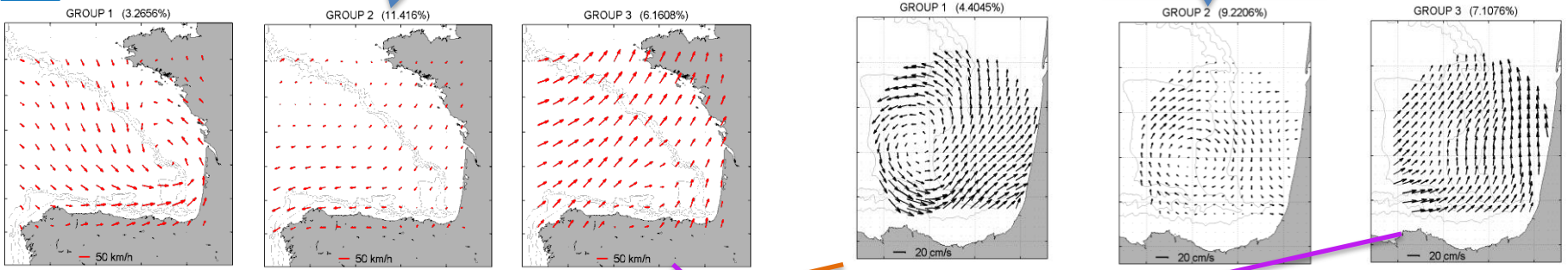
1. Overview of the study area HFR –related recent research

Wind from Weather Research and Forecasting model (WRF)

(3 of 12 groups)

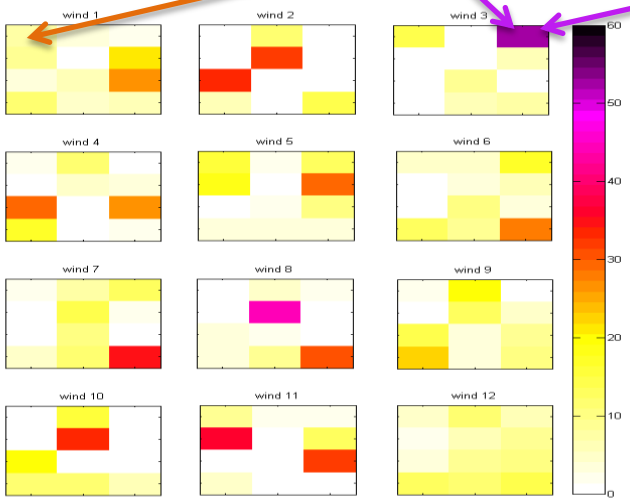
HF Radar currents

(3 of 12 groups)

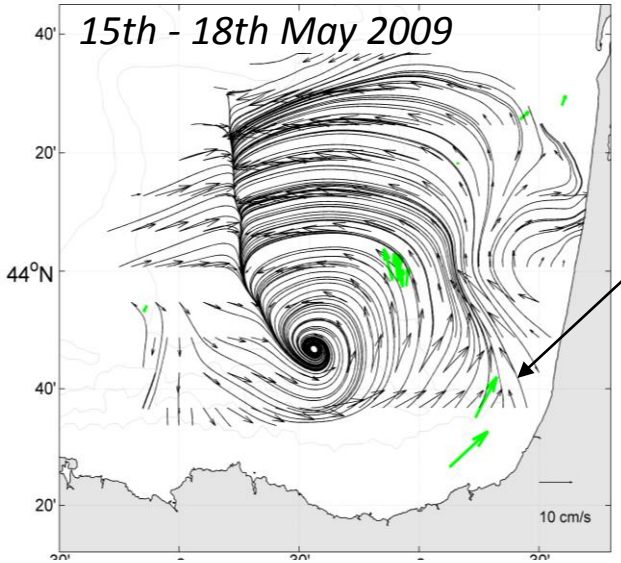


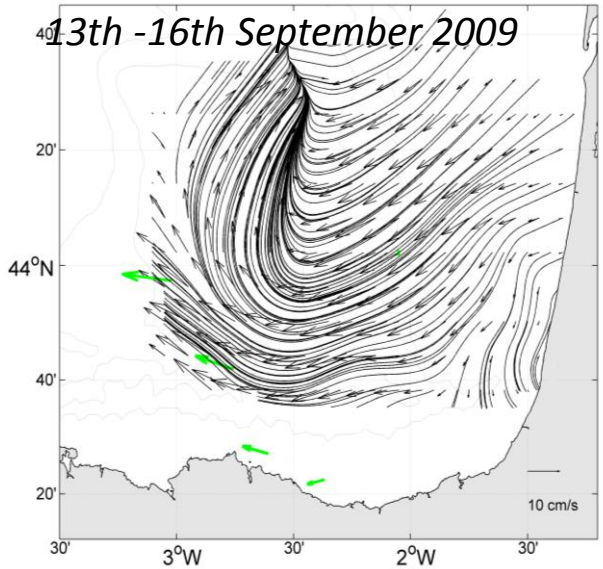
OCURRENCE PROBABILITY MATRIX

- ✓ **Current groups that are not related to any wind group: summer and winter closed patterns**
- ✓ **Most current patterns are related to one or more wind groups**

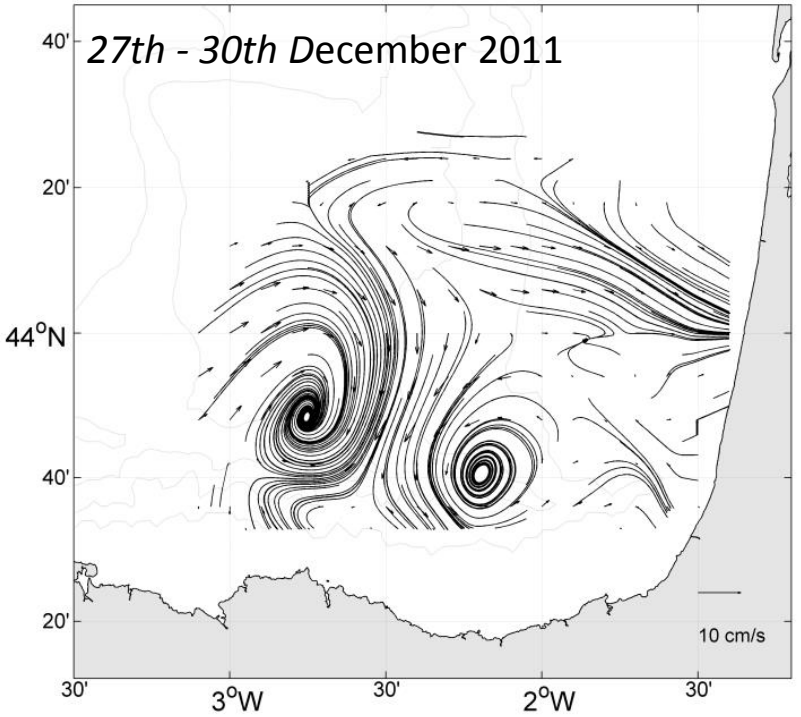


1. Overview of the study area
HFR –related recent research



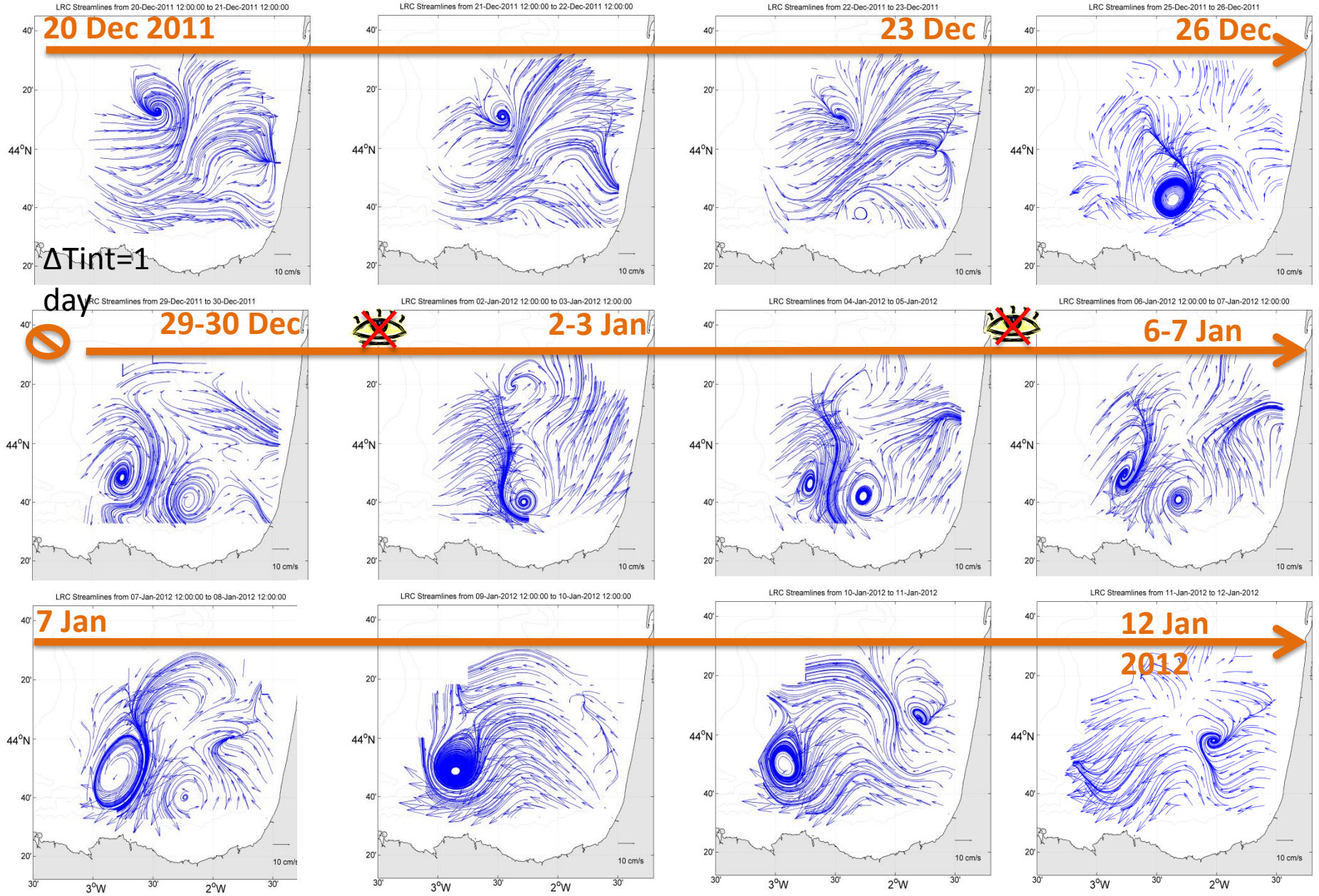


- Methodology (Muller et al. JMS 2009, JGR 2010) already applied to the Iroise sea
- Lagrangian residual currents for 3-day integration period
- Green vectors: real drifters, same integration time



* Rubio et al. OCEANS 13 MTS/IEEE Bergen, June 2013

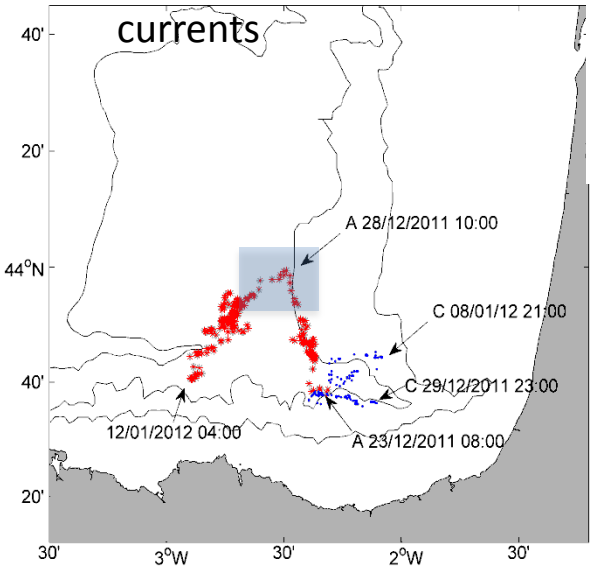
JRAP#4 - SE BoB


20 Dec 2011
23 Dec
26 Dec
ΔTint=1 day
29-30 Dec
2-3 Jan
6-7 Jan
7 Jan
12 Jan 2012
LRC Streamlines from 20-Dec-2011 12:00:00 to 21-Dec-2011 12:00:00
LRC Streamlines from 21-Dec-2011 12:00:00 to 22-Dec-2011 12:00:00
LRC Streamlines from 22-Dec-2011 to 23-Dec-2011
LRC Streamlines from 25-Dec-2011 to 26-Dec-2011
LRC Streamlines from 29-Dec-2011 to 30-Dec-2011
LRC Streamlines from 02-Jan-2012 12:00:00 to 03-Jan-2012 12:00:00
LRC Streamlines from 04-Jan-2012 to 05-Jan-2012
LRC Streamlines from 06-Jan-2012 12:00:00 to 07-Jan-2012 12:00:00
LRC Streamlines from 07-Jan-2012 12:00:00 to 08-Jan-2012 12:00:00
LRC Streamlines from 09-Jan-2012 12:00:00 to 10-Jan-2012 12:00:00
LRC Streamlines from 10-Jan-2012 to 11-Jan-2012
LRC Streamlines from 11-Jan-2012 to 12-Jan-2012
10 cm/s
44°N
3°W
2°W

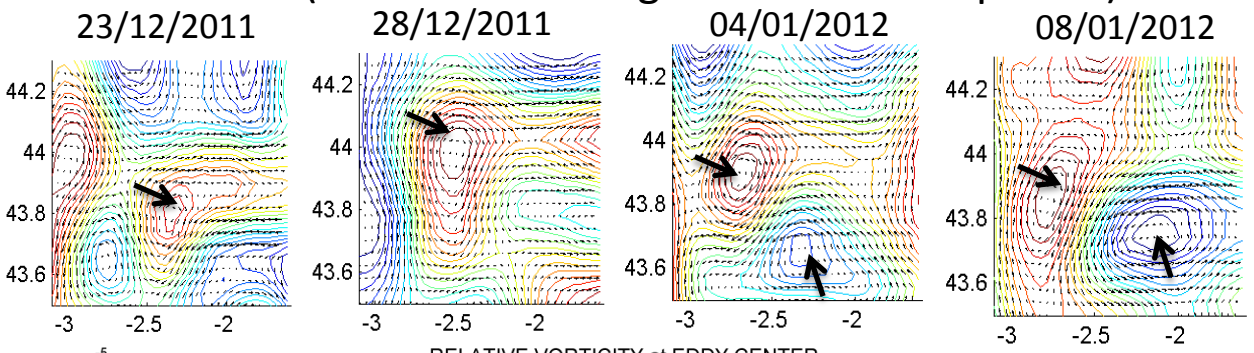
JRAP#4 - SE BoB

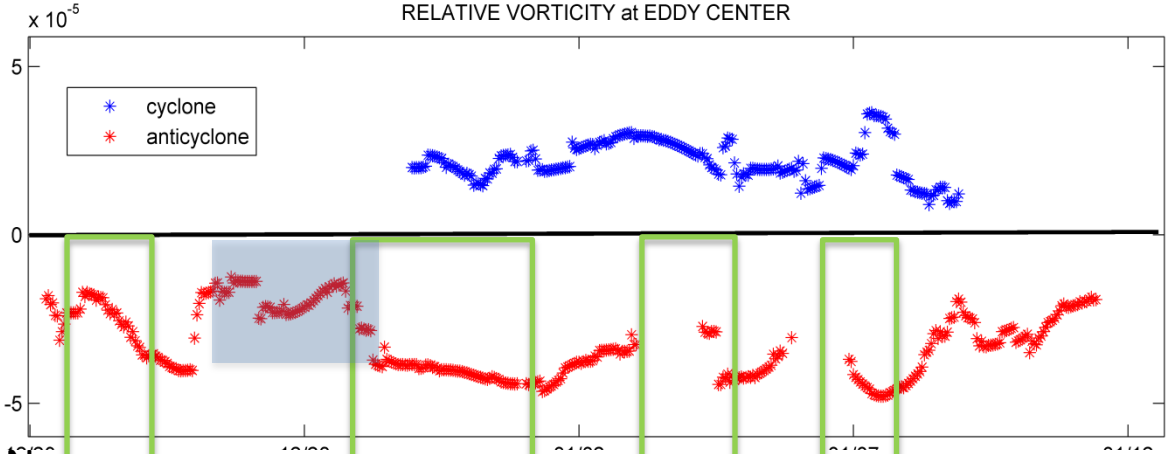
HFR ralated research

Eddy trajectories from snapshots of OMA low pass non divergent currents

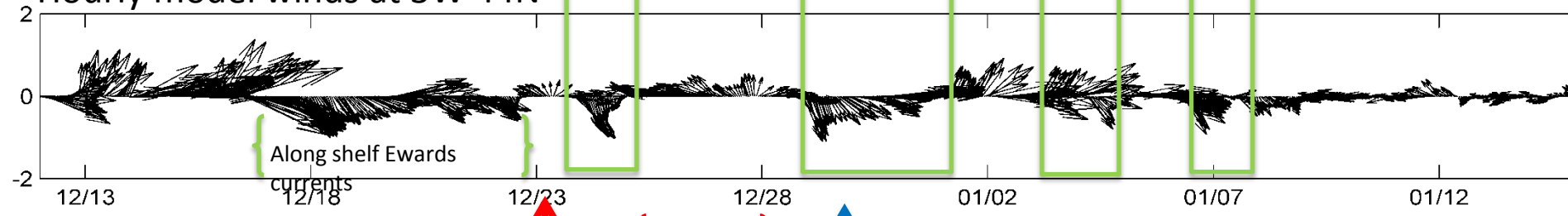


(Ψ and non-divergent currents snapshots)



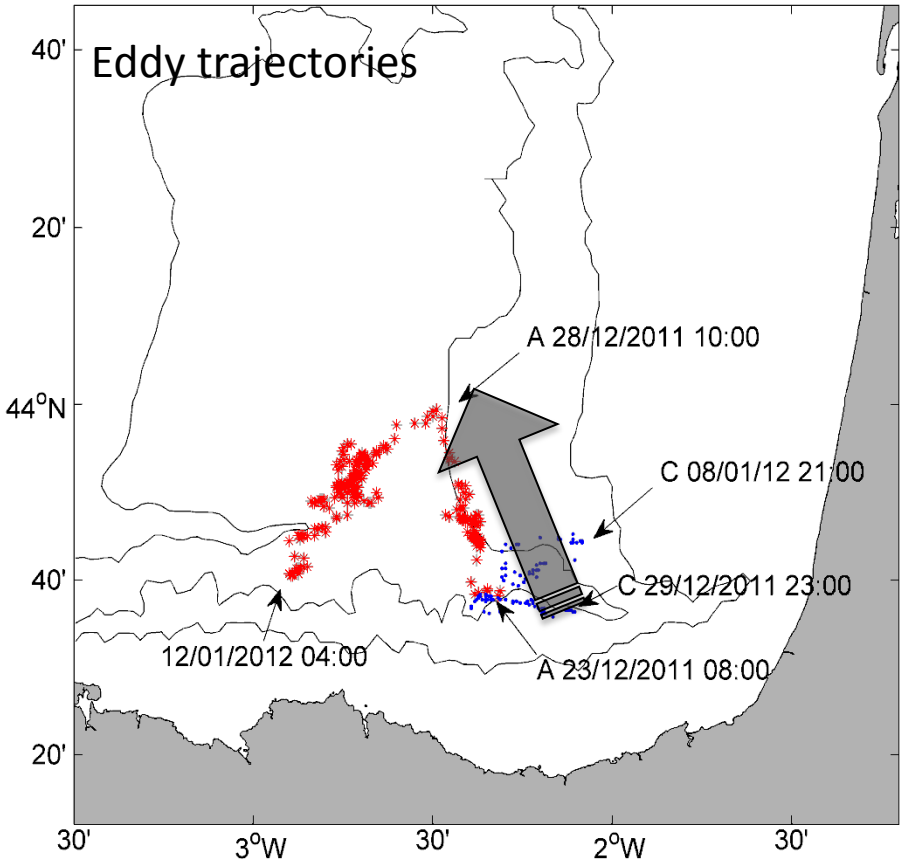


Hourly model winds at 3W 44N

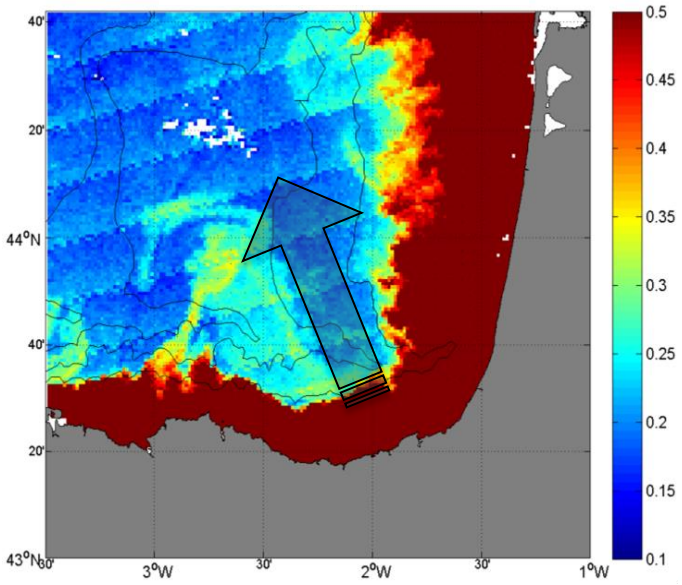


Surface circulation in the SE BoB from HF radar

MESOSCALE EDDIES

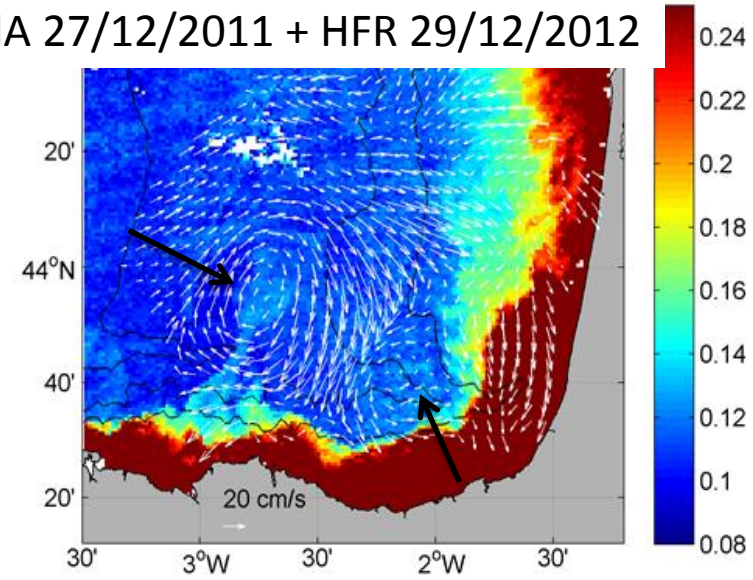


ChlA 27/12/2011



NEODAAS

ChlA 27/12/2011 + HFR 29/12/2012



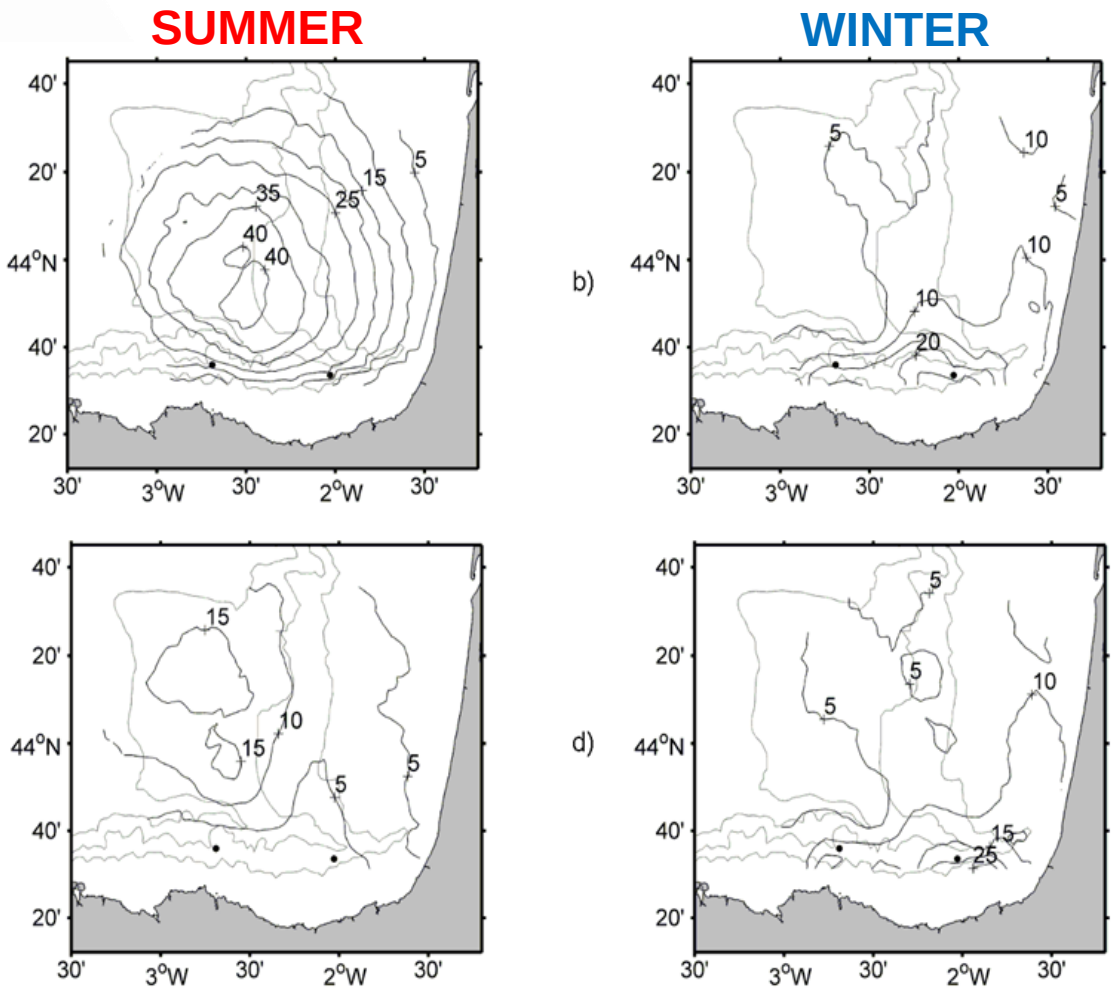
Surface circulation in the SE BoB from HF radar

Seasonal to HF variability

Contribution (percentages) to the total kinetic energy (KE) (2009-2011)

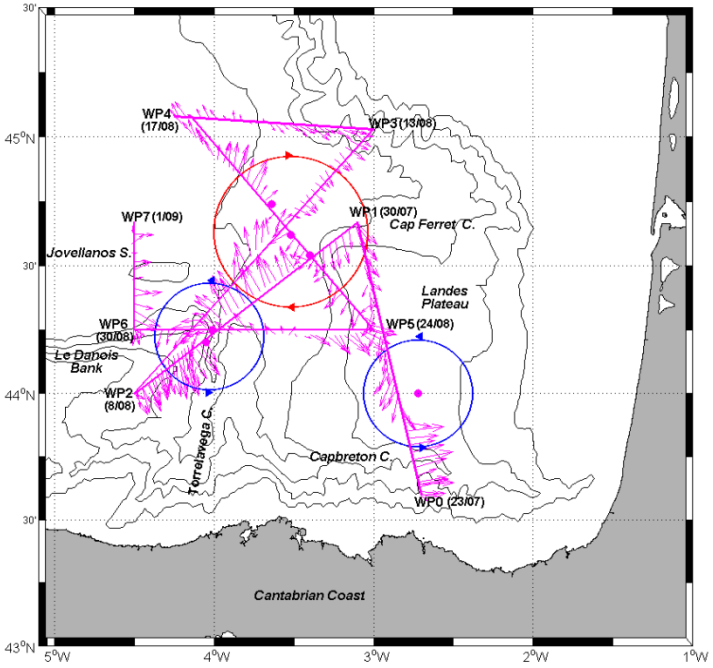
INERTIAL BAND

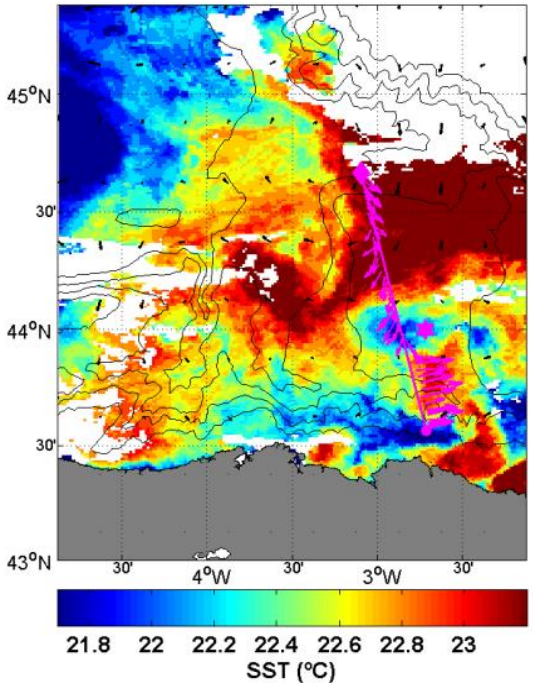
SEMIDIURNAL BAND

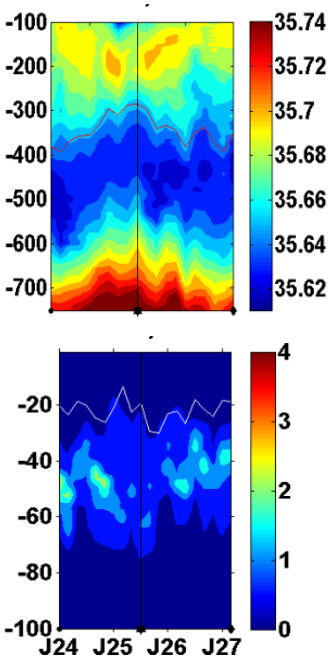


* Solabarrieta, et al. 2013, Continental Shelf Research.

Surface circulation in the SE BoB from HF radar Mesoscale eddies (e.g. C13E)





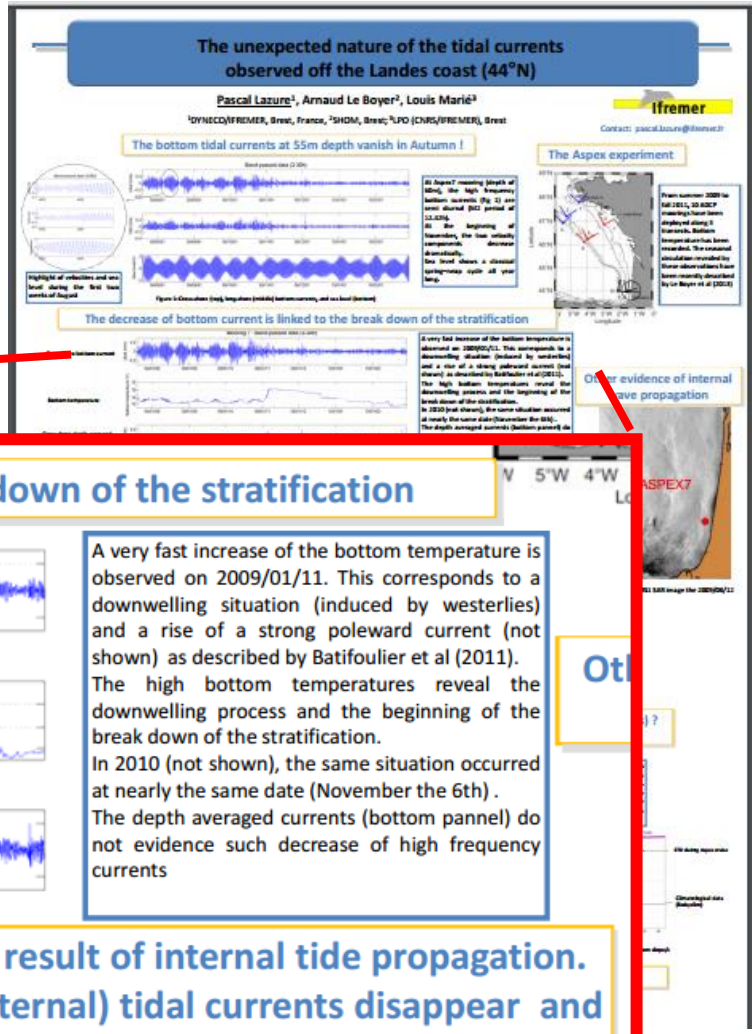


1. Overview of the study area / background

Internal tides

http://archimer.ifremer.fr/doc/00315/42571/41941.pdf

- **Generation and characteristics of internal tides over the shelf?**
- **Surface signal of this waves in HFR?**

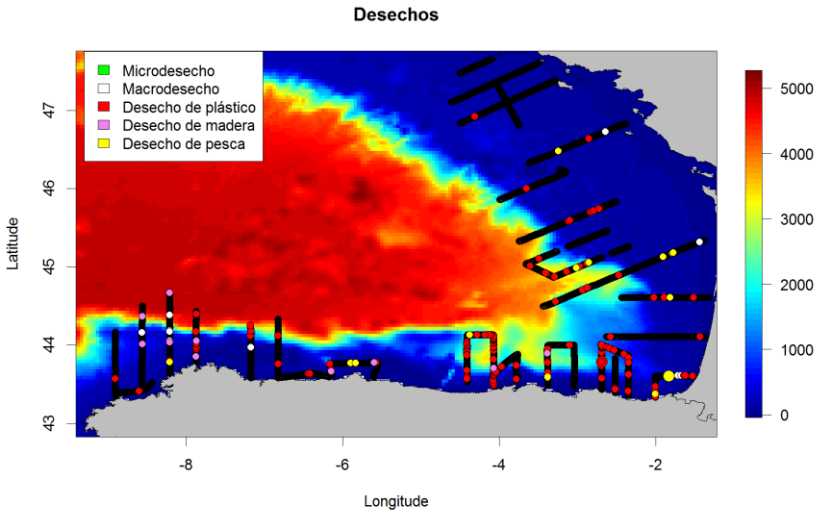


1. MSFD descriptors to resolve

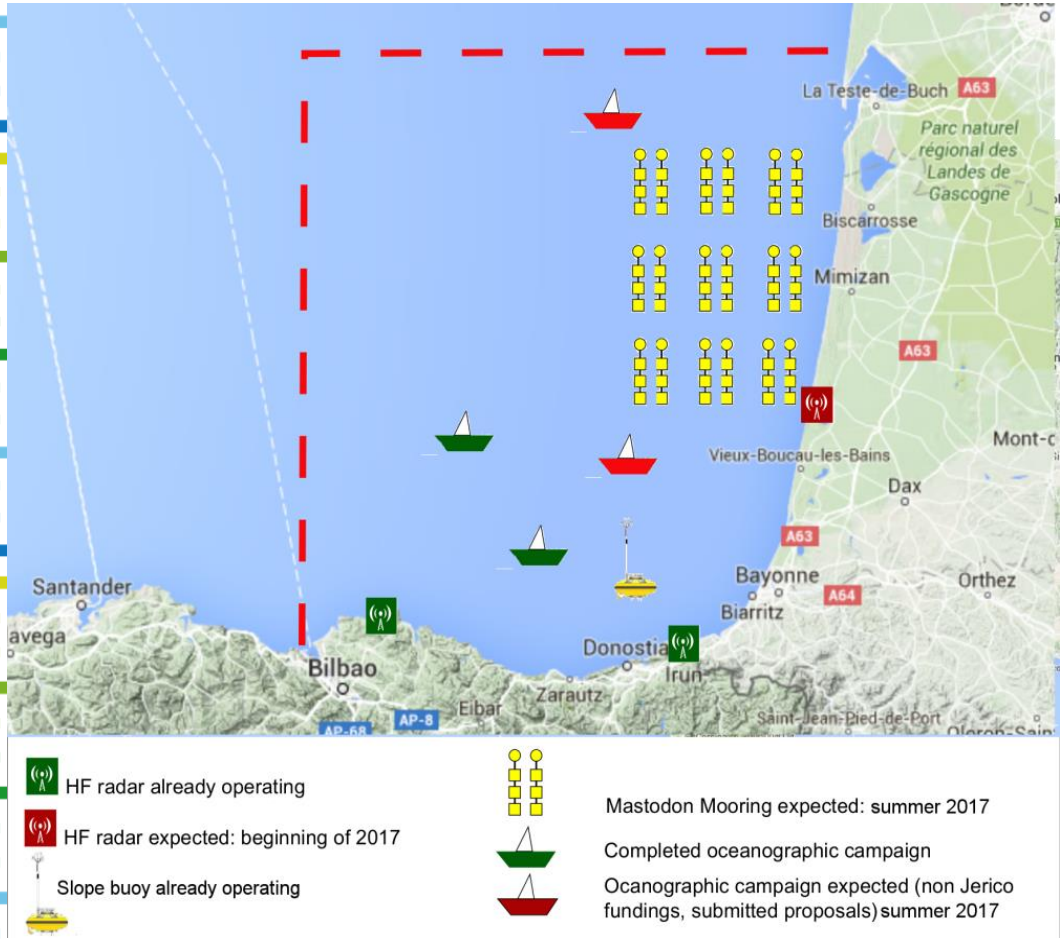
- D7 (Permanent alteration of hydrographical conditions). JRAP#4 will allow for the continuous monitoring of hydrographic conditions.

- D10 (Properties and quantities of marine litter): Marine Litter (ML) is advected or drifted by marine currents. JRAP#4 will provide information about hydrodynamics and derived transport to infer the spatial distribution of this not-desirable material:
  - Coastal arrivals
  - Measurement of surface currents from HFR
  - Validation with databases of ML recovered in beaches.

  - Convergence areas
  - Measurement of surface currents from HFR
  - Estimation of convergence areas
  - Validation with ML monitored by observed on board different research vessels.



2. Main activities - New deployments



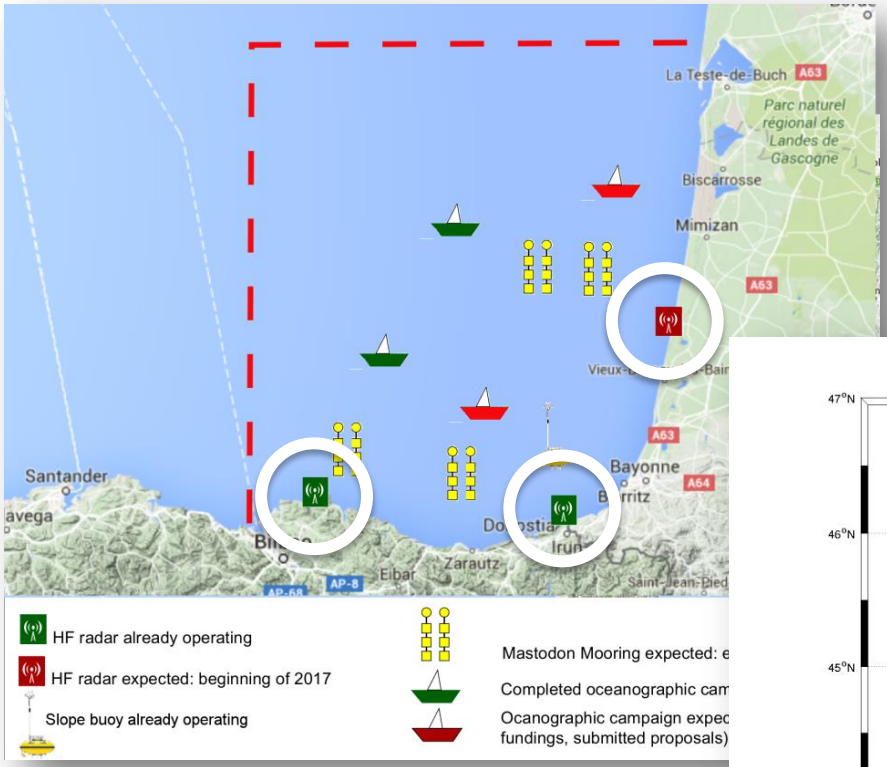
New HFR antenna – Beginning of 2017 (expected to be running at least for a year)

MASTODON moorings – summer 2017

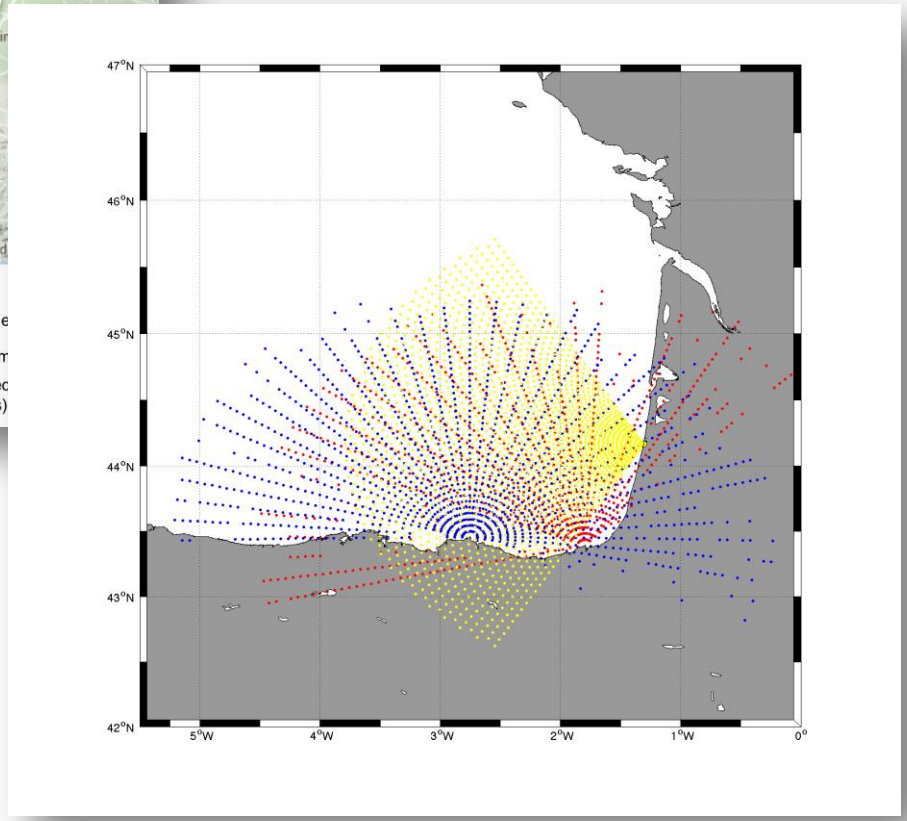
DRIFTERS - summer 2017, most likely during the mastodon campaigns

2 oceanographic campaigns for mastodon deployments (2days + one week : opportunity for complementary data)

South-Eastern Bay of Biscay

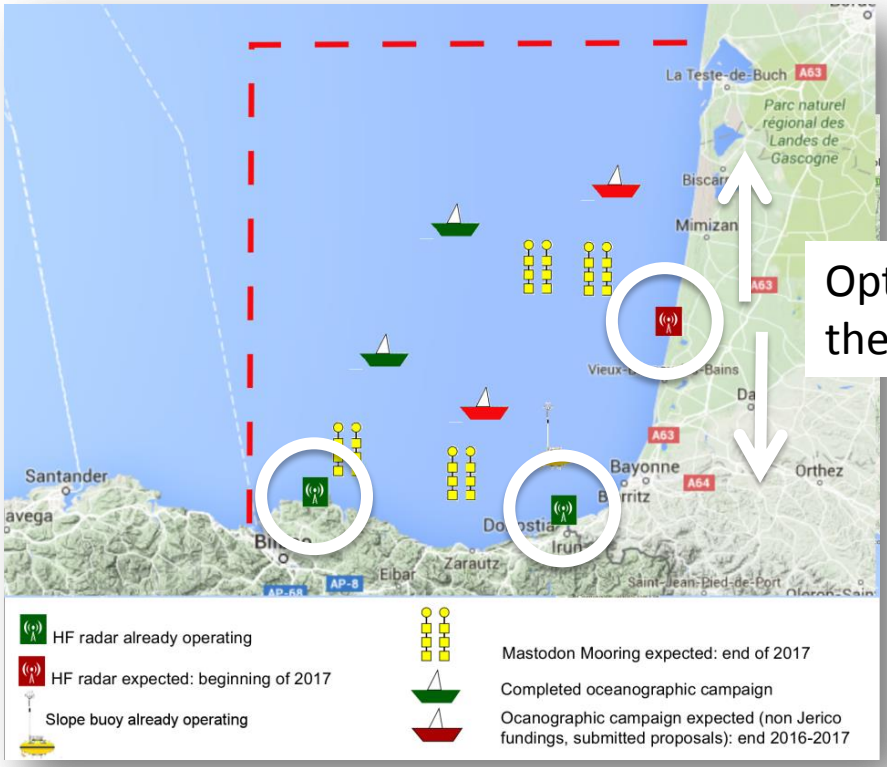


A third HF Radar system on the Landes (French) coast in 2017 (installed by L. Marié, P. Flament)



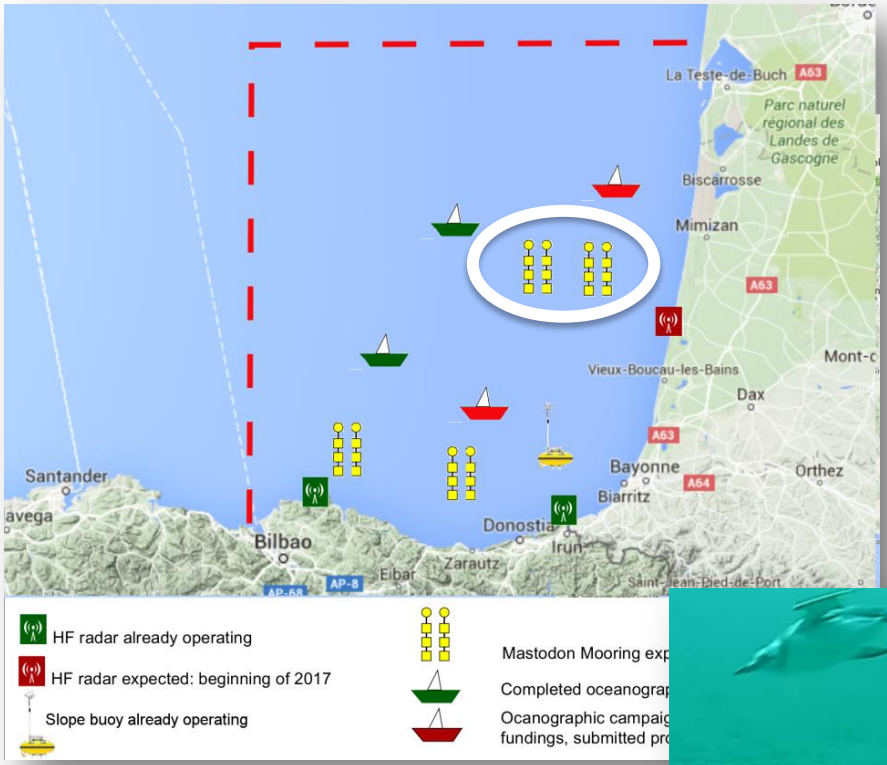
To improve the circulation description and understanding in the region

South-Eastern Bay of Biscay



Optimization numerical experiment for the HF Radar system (link with WP3.7)

South-Eastern Bay of Biscay

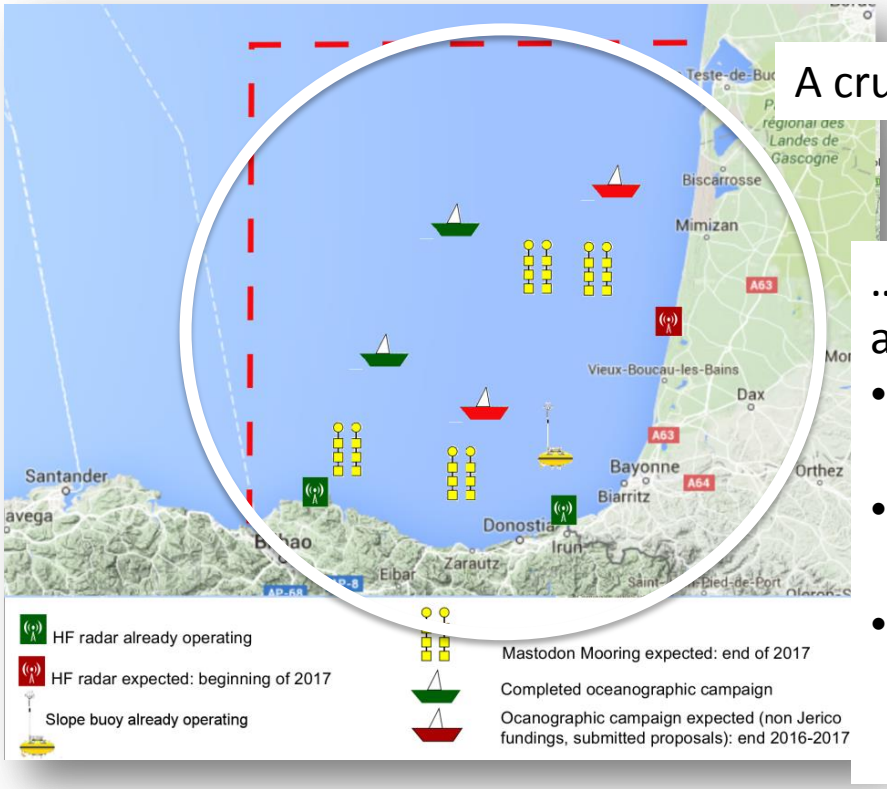


To better describe the true nature of internal waves over the continental shelf, *in situ* measurements of the high frequency temperature variability are needed.

Mastodon-2D (P. Lazure)

A low coast bottom mooring with a thermistor chain. (development in WP3)

South-Eastern Bay of Biscay



A cruise end of summer 2017 …

… as new reference measurements associated with existing datasets:

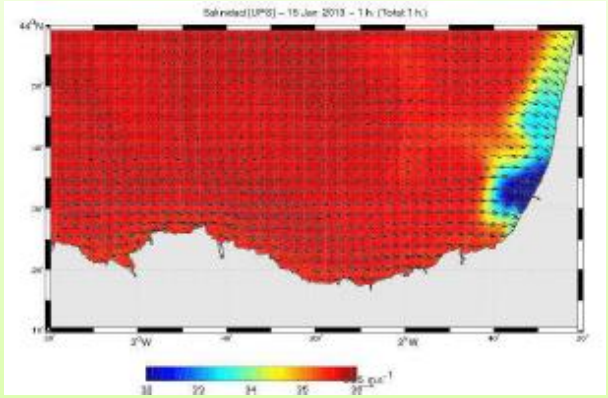
- to validate WP3 developments,
- to understand internal wave dynamics in the region,
- to evaluate 4D-transport and validate new HF Radar observations.

2. Main activities – Numerical experiments

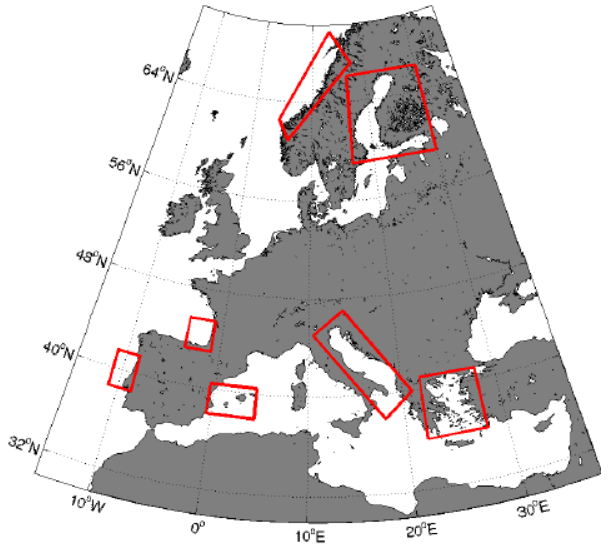
1- OOS optimization using OSE/OSSEs.

In the frame of the WP3.7 dedicated to OSE/OSSEs, the ArM (Array Modes) method (Le Hénaff et al., 2009; Lamouroux et al., 2016) is being extended to HFR observations. This method allows estimating the most efficient location of measurements to constrain the ensemble model variance. In the JRAP#4, the method will be used in the deployment of the new system along the French coast taking into account existing HFR system along the Spanish coast.

2- High resolution numerical modelling without DA in JRAP#6.



ROMS model 670m HR



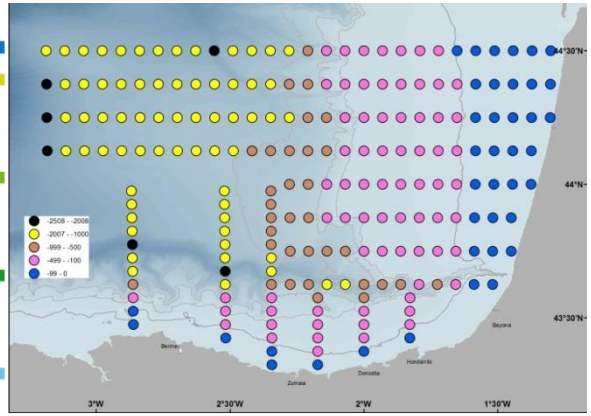
2. Main activities – Complementary data

- **4D transport in the SE BOB from historical and new data in the water column** :
  - COriolis ReAnalysis validated products (CORA), in the regional version (CORA-IB,I for Iberian-Biscay-Ireland) including a large collection of profiles from cruises and observing systems over the shelf to the deep ocean in the BOB.
  - AZTI campaigns-we expect to cover the study area mode densely during 2017 from other (biological) campaigns in the SE BOB.

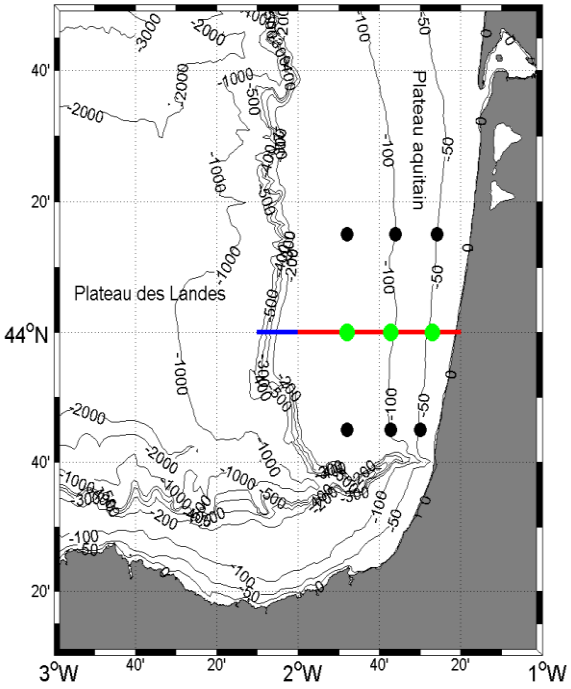
- **Other complementary data** for multidisciplinary approaches in line with MSFD issues:
  - Marine litter (ML) data – coastal arrivals(recovery, processing and analysis of these data is foreseen in the framework of the LEMA project if funded).
  - ML monitored by observed on board different research vessels: there are ML data bases obtained by during different yearly campaigns. Biological/acoustical data as e.g. BIOMAN (May) and JUVENA (September) These records began in 2012. Depending on technological limitations, other ML/biological data will be collected during MASTODON CAMPAINGS (external funding)

2. Main activities – Complementary data

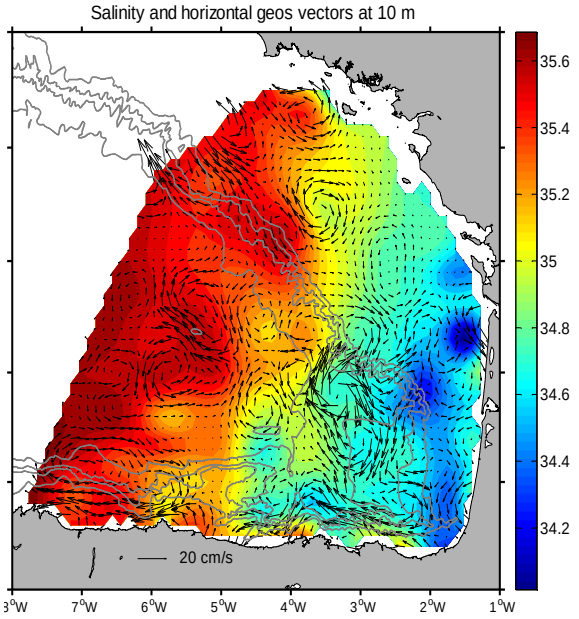
BIOMAN campaigns



MASTODOM campaigns



JUVENA campaigns



May 2017
& historical

Around August 2017

September 2017
& historical

3. Crosscutting opportunities

JRAP#1: In particular **two applications** may benefit cross-cuttings between both JRAPs: (1) studies looking for the **optimization of the monitoring of the European anchovy** (Engraulis encrasicolus) ichthyoplankton for recruitment modelling and (2) design of **harmful algal monitoring for offshore aquaculture** purposes. (Tasks 3.1 and 3.2)

JRAP#3: Join study on the impacts of current in the offshore concentration of pollutants through the **installation of a passive sampler in the Donostia buoy**. The passive sampler will be deployed during several (to be determined and depending on external funding) short integration periods (two weeks/one month) and **HFR currents and vertical information from the buoy and moorings (if periods coincide) will be used to characterize the different hydrodynamic scenarios** and their effect on the off shore concentrations measured

JRAP#6: High resolution (670m) Operational Simulations for the SE BOB using ROMS and realistic forcings without DA. The cross-cuttings will involve **joint analysis of data and simulations for model assessment**, model outputs to complete data description of currents and transport.

4. Risks

i. Delay in OSSES since several new deployments will depend on them

ii. Delay in the deployment of instruments and availability of new data (mostly at the SE BOB where they are starting later)

iii. Lack of data from new or existing systems

iv. Needed close cooperation with other WPs. Inputs of WP3 (3.2 –HFR, 3.3 MASTODON, 3.7 OSSES) are key for scientific and technical advances in JRAP#4

i. Intensive CTD stations during AZTI biological campaigns and complementary data during IFREMER MASTODON campaigns will be subjected to the time limitations of these campaigns.

ii. ML databases recovery and processing will depend partially on the approval of LEMA LIFE proposal.

iii. Possible cross-cuttings in the SE BOB reported between JRAP#4 and JRAP#1 will depend on external funding, first, for performing the monitoring of plankton and harmful algae, secondly, for analysing jointly the information, and finally for reporting the results.

Mitigation measures…

Thank you for your attention !

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654410.

1.A few more on proposed scientific focus

A first proposed (evident?) focus would be on the **North Current**

→ the main circulation structure of the area, flowing all along the Italian, French and Spanish coast (a transnational feature...)

→ transport and mixing of MAW and LIW, hence implied in the long term hydrological budget of the Mediterranean (climate change related topic) as well as floating debris, plankton or toxic pelagic organisms (jellyfish)

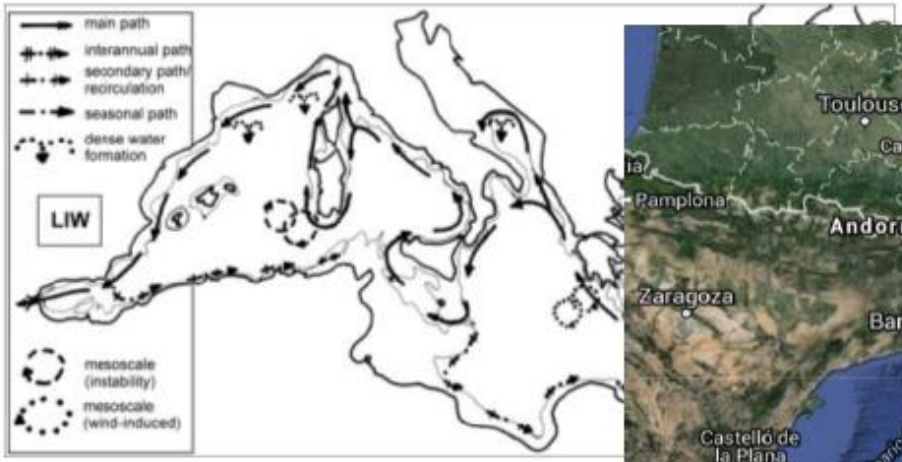
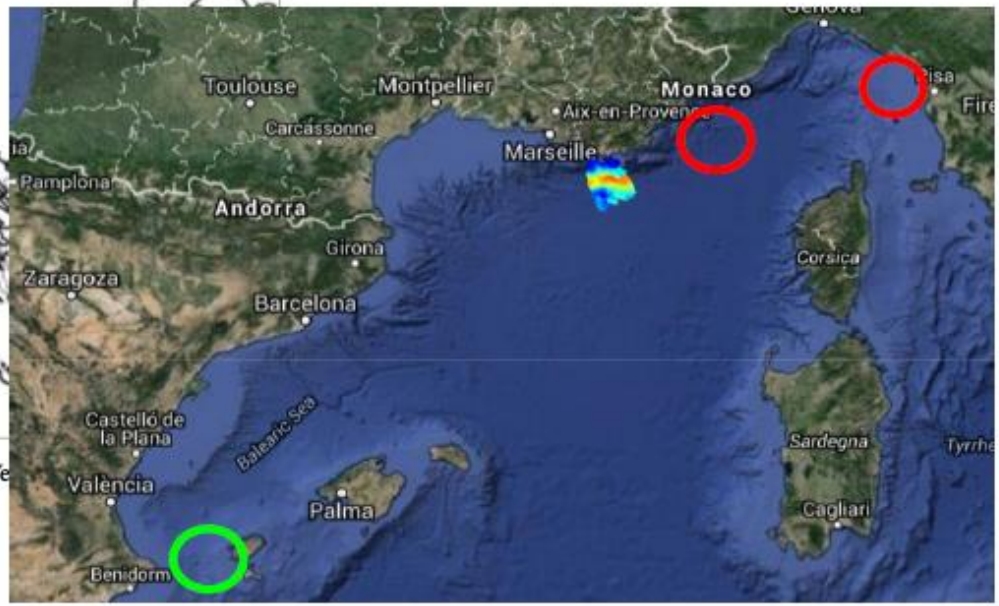


Fig. 3 Circulation of LIW extrapolated from [9] for the We represents the 500-m isobath



A few more on proposed scientific focus

Another scientific subject of common interest should be **wind forcing and the short term response of surface circulation**, i.e., inertial motions and Ekman drifts

→ still not well resolved by ocean model (a classical weakness of « turbulence » science...)

→ essential for efficient search and rescue or oil spill monitoring systems

→ can « mask » the NC surface signature and, more generally, « trouble » the current field interpretation...

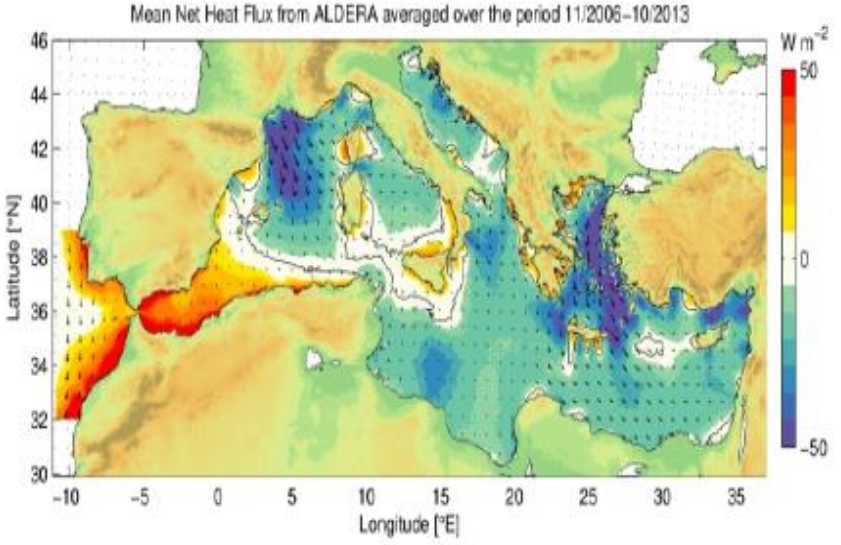
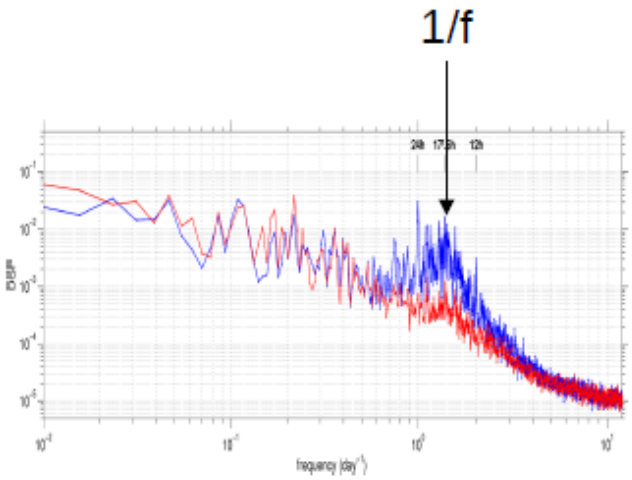
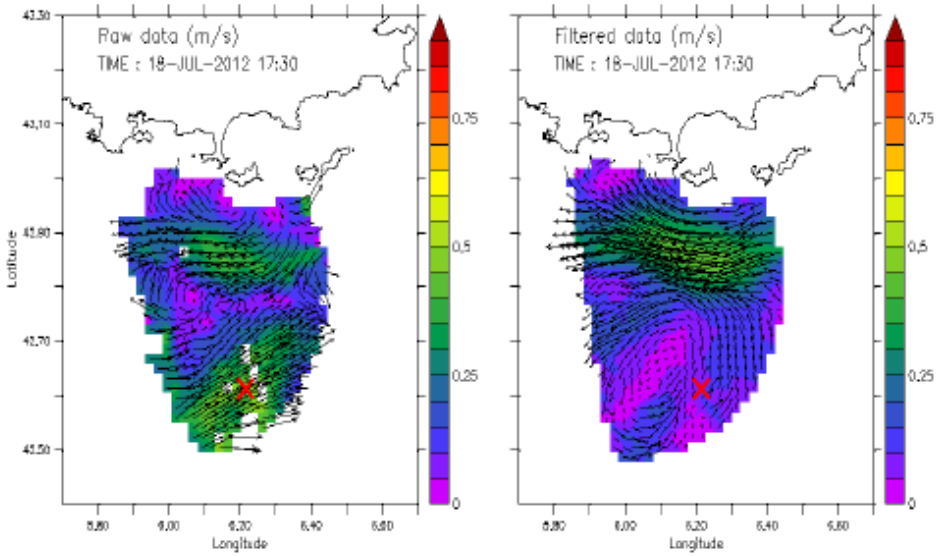


Fig. 0.2: Flux net de chaleur à la surface de la mer Méditerranée calculé à partir de la réanalyse atmosphérique ALDERA sur la période récente 2006-2013. Les flèches représentent le vent moyen sur la même période.

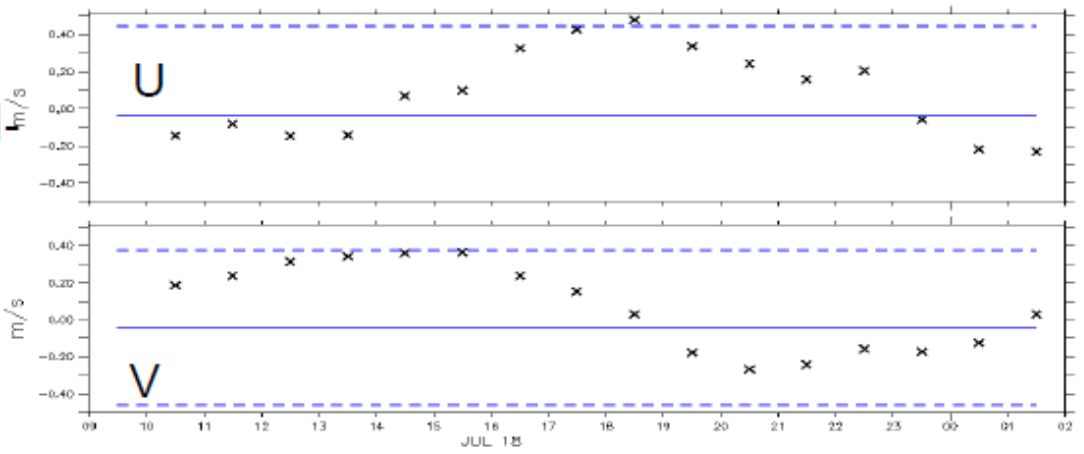
1.Time scales available with HFR

Inertial motions often present in HFR data...





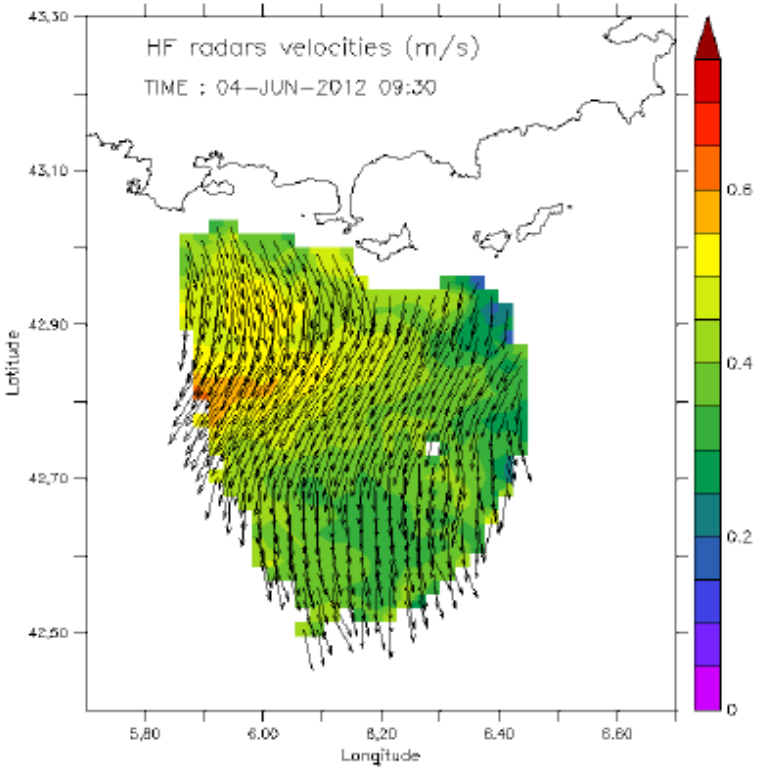
Filtering easy, but we can do more on the characterisation of inertial-induced variability

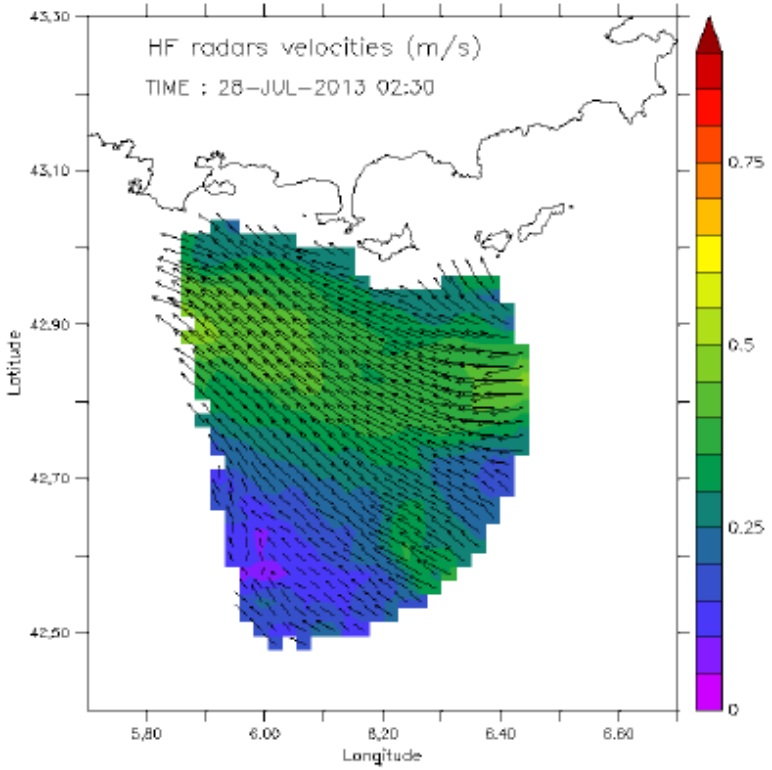


Long term average (2012-2014) +/- 3 STD

1.Time scales available with HFR...

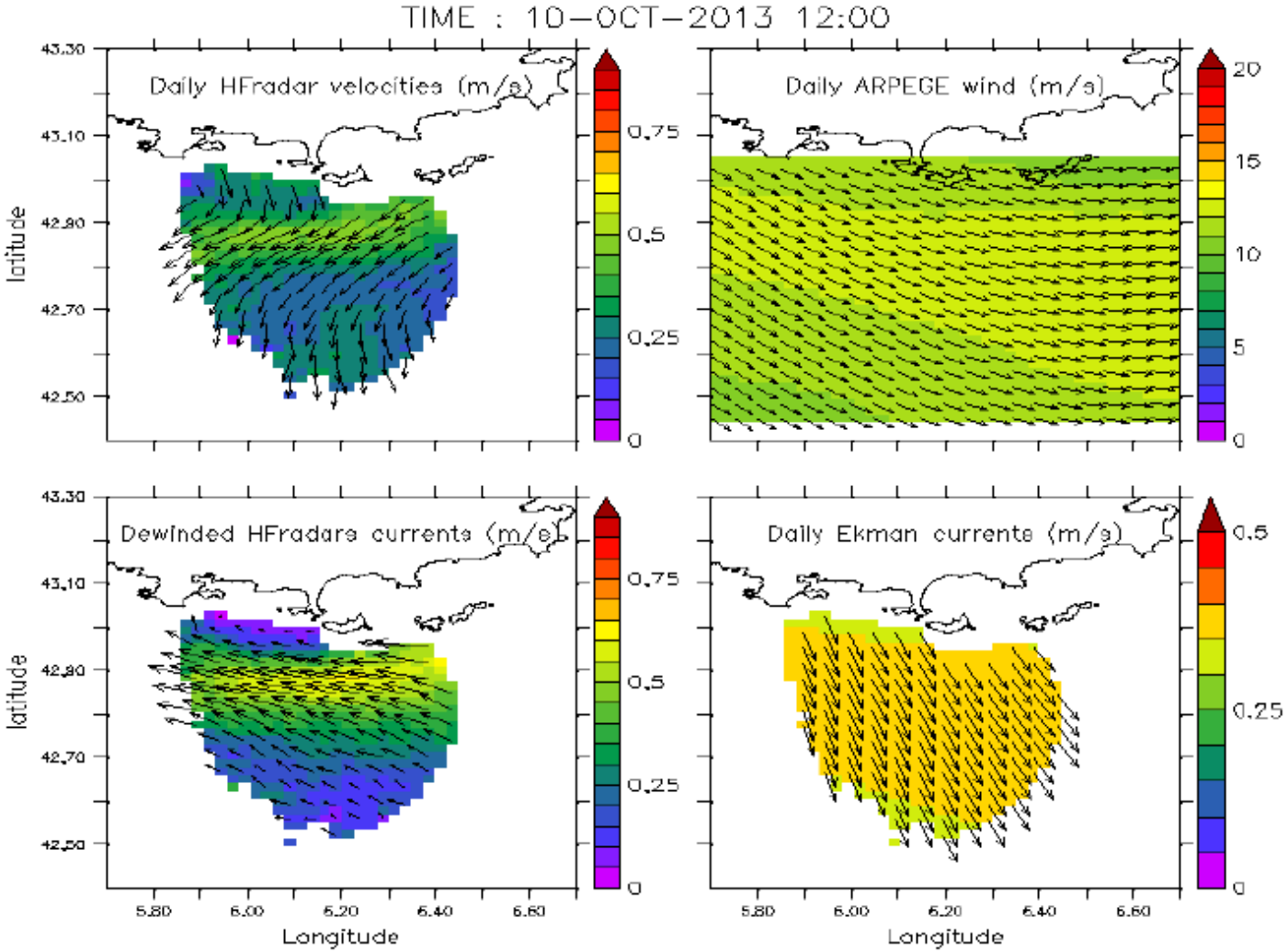
Ekman like surface circulation...





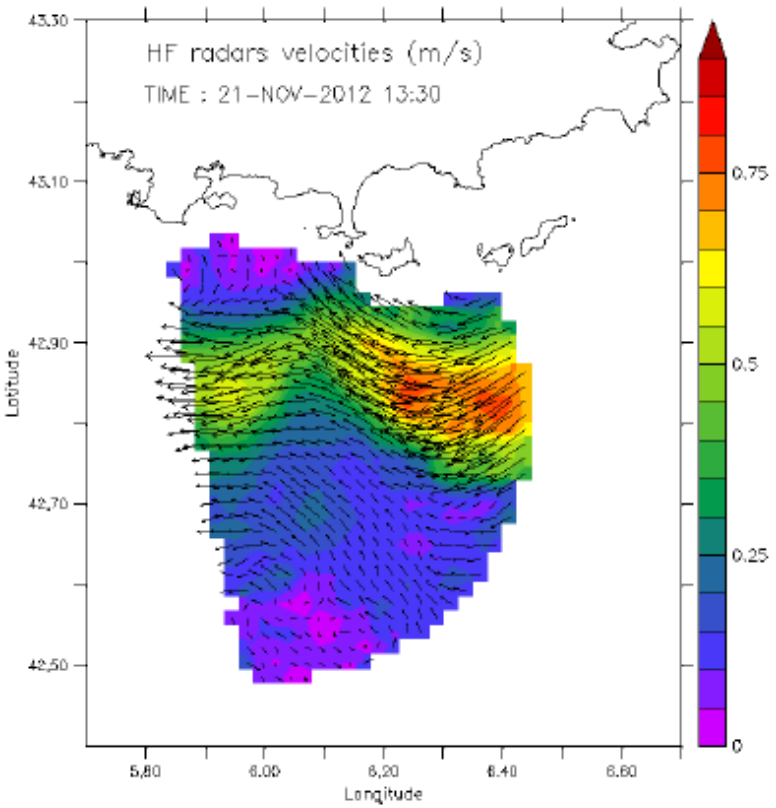
1.Time scales available with HFR…

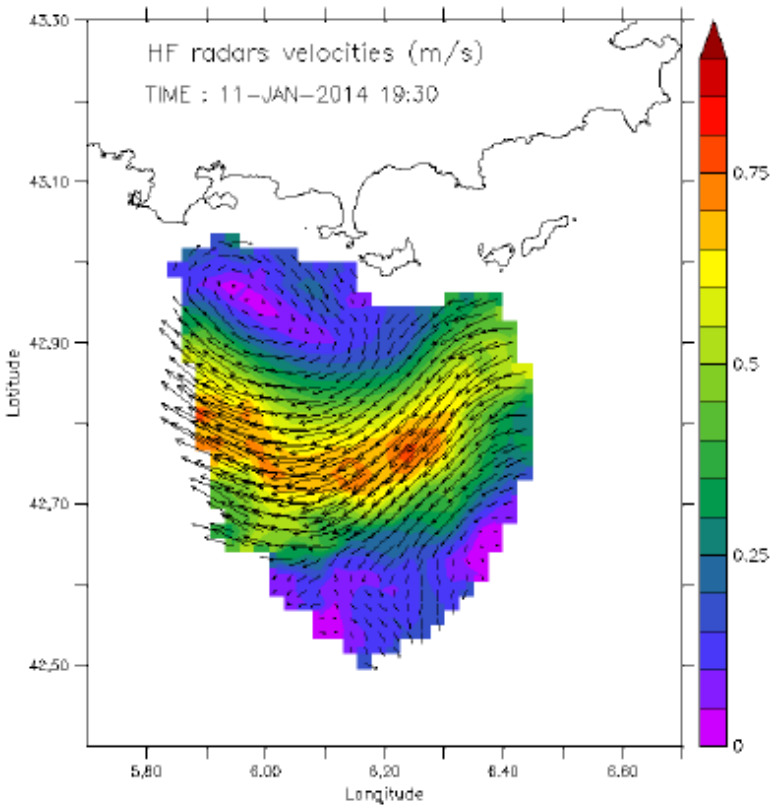
Can we separate Ekman like surface circulation and North Current from HFR and wind data?



1.Time scales available with HFR

Mesoscale variability of the North Current...



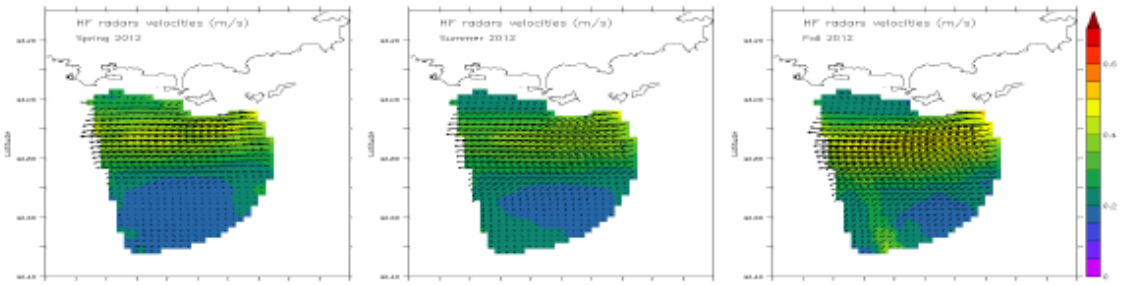


1.Time scales available with HFR

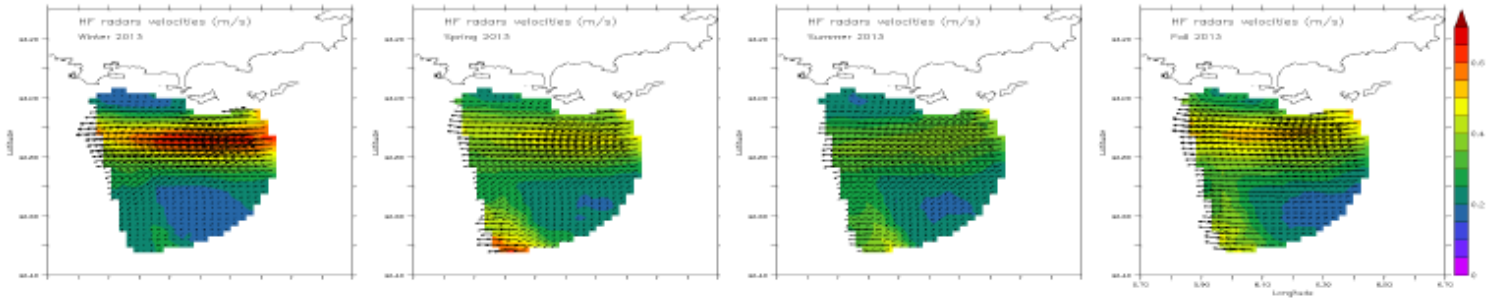
Yet two years and half of HFR data from TOSCA and MOOSE **:**
seasonal to inter-annual variability...

Winter (JFM) Spring (AMJ) Summer (JAS)
Autumn (OND)

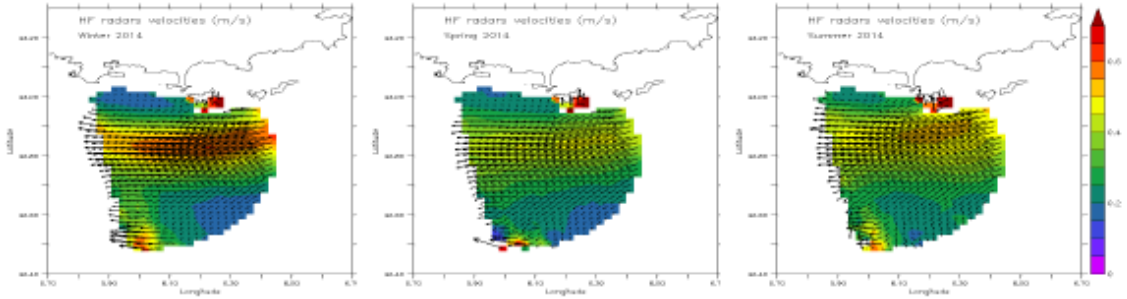
2012 →



2013 →



2014 →



..
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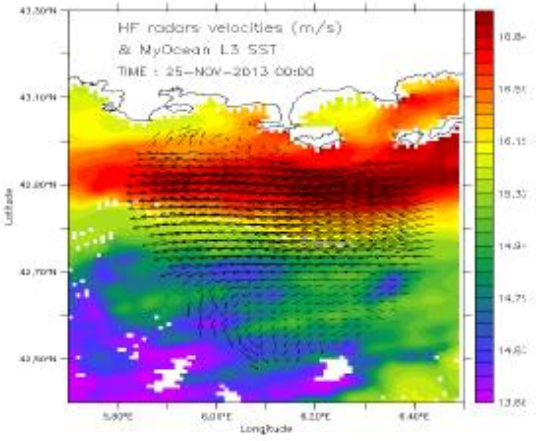
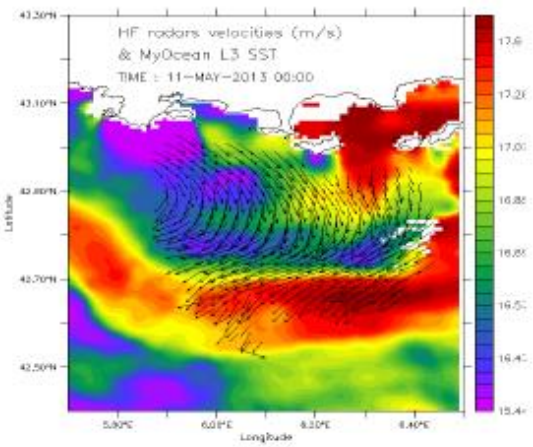
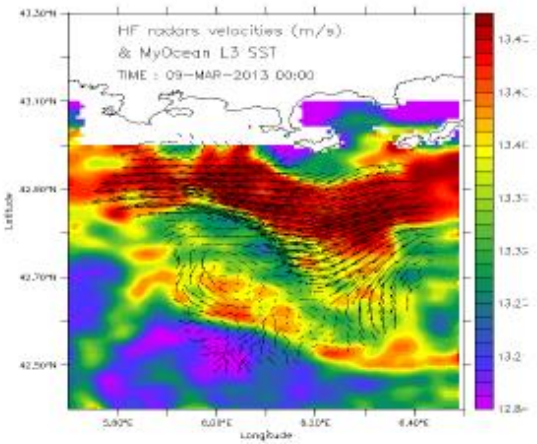
1.Joint analysis with ancillary data/plateforms...

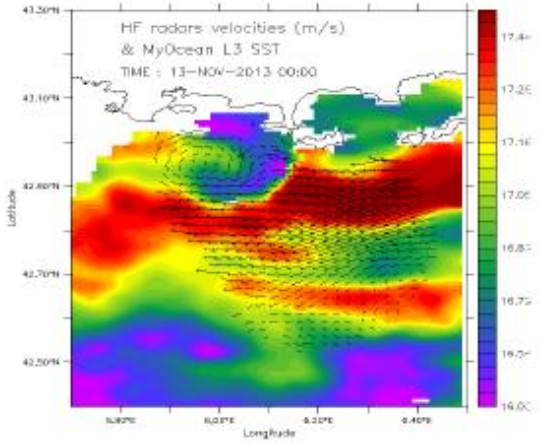
Spatial structures in HFR data to be systematically confronted to remote sensing data, SST and Chla(?)...





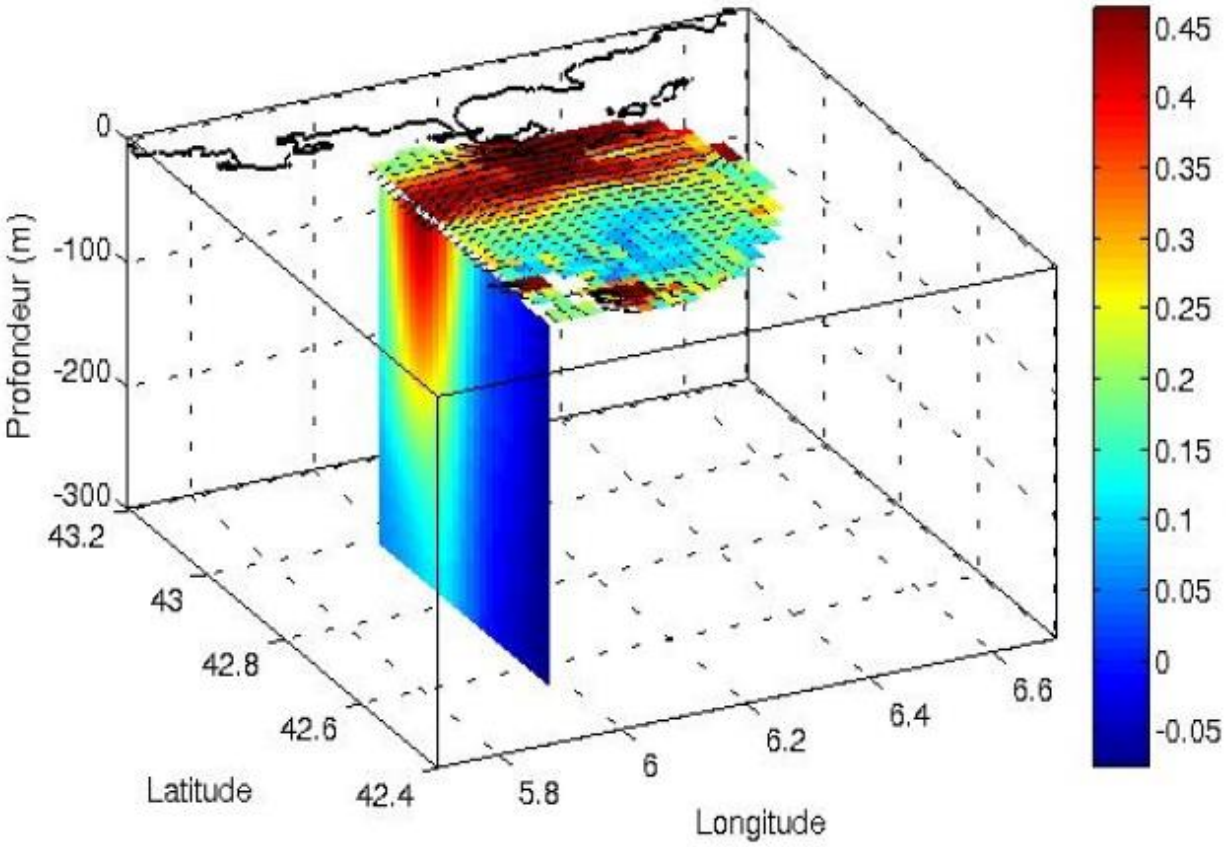


Front detection, wind induced mesoscale variability → meander, eddies...



Joint analysis with ancillary data/plateforms...

Joint analysis with glider would allow to asses the geostrophic part of the flow and the underlying vertical structure...

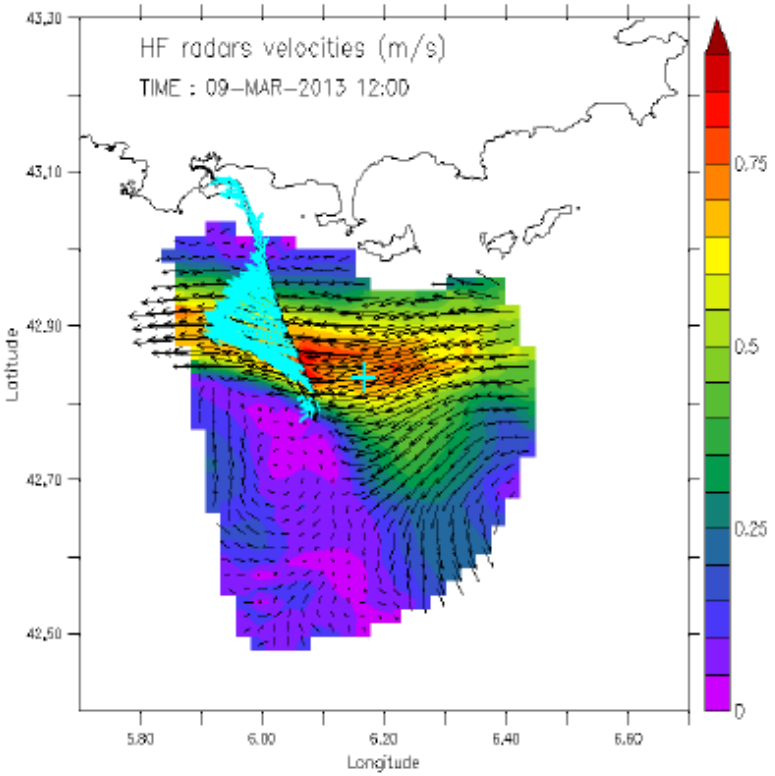


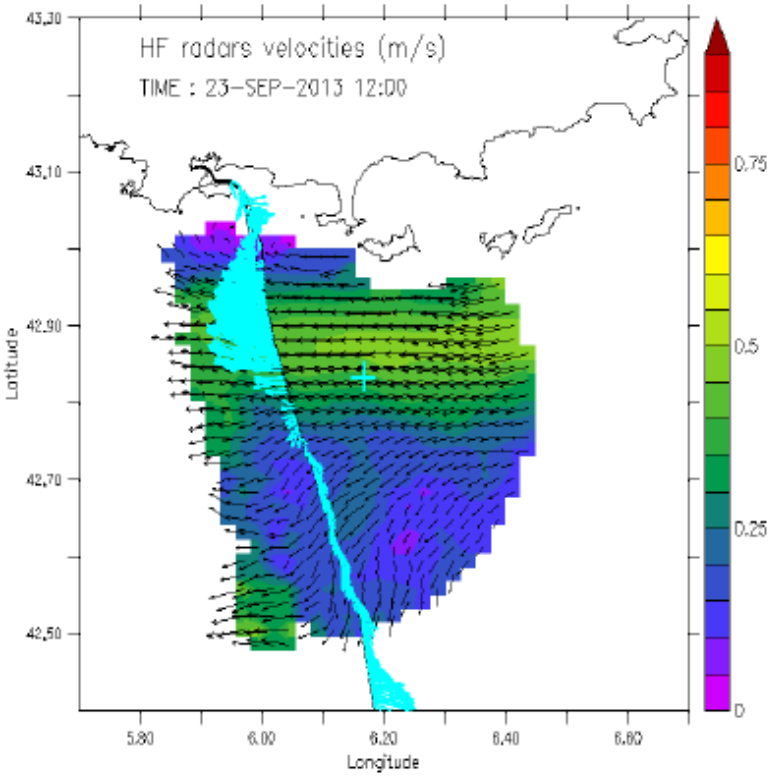
Glider HANNON-ASICSMed 19-22 janvier 2013 (courtesy of Testor P., Bosc A.)

Joint analysis with ancillary data/plateforms...

Joint analysis with ADCP too, but for the whole current (including inertial and Ekman components)...

SAVED

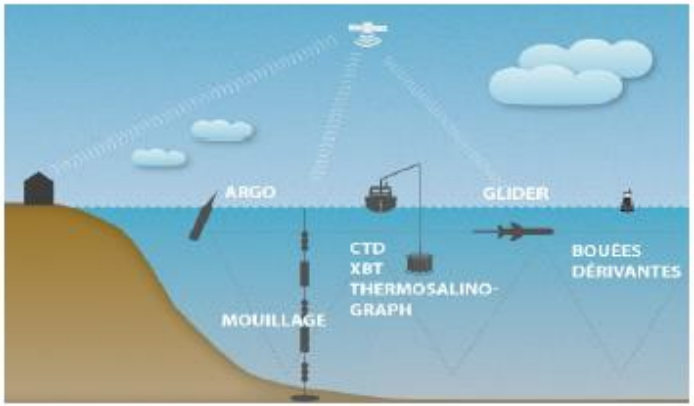


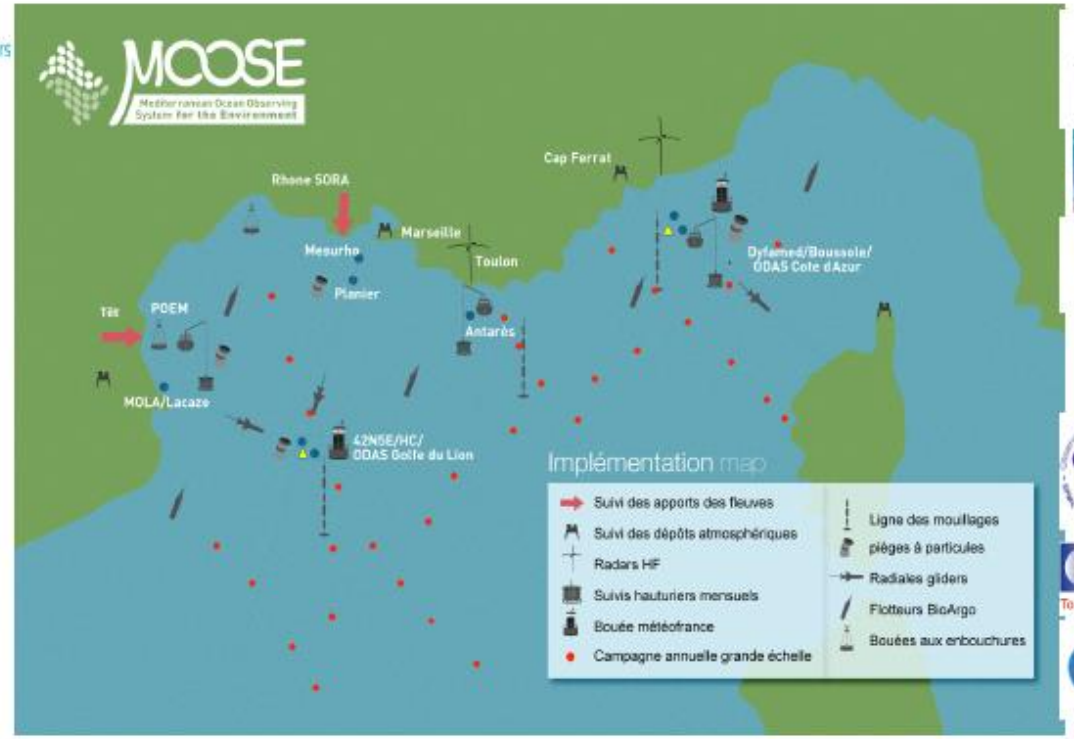


Links with national monitoring actions ?

MOOSE - Mediterranean Ocean Observing System for the Environment

SNO/SOERE





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