Joint European Research Infrastructure network for Coastal Observatories

Report after the Strategic workshop #2 (Oslo)

Grant Agreement n° 262584

Project Acronym: JERICO

Project Title: Towards a Joint European Research Infrastructure network for Coastal Observatories

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Involved Institutions: Ifremer and JERICO partners

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TABLE OF CONTENTS

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REFERENCES

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other				

1. Introduction and Workshop agenda

This report is an add-on to the General Assembly 2 report (plenary meeting held in Oslo in May 2014), which was provided to all JERICO partners.

This strategic workshop was a one-day meeting composed of talks made by JERICO partners who have a clear view of the field they presented. This workshop was one step ward the JERICO-Next vision and proposal.

The event focused on future coastal prospective and strategy, by discussing the possible use of JERICO main focus (gliders, fixed platforms and ferryboxes) and the new approaches to consider.

Presented slides are included in annex of the document.

Agenda:

Wednesday, 7th of May	**Workshop on future coastal prospective/strategy**	
9:00-12:30	**- Label and future strategy deliverables**	Speakers:
	Label definition	HCMR?
	Status of the deliverable – contents	D. Durand
	Work plan for the next year – analyses?	I. Puillat
	Marine biological approach	H. Hummel
	Future possible use of gliders (20')	R. Hall
	Future possible use of ferrybox (20')	SYKE
	Future possible use of fixed platforms (20')	D. Mills
12:30-14:00	Lunch	
14:00-17:00	**- Discussion on H2020 proposal**	
	Sub bottom observatory (20')	J. Del Rio
	HF Radar (20')	J. Mader
	Coastal profilers (20')	P. Farcy
	Jerico 2 approach	P.Farcy &
	Calendar	I. Puillat
	DISCUSSION	

Attendees:

Name	Organization	Country
David Mills	CEFAS	UK
Dominique Durand	IRIS	Norway
Glenn Nolan	MI	Ireland
Henning Wehde	IMR	Norway
Herman Hummel	NIOZ	Netherlands
Ingrid Puillat	IFREMER	France
Joaquin del Rio	UPC	Spain
Joaquín Tintoré	CSIC	Spain
Julien Mader	AZTI	Spain
Kai Sørensen	NIVA	Norway
Leonidas Perivoliotis	HCMR	Greece
Lauri Laakso	FMI	Finland
Manolis Ntoumas	HCMR	Greece
Nadia Pinardi	INGV	Italy
Nolwenn Beaume	IFREMER	France
Patrick Farcy	IFREMER	France
Paul Gaughan	MI	Ireland
Rajesh Nair	OGS	Italy
Robert Hall	UEA	UK
Seppo Kaitala	SYKE	Finland
Stefania Sparnocchia	CNR ISMAR	Italy
Timo Tamminen	SYKE	Finland
Wilhelm Petersen	HZG	Germany

2. Minute of the workshop

1. Session 1: Label and future strategy deliverables

1) Label definition (George Petihakis, HCMR)

George Petihakis presented the work undergone regarding the JERICO label. Since he couldn't attend the workshop, he made his presentation using Skype.

According to the DOW and initial plan, the aim of this label was:

- to establish a consensus on guidelines for best practices in the design, the implementation, the maintenance, the data policy and the valorization of operational coastal observatories;

- to get, for the partners and all new comers that comply with this label, a fair recognition of the quality of the managed observatories;

- to help stakeholders becoming aware of the European interest in the development of high quality coastal observatories;

- to foster a wider market for the industry in sensor technology and platforms based on the agreed standards.

However, this label was proved to be a very difficult task. Indeed, coastal observatories are complex and diverse but criteria and standards must be rather general, which makes the definition of this label problematic. The label document was planned at Month 18 but this deadline was too short as the label needed long discussions and wide agreement between all JERICO partners. Furthermore, the best practice deliverables, which are the cornerstones of the label, are delivered towards the end of the project.

It was decided that the best definition of a JERICO Label is that of "fit for purpose", where each observation system must show that it fulfills a set of requirements emanating from the observational purpose. This will take into account the heterogeneity of the coastal observing systems, the compliance with other normative efforts, the specificity of the coastal environment and the advancements on the scientific knowledge of marine ecosystem processes.

The acquired experience of JERICO partners and the JERICO deliverables from WP3 and WP4 on a wide range of issues has allowed an extensive list of recommendations. However, we have to pay attention as these are not necessarily "good to follow" recommendations.

To conclude, it has been decided that the label will be updated every 3 years. The sustainability of the Committee in charge of the label will be addressed as a topic of the sustainability of the JERICO consortium considering that the label Committee needs to be linked with a permanent European group such as EuroGOOS. To increase this European partnership, an agreement with ESONET and FixO3 label committees may be also needed.

JERICO

JOINT EUROPEAN RESEARCH INFRASTRUCTURE NETWORK FOR COASTAL OBSERVATORIES

2nd General Assembly – NIVA HQ

JERICO LABEL

G. Petihakis | HCMR | gpetihakis@hcmr.gr

THE ORIGINAL IDEA

(IN THE DOW)

Creating a JERICO label:

- to establish a consensus on guidelines for best practices in the design, the implementation, the maintenance, the data policy and the valorisation of operational coastal observatories;
- to get, for the partners and all new comers that comply with this label, a fair recognition of the quality of the managed observatories;
- to help stakeholders becoming aware of the European interest in the development of high quality coastal observatories;
- to foster a wider market for the industry in sensor technology and platforms based on the agreed standards.

Del. No	Title	Lead	Man months	Nature	Dissemination	Del. Date
D1.4	JERICO label definition	11	2.0	O	PU	18

THE REALITY

Proved A very Difficult Task

- Coastal observatories are complex and diverse
- Criteria and standards must be rather general
- Month 18 proved too soon as the Label needs long discussions and wide agreement between partners
- The best practice deliverables which are cornerstones of the Label are delivered towards the end of the project

THE LABEL V2.0

To define the JERICO Label the following are taken into account:

- The heterogeneity of the coastal observing systems to address the multiple space and time scales that characterise the variability of the coastal ocean;
- The compliance with other normative efforts (EU projects such as SeaDataNet & MyOcean, EU initiative EMODnet);
- The specificity of the coastal environment;
- The heterogeneity of the processes and interacting scales;
- The advancements on the observing technology and data transmission and availability; and
- The advancements on the scientific knowledge of marine ecosystem processes.

A "**fit for purpose**" approach

MAIN REPORT

1) Definition

- The JERICO Label is a set of criteria defined to ensure some standardisation and interoperability, and the quality of data for coastal observatories.

2) Criteria

- *Sustainability:*
  - a 5-year funding road map from National and/or International sources is required.
  - Long time-series is considered an advantage.

MAIN REPORT

2) Criteria cont.…

- *Operationality:*

key issues :

- Data is quality controlled following documented protocols.
- Free and open access.
- Long term archiving (more than 20 years) policy and implementation has to be performed for all types of data, including classified data. Archived datasets should be citable with a mention of the observation system.
- Clear mechanism must be in place to guarantee data authorship traceability.
- Data availability (real time – delayed mode) compatible with the "observation method" (for example real time is required in operational systems).
- Data frequency is compatible with the "observation purpose" capturing the time scale(s) of the observed phenomena.

MAIN REPORT

2) Criteria cont….

- *Observing Purpose:* a "Fit for Purpose"

Thus in terms of measured parameters the observation system must have:

- Primary or Core Parameters. These are basic parameters required for the specific observing purpose following the core parameter list.
- Secondary Parameters. These are additional parameters which are 'good to have' and although don't fall within the "Primary or Core" category, they are also measured.

"Fit-For-Purpose" Parameter List

	Weather & Climate	Marine Operations	Natural Hazards	National Security	Public Health	Ocean Processes	Sustained Resources	OTHER
BIOLOGICAL								
Pathogens				✓	✓		✓	
Phytoplankton	✓	✓		✓	✓		✓	
Zooplankton							✓	
Fish							✓	
Benthos								
Mammals								
Seabirds								

	Weather & Climate	Marine Operations	Natural Hazards	National Security	Public Health	Ocean Processes	Sustained Resources	OTHER
PHYSICAL								
Salinity	✓	✓	✓	✓	✓	✓	✓	
Temperature	✓	✓		✓	✓	✓	✓	
Sea Level	✓	✓	✓	✓		✓	✓	
Surface Waves	✓	✓	✓	✓	✓	✓	✓	
Surface Currents	✓	✓	✓	✓	✓	✓	✓	
Optical Properties (e.g. CDOM & SPM)				✓	✓	✓	✓	
Heat Flux	✓					✓	✓	
Ocean Colour	✓	✓			✓	✓	✓	
Benthic Habitats		✓					✓	
Wind Speed & Direction	✓	✓				✓		
Surface Air Temperature	✓	✓				✓		
Tidal Stream Flow	✓		✓			✓	✓	

An important issue is the specifications of the various sensor types in terms of range and accuracy. Although both characteristics will be judged against the observational purpose, it is mandatory that the sensors be registered in a database accessible under open data principles.

	Weather & Climate	Marine Operations	Natural Hazards	National Security	Public Health	Ocean Processes	Sustained Resources	OTHER
CHEMICAL								
Contaminants				✓	✓		✓	
Dissolved Nutrients					✓		✓	
Dissolved Oxygen						✓	✓	
CO2 Partial Pressure					✓	✓	✓	
pH Acidity					✓	✓	✓	

MAIN REPORT

3) Classification Scheme

New Entry*:* New System (Sensor, Platform, Infrastructure) infrastructure enters JERICO scheme.

Standard Level*:* The System (Sensor, Platform, Infrastructure) complies with the "fit for purpose" criteria with minor discrepancies.

Full Level*:* The System (Sensor, Platform, Infrastructure) complies with the "fit for purpose" criteria and may also hosts extra parameters.

MAIN REPORT

4) Infrastructures

The three different types of observing systems included in JERICO are:

- *Fixed platforms*
  - Buoys
  - Platforms
  - Coastal stations
  - Stand-alone sensors (e.g. tide recorder)
- *Ferry Boxes*
  - Passenger ships
  - Cargo ships
  - Research vessels
- *Gliders*
  - Autonomous surface vehicles (e.g. wave gliders)
  - Autonomous underwater vehicles (e.g. buoyancy gliders*)*

MAIN REPORT

5) Rules Applied

The JERICO Label shall not supersede existing legal or safety regulations or requirements and in most cases applies as a subsidiary to existing standards.

6) Nomination of the Label

- request → award
- dedicated committee
- the Label will be awarded for a three-year period.
- fail → recommendations

7) Update of the label

- update every 3 years.
- Links with organisations, initiatives, projects

MAIN REPORT

8) Protection of the label

No liability

8) Mitigating Measures

Restriction / mitigation → time limit to comply

8) Environmental Impact

- *A precautionary approach*
- *Acoustic devices and sea mamals*
- *Ensure that electrical and acoustical noise are below the levels identified in the OSPAR agreement. S*
- *Follow the rules and recommendations of int. bodies such as IUCN and ICES.*
- *Minimise disturbance to species and habitats during fieldwork*
- *Seek permission for fieldwork in marine protected areas, where necessary*
- *Retrieve all deadweight or unused devices.*

MAIN REPORT

11) Recommendations

The acquired experience of JERICO partners and the JERICO deliverables from WP3 and WP4 on a wide range of issues has allowed an extensive list of recommendations. Although not obligatory these are "good to follow" recommendations.

- *Recommendations on sensing technologies*
  - Pumped systems vs. un-pumped,
  - Open-path systems vs. closed-path,
  - Conduction vs. induction,
  - Wet chemistry vs. gas tension,
  - Optical vs. electrochemical,
  - Wavelength (chlorophyll, turbidity, phycocyanin)

MAIN REPORT

11) Recommendations cont.…

- *Specific recommendations for coastal fixed monitoring platforms*
  - Energy storage
  - Connectors
  - Mooring lines
  - Data transmission
  - Choice of materials – corrosion and ageing recommendations
- *Specific recommendations for ferry boxes*
  - Connectors
  - Data transmission
  - Choice of materials – corrosion and ageing recommendations
  - Flow control
- *Specific recommendations for gliders*
  - Energy storage
  - Connectors
  - Data transmission
  - Choice of materials – corrosion and ageing recommendations

MAIN REPORT

11) Recommendations cont.…

- *Qualification and testing*
  - Define a life cycle of the equipment.
  - Define the list of equipment parts to be tested
  - Define the type of tests to be performed
  - Define the required testing facilities
  - Test archiving

- *Recommendations on Operating Issues*
  - Power and consumption issues for each type of platform or glider
  - Sampling frequency/averaging
  - Pumping issues (FerryBox) rate of flow, time constant, effect on results.
  - Sensors set-up in terms of operating (e.g. CO_2 sensor, flow-through sensors)
  - Remote access / control (FerryBox, Gliders, Fixed Platforms)
  - Data transmission – intervals / underwater communication
  - Documentation (log book, auditing, system description)

MAIN REPORT

11) Recommendations cont.…

- *Recommendations for Deployment-Installation*
  - Deployment issues for Fixed Platforms
  - Deployment issues for Gliders
  - Installation issues for Ferry Box

- *Recommendations for Maintenance*

A maintenance plan will be established to describe periodic maintenance operations that have to be carried out (mandatory) and anticipate scenarios of exceptional maintenance operations.

- Fixed platforms (procedures – skill of maintenance teams - maintenance intervals)
- Gliders (procedures – skill of maintenance teams- maintenance intervals)
- Ferry boxes (procedures – skill of maintenance teams- maintenance intervals)

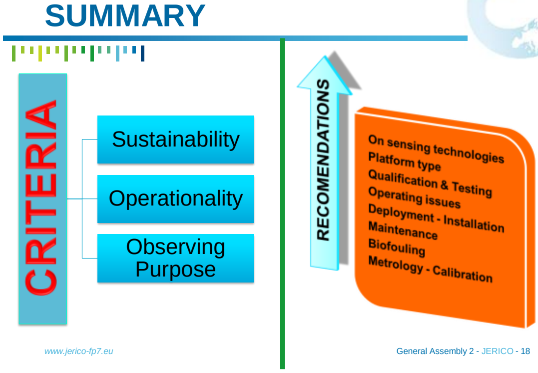
MAIN REPORT

11) Recommendations cont.…

- *Recommendations for Biofouling prevention*
  - Types of biofouling protection/devices
  - Biofouling protection demands (intervals, sensors affected, etc)

- *Recommendations for Metrology-Calibration*
  - Recognized standards. For parameters where international references exist, the methodology must be followed and documented (mandatory).
  - Calibration history for each sensor.
  - Calibration can be done either by the manufacturer, in-house or by a third party.
  - Calibration labs must have fully documented procedures with operation manuals, protocols etc ensuring full traceability. The appropriate methods, which are followed, for each parameter must be recorded with corresponding references.
  - All calibrated sensors must be field validated.

SUMMARY



FUTURE PLANS

- The Label will be updated every 3 years.
- The sustainability of the Committee in charge of the Label will be addressed as a topic of the sustainability of the JERICO consortium considering that the Label Committee needs to be linked with a permanent European group such as EuroGOOS.
- Furthermore an agreement with ESONET and FixO3 Label committees may be also needed.
- JERICO will propose the constitution of this permanent group by the end of JERICO project in 2015.

ANNEXES AND REFERENCES

- JERICO Label questionnaire
- ESONET D.68 ESONET Label definition
- JERICO D 3.1 Report on current status of Ferrybox
- JERICO FCT First survey analysis
- JERICO WP 2 Report on existing observation network from all ROOSs
- JERICO D 4.2 Report on Calibration Best Practices
- JERICO D 4.3 Report on Biofouling Prevention Methods
- JERICO D 4.4 Report on Best Practice in conducting operations and maintaining
- Glossary

2) *From national programme to a pan European network (D. Durand, IRIS)*

Dominique Durand presented the future strategy for coastal observatories, with a pan European network approach.

JERICO may become the coastal component of the European Ocean Observing System (EOOS). As a pan European research infrastructure of operational coastal observatories, JERICO should:

- serve national and European research needs
- facilitate the implementation of legislation and directives that addresses the governance of European land-impacted seas
- provide opportunities for innovation and business development.

This is driven by two forces: the *need of in-situ observations* related to the implementation of the coastal component of the European operational oceanography service, and the *Marine Strategy Framework Directive*.

When it comes to the MSFD, JERICO products may contribute to the assessment of the environmental status, the assessment of Biodiversity, the understanding of environmental variability and status and finally play a major role in sustaining the trans-boundary dimension of the directive.

One of the main challenges for JERICO is therefore to integrate and densify the network of observations in such a way that it becomes a cost-efficient source of data and information for managing European coastal seas, including:

- Contributing in answering key scientific challenges
- Operational provision of information to stakeholders, and more technically to nowcasting and forecasting models,
- Support to European policy making

The integration of national facilities into a pan European network of observing systems, serving trans-boundary environmental challenges, faces two main types of bottlenecks: scientific/technical and governance/economical ones.

For sound and intercomparable environmental assessments across Europe, there is a necessity to have common (best) practices, common calibrations, common processing, quality control and a common expertise for validation. Harmonisation between national coastal observatories must continue as it is the backbone of the future JERICO network. There are remaining challenges on reaching a consensus, maybe especially regarding fixed platform and similar observatories (Platform and sensors) at regional level should be deployed to ensure the consistency of observations upstream and downstream.

The need for pan European activity includes the need for the provision of data to support forecast models. These are global in extent but to be accurate they have to assimilate, be validated against or parameterized towards high resolution data on the local scale from JERICO components.

Here are some bottlenecks that JERICO could contribute in overcoming:

Reaching a suitable description of hydrodynamics is the key for assessing trans-boundary processes.

- provide data that support hydrodynamic models.

- modelling the biochemistry, particle transport and anthropogenic impacts on ecosystem:

- providing **appropriate** data on distribution and bioavailability of chemical substances (nutrients, contaminants), sediment transport, and basic ecological parameters (light, O_2/H_2S, osv.)

To conclude and do a parallel with the JERICO project, there is a good progress in most of the WPs, but big effort remains to be done toward the delivery of relevant inputs to the strategy documents, especially proper and exhaustive description of status and gaps in term of observing systems and consensus on best practices as inputs to the Label. There are clear recommendations on bottlenecks to overcome (efficiency of the process forward) and ways forward on integrating new/mature sensors (WP10) on existing JERICO platforms.

JOINT EUROPEAN RESEARCH INFRASTRUCTURE NETWORK FOR COASTAL OBSERVATORIES

Future Strategy for Coastal Observatories

From National programme to a pan European network

Speaker I Organism I adresse mail

Background for JERICO

JERICO may become the coastal component of the EOOS

As a pan European research infrastructure of operational coastal observatories, JERICO should :

- *serve national and European research needs,*
- *facilitate the implementation of legislation and directives that addresses the governance of European land-impacted seas*
- *provide opportunities for innovation and business development.*

Two driven forces:

- *the needs of in-situ observations related to the implementation of the coastal component of the European operational oceanography service*
- *the Marine Strategy Framework Directive.*

Strategy document - ToC

JERICO AND THE MSFD

When it relates to the MSFD, JERICO products may:

- *Contribute to the assessment of the environmental status,*
- *Possibly contribute in the assessment of Biodiversity*
- *Contribute in the understanding of environmental variability and status*
- *Play a major role in sustaining the trans-boundary dimension of the directive*

One of the main challenges for JERICO is therefore to integrate and densify the network of observations in such a way that it becomes a cost-efficient source of data and information for managing European coastal seas, including:

- Contributing in answering key scientific challenges
- Operational provision of information to stakeholders, and more technically to nowcasting and forecasting models,
- Support to European policy making

TRANS-BOUNDARY OBSERVATIONS

Trans-boundary and trans-national dimensions of the environmental health in the coastal domain.

- *identification, mapping and quantification of pollution sources*
- *trans-boundary **transport**, Incl. For ex. harmful chemical and/or biological compounds (harmful algae, heavy metals, contaminants, invasive species).*

The integration of national facilities into a pan European network of observing systems, serving trans-boundary environmental challenges faces two main types of bottlenecks:

- *Scientific and technical bottlenecks*
- *Governance and economical bottlenecks*

SCIENTIFIC & TECHNICAL BOTTLENECKS

Harmonisation

For sound and intercomparable environmental assessments across Europe there is a necessity to have common (best) practices, common calibrations, common processing, quality control and a common expertise for validation.

Harmonisation between national coastal observatories must continue as it is the backbone of the future JERICO network.

Remaining challenges on reaching a consensus, maybe especially regarding fixed platform

Similar observatories (Platform and sensors) at regional level should be deployed to ensure the consistency of observations upstream and downstream.

SCIENTIFIC & TECHNICAL BOTTLENECKS

The role of JERICO on coastal modelling

The need for pan European activity includes the need for the provision of data to support forecast models. These are global in extent but to be accurate they have to assimilate, be validated against or parameterized towards high resolution data on the local scale from JERICO components.

Bottlenecks that JERICO could contribute in overcoming:

Reaching a suitable description of hydrodynamics is the key for assessing trans-boundary processes.

- *provide data that support hydrodynamic models.*

Modelling the biochemistry, particle transport and anthropogenic impacts on ecosystem:

- *providing **appropriate** data on distribution and bioavailability of chemical substances (nutrients, contaminants) , sediment transport, and basic ecological parameters (light, O2/H2S, osv.)*

TRANS-BOUNDARY OBSERVATORIES

The role of moving observatories

Moving observatories of trans-boundary nature (Ferrybox, glider, regular transect) have a specific role to play when it relates to providing trans-boundary synoptic view.

the role of remote sensing is important. The role of Jerico towards COPERNICUS?

Promoting Trans- boundary and trans-national cable-based observatories?

Governance bottleneck

JERICO is a building block of EOOS. It aims at providing an European web capturing national/regional coastal observatories.

Observing systems are nationally funded, answered to national focus and to specific scientific questions.

Governance bottleneck

- *What initiatives are needed to motivate the research community and the nations to harmonize at European level?*
- *What are the role of nations, regions, Europe?*
  - *regional focus – narrower scientific question*
  - *addressing trans-boundary issues at the adequate level*
  - *taking advantage of the European region policy*
- *Can one jointly and strategically agree on the future national RI proposals?*
- *Can one set a bit of top-down in the bottom-up practices.*

Remaining challenges

- Good progress in most of the WPs, but big effort remains to be done toward the delivery of relevant inputs to the strategy documents:
  - Proper and exhaustive description of status and gaps in term of observing systems
  - Consensus on best practices as inputs to the Label
  - Clear recommendations on bottlenecks to overcome (efficiency of the process forward)
  - Way forward on integrating new/mature sensors (WP10) on existing JERICO platforms
  - A vision for Europe on coastal observing network

Time for comments and discussion

Thanks

3) Marine biological approach (H. Hummel, NIOZ)

Herman Hummel (NIOZ) presented his vision of a possible strategy with the monitoring of marine biodiversity. The discussion and presentation also refers to the deliverable D1.9 of WP1“**Strategy and interfaces for the monitoring of marine biodiversity”**, presented during the general assembly. Consequently the corresponding slides are also included.

Nowadays there is more and more demand for the detection, understanding and forecasting of crucial coastal processes over extensive areas, for both fundamental research and coastal seas management purposes.

The monitoring of marine biodiversity is of increasing importance as:

- Marine ecosystems and biodiversity in particular, are under pressure of global change, anthropogenic activities, exploitation, pollution and globalisation
- Restoration measures are taken and sustainable coastal management has been implemented, which asks for evaluation
- Data are needed for assessments regarding the national and European policies and regulations; e.g. the WFD / MSFD and Natura2000

Within JERICO, the task 1.4 “Definition strategy and interfaces with the monitoring of marine biodiversity” was defined to investigate the potentials and possible strategy for JERICO to become an important network for biodiversity observation.

Three strategies were identified and might be combined in order to become that important network for biodiversity observation:

- Implementation of sensors, indicative for biodiversity state, in the existing or foreseen JERICO observatory network
- Linking of JERICO network to existing or developing initiatives of biodiversity networks or pan-European biodiversity measurement programmes
- Optimization of sensors delivering biodiversity related information already present or foreseen in the JERICO network

The current JERICO sensors, with regards to temperature, salinity, chlorophyll-a, turbidity, dissolved oxygen, pCO2 and nutrients, have some relevance towards biodiversity:

- Most of the parameters correlate to biodiversity: at a certain level for some organism groups under certain conditions (It is however generally not more than an indication)
- These parameters describe boundary conditions for species and therewith to a certain extent identify potential biodiversity.

The realized biodiversity is however dependent on anthropogenic impacts and disturbances: sea floor integrity issues, fisheries and harvesting, pollutants including chemicals and noise, human presence.

In that extend, in order to estimate realized biodiversity, in situ monitoring of biodiversity is essential: the quality state (and monitoring) is valuable towards inter- and extrapolation of in situ biodiversity observations. Combining the two will achieve the best ratio between reliability and cost-effectiveness.

To conclude, there is a promising future for biodiversity observation within a possible JERICO "2" project framework:

- Imaging technologies (i.e. camera auto detection and photo- or video analyses):
- High potential indicator value
- Applicable from a variety of platforms
- Measures diversity for a broad range of biota
- Cost efficiency
- Methods do however not always cover large (spatial) areas
- Genetic markers might particularly have potential for the future
- Current operability status for broad-scale application to estimate diversity at various levels and a range of biota is limited
- Hydrophones, spectrophotometry and radio spectrometry

The optimal strategy for JERICO to become an important network towards biodiversity observation might be to focus on a limited number of parameters that describe habitat diversity and/or to focus on the implementation of new sensors for sea floor characterization and hydrodynamics.

If in-situ (real) biodiversity observation is considered, it would be possible to focus on techniques with auto-detection potentials (e.g. imaging and acoustics) that cover biodiversity largely missing in other initiatives and to connect to current pan-European biodiversity and earth observation initiatives and tune activities towards joint cooperation (whereby spatial and temporal collated data can be coupled).

Development and implementation of a pan-European Marine Biological Observatory System

Future Strategy for biological coastal observation

Herman Hummel
Monitor Taskforce, Royal Netherlands Institute for Sea Research

JERICO Worrkshop - Oslo, May 7th, 2014

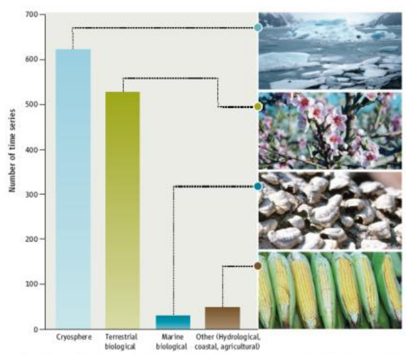
Is marine realm so special that it needs more attention ?

Yes, because marine territory covers 70 % of earth surface.

Yes, because marine realm has :
- **although less species**
- **greater phylogenetic diversity than land faunas and floras**

	Number of phyla	
	Endemic	Total
Freshwater	0	14
Terrestrial	1	11
Marine	13	28
Total		33

This does provide (and may provide still unknown) goods and services of great value and importance to mankind:
- **food**
- **chemicals**
- **play crucial roles in biogeochemical processes sustaining the biosphere**



Marine undersampling. The number of time series from different environments included in the recent IPCC (Intergovernmental Panel on Climate Change) Fourth Assessment Report differ widely. Marine systems are vastly underrepresented compared with terrestrial systems (1).

Yes, because number of time series available for marine realm is relatively very low

A.J. Richardson & E.S. Poloczanska, 2008. Ocean science: Under-resourced, under threat. Science 320: 1294-1295

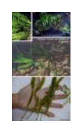
Why more attention on marine realm during last decades ?

Because of (anthropogenic) threats to the environment:
- **although local environment for millennia influenced**
- **this and last century increasingly strong impact on global environment**

Increased pressures
- **aquaculture / over-fishing**
- **species introductions / invading (exotic) species**
- **pollution / mining**
- **tourism**

Threats do have an impact on the goods and services of biodiversity
(affecting nurseries, source of stock, recycling nutrients, scenery, public health)






Mechanisms through which marine research (in Europe) in the last decades was promoted

- Fisheries directed organisations: ICES (since 1902), CIESM (since 1919)
- Symposium series : EMBS (since 1966), ECSA

- **1984-2002**: **EC 1st - 5th FW programmes** with occasional groups of institutes
  - MAST programme – Marine Science and Technology
    1991 : (X)ODC : Oceanographic Data Centres
    1993-2000 : OMEX (Ocean Margin Exchange) programme
- **1992**: **CBD - Convention on Biological Diversity** (Rio de Janeiro) - Focus on joint action regarding marine biodiversity in Europe developed only recently
- **1993**: IGBP – LOICZ (Land Ocean Interactions in the Coastal Zone) programme

From mid nineties in Europe increased level of networking
- **1994**: **EuroGOOS** – European Global Ocean Observing System
- **1995**: Foundation of **MARS** - Marine Research Institutes and Stations Network
- **1995**: **ESF Marine Board**
- **1999**: **EPBRS** – European Platform for a Biodiversity Research Strategy
  Policy and science (halting biodiversity loss by 2010)
  - 2001 Bioplatform, 2006 Biostrat

After first initiatives there was still the need for large networks, since:

- Knowledge on marine biodiversity in Europe is **fragmented** within and between disciplines.
  The research community has been unable to overcome its fragmentation :
  - by habitat: pelagic vs. benthic, deep sea vs. shallow coastal
  - by discipline: ecology vs. taxonomy, genomics
  - by nationality
- Approach to understand (patterns, function of) biodiversity has hitherto been **ad hoc and local**, mainly by its regional or national focus in biodiversity research.
- **No agreed common methodology** for many aspects of biodiversity is available.

Consensus had grown that:

- **concertation and co-ordination at European scale** is urgently required to
- implement **long-term** and **large-scale** biodiversity research

- **EC 5th FW : Concerted Actions and e-conferences**
  - 1999-2001: ERMS - European Register of Marine Species
    - 2000: SMEBD - Society for the Management of Electronic Biodiversity Data
  - 2000-2002: Concerted Action **BIOMARE**
  - 2002-2004: e-conferences by M@rble and Marbena

- **EC 6th FW: Networks of Excellence and Integrated Projects**
  - **MarBEF** (2004), MGE (2005), EurOceans (2005), ESONet (2007)
  - SeaDataNet (2006)

- **EC 6th FW: ERA nets (**2004-2008; European Research Area - funding agencies)
  - Balloon, MarinERA, BioDiversa, MariFish

- **EC FP 7th : Larger (Networks of) Networks (+ ESF and EuroGOOS)**
- **EC FP 7th - ESFRI - European Strategy Forum on Research Infrastructures**
  - 2008: EModNet - European Marine Observation and Data Network
  - 2008: **LifeWatch**

- Larger intergovernmental networks
  - 2000: GBIF (Global Biodiversity Information Facility)
  - 2005-2010: GEOSS (Global Earth Observation System of Systems)
  - GEOBON (GEO Biodiversity Observatory Network)

JERICO Worrkshop
Oslo, May 7th, 2014

BIOMARE

Implementation and networking of large-scale long-term MARine BIOdiversity research in Europe.

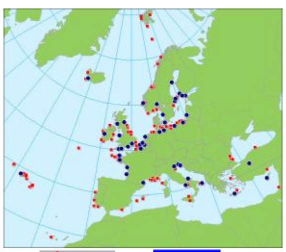
General co-ordinators:
Herman Hummel, Carlo Heip & Pim van Avesaath

Netherlands Institute of Ecology

NIOO

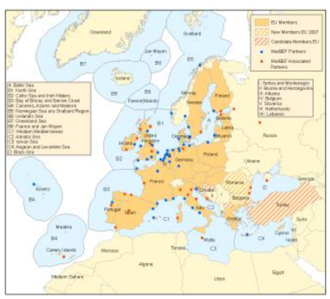
Funded under the Energy, Environment and Sustainable development (EESD) Programme of the European Union. Contract number: EVR1-CT2000-20002

Collation of the results from the previous actions by MARS, Marble, MarBENA, BIOMARE, MarBEF, and LifeWatch led to EMBOS

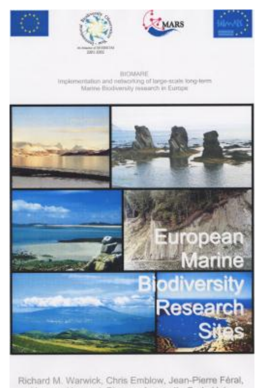


MARS members (blue dots)

BIOMARE Reference / Focal sites (red dots)



MarBEF participating institutes:
- **56 Full Members (blue dots)**
- **39 Associated Members (red dots)**



Results published in:

Book on marine biodiversity reference sites

and

Book on marine biodiversity indicators

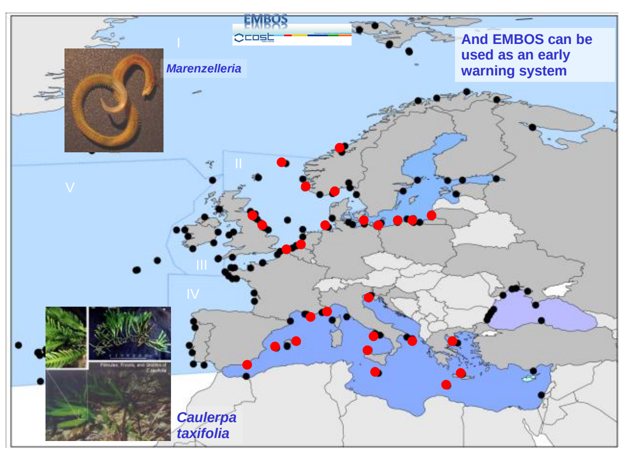
Aims of EMBOS (MARS, MarBEF+) and EMBRC are:

To install a permanent international pan-European large-scale network of marine biological observatories

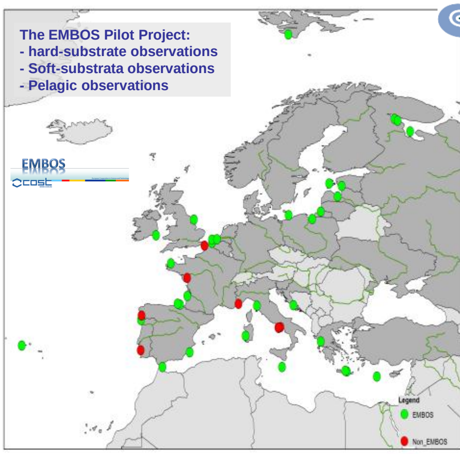
with an optimized and standardized methodology, to assess long-term changes, and their possible causes (natural and anthropogenic)

- **Assessment of impact of changes on marine ecosystems and services they provide**
- **An early warning system for changes**
- **Quantification of long-term changes**
- **Understanding of natural and anthropogenic drivers responsible for changes.**

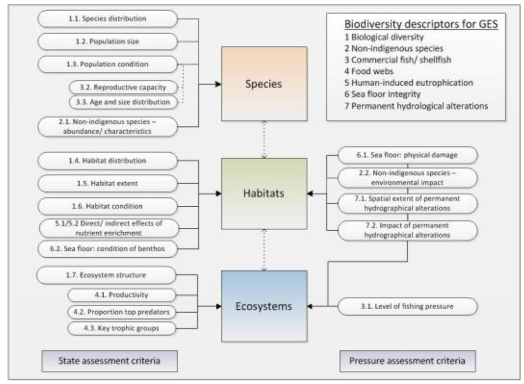
JERICO Workshop
Oslo, May 7th, 2014



The EMBOS Pilot Project:
- **hard-substrate observations**
- **Soft-substrata observations**
- **Pelagic observations**

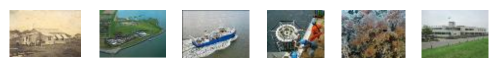


EMBOS: Scheme of MSFD indicators to select from



The RIGA results

			EMBOS Subgroups			Plenary		
ID	1. Name of indicator	BIOMARE Recommen-dation	NE Atlantic	Baltic	Medi-terranean		Remarks plenary discussion	Description
1	Taxonomic distinctness	4	1	0	1	1	Easy to be included in Multi metric index that is based on species (abundance) lists	Taxonomic spread of species, independent of sample size and sampling effort. A measure of the average degree to which species in an
3	Number of species	3	1	1	0.5	1	The number of species and their abundances are the basis for the Multi metric	Simple concept, but notoriously sample-size dependent and therefore difficult to measure accurately. Of use in rigorously controlled
5	Measurement of functional diversity	3	1	1	1	1		Knowledge of functional roles per species needed - for plants by morphology, for animals either by morphology, life history, trophic or
7	Conspicuous species by visual	3	0	1	0.5	1	Only regional (as also Envrionmental engineers). Can be part of the Multi	Superficial visual survey recording of only the conspicuous species (e.g. cover of fucoids algae, mussels, sponges, etc.; distibution and
10	Environmenta l engineers	4	0	1	0.5	1	Only regional (as Conspicuous species). Can be part of the Multi metric	
11	The log normal distribution	2	1	1	1	1	Can be part of the Multimetric indices	Unimpacted communities have a log normal distribution of the numbers of individuals among species, so that cumulative percentage
14	Ratios between pollution	2	1	1	1	1	Delete pollution and widen up towards other environmental factors. Yet,	Ratios are established between taxa regarded as pollution sensitive and those considered insensitive.
18	AMBI	2	1	0	1	1	BQI is preferred (can be part of the Multimetric indices)	Pollution or disturbance classification representing benthic community 'health' based upon proportions of five ecological groups. The
19	BQI		1	not discussed	1	1	Preferred above AMBI. Can be part of the Multimetric indices	



Proposals for Horizon 2020

SC5-06 – 2014: Biodiversity and ecosystem services: drivers of change and causalities

Initiative by MARS, EMBOS, MarBEF+, EMBRC, ICES, DEVOTES, VECTORS, EUBON

INFRAIA-1 – 2014/2015: Integrating and opening existing national and regional research infrastructures of European interest

Sub-topic: Research Infrastructures for integrated and sustained coastal observation.

Potential cooperation between JERICO & EMBOS
aiming at a single European channel for all physical, chemical and biological coastal data.

Strategic issues from point of view of EMBOS, MARS, MarBEF+, EMBRC

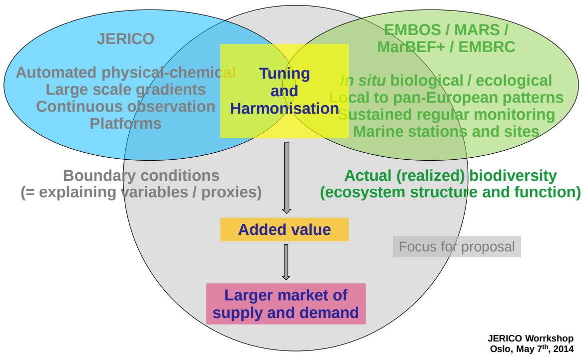
INFRAIA 8:
- **Integration of biology, physics, chemistry is key to a successful call**
- **Strength of EMBOS / MARS / MarBEF+ / EMBRC particularly in biology.**
- **Important to include not only instrumentation but also in-situ biological observation as it cannot be done by instruments only.**
- **Look at the future of automation of biological sampling and monitoring.**
- **Biological observation and physico-chemical monitoring needs to be in same place.**
  Innovation is in the combination, not in prolongation of individual networks
- **Can not include all parties - need to identify key networks / institutes / persons.**
- **Good spread of partners geographically.**
- **Different research communities act jointly – principle is cooperation, not incorporation – i.e. biology needs to be as strong as physical and chemical observation.**

Taking into account the own character of the communities (i.e differences)

JERICO	EMBOS / MARS / MarBEF+ / EMBRC
Automated physical-chemical	*In situ* biological / ecological
Large scale gradients	Local to pan-European patterns
Continuous observation	Sustained regular monitoring
Platforms	Marine stations and sites
Delivers:	
Boundary conditions	Actual (realized) biodiversity
(= explaining variables / proxies)	(ecosystem structure and function)
habitat characterizations	Actual habitat diversity

To do:
- **Tuning between networks of observations in time and space**
  (find common language, and indicate added value)
- **Standardisation/harmonisation of observations between/within networks**
  (and focus not only on detailed development of techniques within community)
- **Articulation of questions by end-users**
- **Delivery of data and expertise (products) to end-users**
  (Connection to directives (MSFD) and management objectives)

Taking into account the own character of the communities (i.e differences)



JOINT EUROPEAN RESEARCH INFRASTRUCTURE NETWORK FOR COASTAL OBSERVATORIES

Strategy and interfaces for the monitoring of marine biodiversity

WP1 – TASK 1.4 – DELIVERABLE D1.9

Sander Wijnhoven & Herman Hummel

Monitor Taskforce, NIOZ-Yerseke, the Netherlands

www.jerico-fp7.eu

Introduction

Joint European Research Infrastructure network for Coastal Observatories:

- **JERICO aims to increase the coherence and sustainability of European coastal observatories within a pan-European network**
- **by amongst others defining best practices for design, implementation, maintenance, data distribution and quality standards**
- **focussing on the biochemical compartment (i.e. Temperature, Salinity, Chlorophyll-a, Turbidity, Dissolved Oxygen and Carbon dioxide).**

Nowadays there is more demand for detection, understanding and forecasting of crucial coastal processes over extensive areas, for both fundamental research and coastal seas management purposes.

- Is that possible solely on basis of the above biochemical compartments?

Introduction

Particularly the monitoring of marine biodiversity is of increasing importance as:

- Marine ecosystems, and biodiversity in particular, are under pressure of global change, anthropogenic activities, exploitation, pollution and globalisation

- but also restoration measures are taken and sustainable coastal management has been implemented, which asks for evaluation

- and data are needed for assessments regarding the national and European policies and regulations; e.g. the WFD / MSFD and Natura2000

Goal and methodolgy

Therefore the goal of Task 1.4 was:

- To investigate the potentials and possible strategy for JERICO to become an important network for biodiversity observation

Methodology:

- Identification of potentials on basis of:
  - **literature and expert consultation,**
  - **weighing advantages and disadvantages,**
  - **discussing opinions in a workshop**

Strategies

Three strategies identified that might be combined:
in order to become that important network for biodiversity observation

- **1) Implementation of sensors, indicative for biodiversity state, in the existing or foreseen JERICO observatory network**
- **2) Linking of JERICO network to existing or developing initiatives of biodiversity networks or pan-European biodiversity measurement programmes**
- **3) Optimization of sensors delivering biodiversity related information already present or foreseen in the JERICO network**

Biodiversity sensing

Biodiversity sensing is not that straightforward:

- **Can be estimated at various levels (organism-, population-, community-, and ecosystem-level)**
- **for a variety of species groups in need of different methodologies (from protozoans to large marine mammals)**
- **in different environments (e.g. pelagic, benthic, water surface and in the air)**
- **with different types of diversity (e.g. functional, genetic, taxonomic, and behavioral diversity, and derivatives like production, biomass and food-web structure)**

The range of technologies (to be) used in JERICO is later evaluated (and scored) against these factors

Biodiversity sensing

Additionally of importance is:
and used for the evaluation and scoring

- that sufficient temporal and spatial resolution is achieved

- that measurements and proxies are sufficient indicative, reliable and reproducible

- that monitoring is cost-effective

- that methodologies are widely applicable

Current JERICO sensors

Temperature, salinity, chlorophyll-a, turbidity, dissolved oxygen, pCO2, nutrients

Relevance towards biodiversity:

- Most of the parameters do only to some extent correlate to biodiversity: i.e. at a certain level for some organism groups under certain conditions
(It is however generally not more than an indication)

-These parameters do in fact describe boundary conditions for species and therewith to a certain extent identify potential biodiversity

The realized biodiversity (i.e. the quality state) is however also dependent on anthropogenic impacts and disturbances (e.g. sea floor integrity issues, fisheries and harvesting, pollutants including chemicals and noise, human presence) **and available species pools and connectivity.**

Current JERICO sensors

To estimate realized biodiversity, *in situ* monitoring of biodiversity is essential

- Yet monitoring of (developments in) potential boundary conditions and the quality state is valuable towards inter- and extrapolation of *in situ* biodiversity observations,

Combining the two will achieve the best ratio between reliability and cost-effectiveness

Analysing methodologies

Methodologies with potential to sense biodiversity relevant aspects within the JERICO framework

Range of methodologies available is evaluated with regard to:
- **Potential indicator value for biodiversity**
- **Applicability at a variety of platforms**
- **Extent of high frequency data deliverance**
- **Spatial range that can be covered**
- **Current integrability and operability status**
- **Installation and operational costs**
- **Biodiversity: organisational level, species group, environment**

In our report a scoring methodology is suggested
relative importance of evaluated aspects might depend on other pan-European sensing initiatives and identified gaps therein.

Evaluation of methodologies

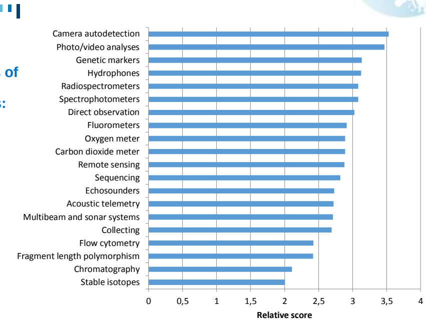
Scoring on various aspects indicates the potentials of various methodologies

$$Total = \frac{\left(\left(\frac{Val}{3}\right) + \left(\frac{5(Plat+1)}{8}\right) + Dat + Spat + \left(\frac{Inte + Oper}{2}\right) + Cost + \left(\frac{5(Lev + Group + Env)}{14}\right)\right)}{8}$$

Methodology\To measure	Potential indicator value (*Val*)	Multi-platform use (*Plat*)	Data type (*Dat*)	Spatial scale (*Spat*)	Integratebility in current observatories (*Inte*)	Operability (current status) (*Oper*)	Total costs (*Cost*)	Multilevel biodiversity indication (*Lev*)	Multi-target groups (*Group*)	Multi-environments (*Env*)	Total score (*Total*)
Indicator value	*36*	*7*	*5*	*5*	*5*	*5*	*5*	*4*	*7*	*3*	*5,25*
Acoustic telemetry	2	5	5	4	4	5	1	1	4	3	**2,72**
Carbon dioxide meter	2	6	5	3	5	5	4	1	1	1	**2,89**
Camera autodetection	20	6	5	3	3	3	3	2	5	2	**3,53**
Chromatography	7	5	2	1	3	5	2	2	1	2	**2,11**
Collecting	24	1	2	1	1	5	2	3	7	2	**2,69**
Direct observation	26	0	1	2	1	5	5	3	5	3	**3,03**
Echosounders	4	6	3	3	3	3	5	2	3	1	**2,73**
Flow cytometry	10	5	3	2	3	4	2	2	1	2	**2,42**
Fragment length polymorphism	8	1	1	3	1	4	5	1	7	3	**2,42**
Fluorometers	9	6	5	2	3	4	4	1	1	2	**2,91**
Genetic markers	15	6	2	3	3	2	5	2	5	2	**3,14**
Hydrophones	7	6	5	3	4	5	4	2	2	1	**3,12**
Multibeam and sonar systems	5	3	3	4	3	3	5	2	4	1	**2,71**
Oxygen meter	2	6	5	3	5	5	4	1	1	1	**2,89**
Photo/video analyses	22	7	2	2	4	5	3	3	5	3	**3,47**
Remote sensing	12	1	4	5	1	3	5	1	2	2	**2,88**
Sequencing	18	1	1	2	1	5	5	2	7	3	**2,82**
Spectrophotometers	9	7	5	3	3	4	3	2	2	2	**3,08**
Radiospectrometer	9	7	5	3	3	4	3	2	2	2	**3,08**
Stable isotopes	9	1	1	2	1	4	2	2	7	3	**2,00**

Evaluation of methodologies

Ranking of relative scores of potential methodologies:



Promising methodologies

Promising for biodiversity observation within a future JERICO framework:
- Imaging technologies (i.e. camera autodetection and photo- or video analyses):
- high potential indicator value
- applicable from a variety of platforms
- measures diversity for a broad range of biota
- cost efficient
- methods do however not always cover large (spatial) areas

- Genetic markers
- might particularly have potential for the future
- current operability status for broad-scale application to estimate diversity at various levels and a range of biota is limited

- Hydrophones, spectrophotometry and radiospectrometry
- Although not the highest scores might potentially fill in gaps for specific species groups not covered yet

Mind:
There may be good reasons to select other techniques now or in future!

JERICO among other actions

JERICO versus other Actions

Combining automated physical-chemical large scale continuous observation with more detailed local *in situ* biodiversity observation seems to be most promising.

JERICO could deliver proxies, habitat characterizations and explaining variables to inter- and extrapolate actual biodiversity observations to larger scales

Of importance is tuning of observations between networks (JERICO and partner networks) in time and space, standardizing observations and connecting to management objectives

Promising cooperations

EMBOS – pan-European Marine Biodiversity Observatory System
- **installing a network of coastal biodiversity observatories focusing on standardized *in situ* observations**
- **mutual beneficiaries:**
  - JERICO could link their valuable environmental observations directly to biodiversity observation
  - EMBOS could scale detailed local and transect information to pan-European mapping

ICES – International Council for the Exploration of the Sea
- **amongst others makes available biodiversity data (e.g. fisheries and trawling data) and maintains long-term data series**
  - wise to tune JERICO observations with ICES, focus on gaps within ICES and prevent duplication

Promising cooperations

With regard to initiatives like EEA, GEO BON and DEVOTES:
- **Stay in contact and discuss progress and opinions with other initiatives (e.g. in networks of networks)**
- **Consider indicators already in use in EU countries in policy and management and connect to their needs**
- **Promote indicators for which essential temporal and spatial resolution is likely to be realized**

Related networks like ESONET, EMSO, FixO³, ARGO and LTER:
- **Exchange experiences**
- **Tune activities for smooth transitions in observations to other realms and/or geographic regions**

Conclusions: A roadmap for the future

The optimal strategy for JERICO to become an important network towards biodiversity observation as well, might be:

- to focus on a limited number of parameters that describe habitat diversity and allow 3D ecotope mapping

- to focus on the implementation of new sensors for sea floor characterization and hydrodynamics

- if in-situ (real) **biodiversity observation is considered, to focus on techniques with auto-detection potentials (e.g. imaging and acoustics) that cover biodiversity largely missing in other initiatives**

- to connect to current pan-European biodiversity and earth observation initiatives and tune activities towards joint cooperation (whereby spatial and temporal collated data can be coupled)(an ideal opportunity is the initiation of joint activities and cooperation in Horizon2020 proposals)

4) Future possible use of gliders, ferryboxes and fixed platforms (R. Hall, UEA – Timo Tamminen, SYKE - D. Mills, CEFAS)

- Robert Hall (UEA) was the first one to speak on this matter, with a focus on **gliders,** and especially **seagliders**.

Seagliders are a new component of the ocean observing system. At the surface, they transmit data back in real time via satellite and receive new piloting instructions. They are ideal for winter or rough weather and work autonomously with set waypoints or in virtual mooring mode.

Regarding data processing and calibration, its specs are of JERICO interest:

- Real-time data are available straight away by ftp
- Delayed mode data are calibrated and cleaned up
- Flight model regressions to optimise data quality and calculate dive-average currents
- Flags for good/bad/modified data
- Thermal lag corrections for conductivity cell
- Lag corrections for dissolved oxygen optode
- Compare with CTD data for absolute calibrations
- Calibrate dissolved oxygen, chlorophyll against samples
- Vertical and horizontal gridding

Furthermore, ocean gliders can measure physics, chemistry and biology of the ocean simultaneously: they offer the opportunity to measure in remote areas and during rough weather, including near-surface values and complement existing technologies such as moorings and HF radar.

Regarding human resources, there is only one person needed to deal with the glider: there is no need to watch it 24/7 but just checking every day.

Seagliders as a multidisciplinary ocean observing platform

Rob Hall

School of Environmental Sciences
University of East Anglia

robert.hall@@uea.ac.uk

www.ueaglider.uea.ac.uk

With UEA colleagues Karen Heywood, Jan Kaiser, Gillian Damerell, Bastien Queste, Ben Webber, Adrian Matthews Gareth Lee and Stephen Woodward

Seagliders : a new component of the ocean observing system

- Ocean gliders weigh 50 kg in air, use buoyancy changes to descend/ascend
- 20-30 cm s^{-1} horizontal, 10-20 cm s^{-1} vertical speeds
- Maximum profile depth 1000 m, minimum 50 m
- At the surface, they transmit data back in real time via satellite & receive new piloting instructions
- Surface every 15 minutes for shallow dives or 4-6 hours for 1000 m dives
- Ideal for winter or rough weather
- Work autonomously with set waypoints or in virtual mooring mode
- Missions of up to ~ 6 months' duration
- Designed by UW, formerly licenced to iRobot, now to Kongsberg


Kongsberg Obtains Rights to Commercialize Seaglider™ Technology
AUTONOMOUS UNDERWATER VEHICLE NEWS 16. May 2013

Kongsberg Underwater Technology, Inc. announced today that it has successfully completed negotiations with the University of Washington's Center for Commercialization to obtain the sole rights to produce, market and continue the development of Seaglider ™ technology.

Seaglider sensors

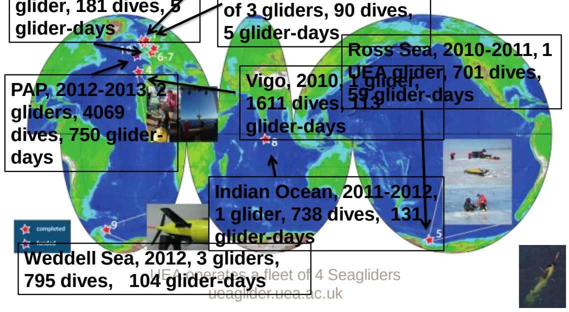
- CTD – temperature, salinity and pressure
- Dissolved oxygen O_2 from Aanderaa optode
- Chlorophyll and CDOM fluorescence (Wetlabs triplet puck)
- Optical backscatter for particulate carbon (Wetlabs puck)
- PAR solar radiation
- Bioacoustic echo sounder for zooplankton biomasss

- Dive-average current
- Surface drift

- Independent Argos tag for emergency location

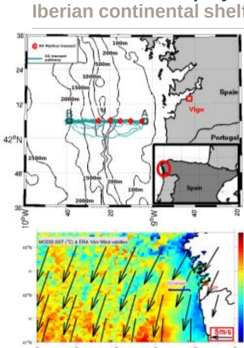
UEA Seaglider Group

Deployments to date:

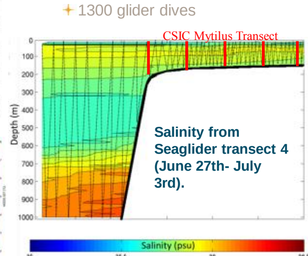


UEA operates a fleet of 4 Seagliders
ueaglider.uea.ac.uk

UEA SeaGlider Deployment summer 2010
Iberian continental shelf and slope

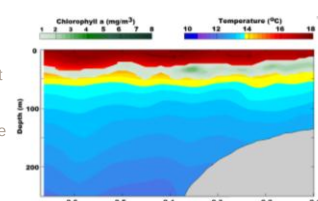


- 50 km section
- 17 sections June-August
- 1300 glider dives



No upwelling, limited productivity

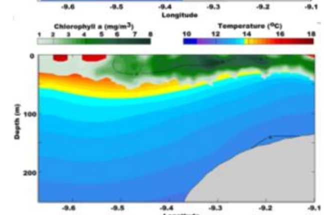
- Deep chlorophyll maximum at 30-45m depth
- Isotherms are near horizontal
- Oxygen depleted near surface



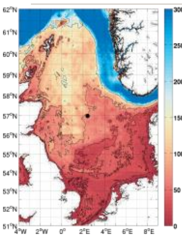
Large bloom event

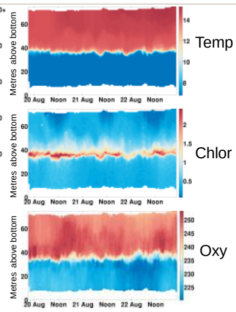
- Isotherms sloping indicating upwelling
- Cooler near surface temperatures
- Increase in oxygen

Net community production estimated using Seaglider dissolved oxygen measurements



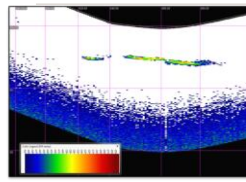
UEA and Cefas Seaglider Deployment
North Sea pilot study summer 2011

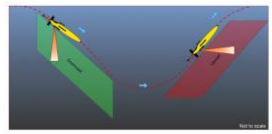


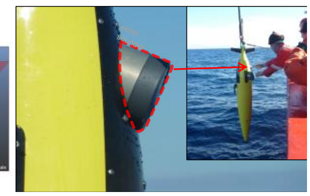


- 23 + 158 dives
- CASE PhD studentship with Cefas
- Mechanisms for oxygen depletion

New sensors on a Seaglider for krill dynamics

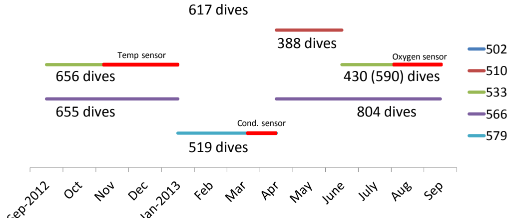


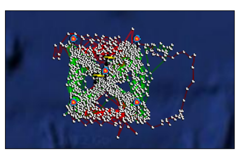




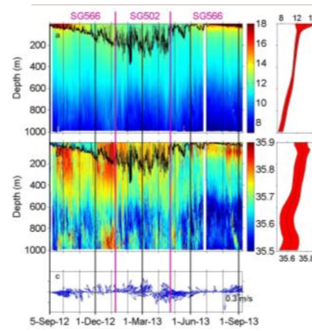
- Imagenex echo sounder – for acoustic backscatter signal strength
- 120 kHz single beam echo sounder
- Known acoustic characteristics
- 0.5 m bins, with range to 100 m

Osmosis gliders





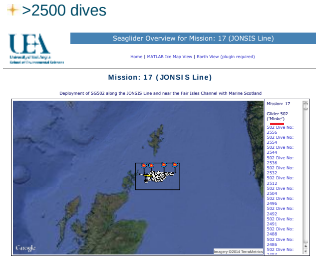
Seaglider study of deepening and shoaling of mixed layer



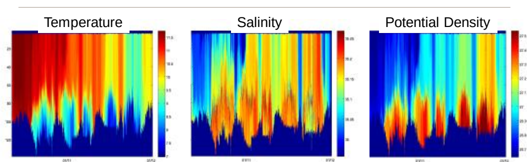
- Two gliders at the Porcupine Abyssal Plain time series site
- Seasonal cycle in processes over one year
- Multidisciplinary

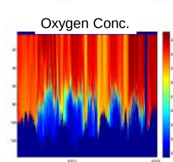
Brahan Project
with Marine Scotland Science

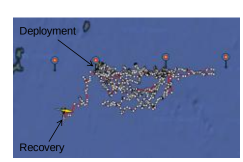
- October – December 2013
- Water depth ~ 100 m
- Tidal currents > 50 cm/s
- >2500 dives



Brahan Project
with Marine Scotland Science







Seaglider infrastructure

- UEA now equipped to undertake refurbishments of Seagliders, including
  - testing of any faults/problems
  - battery replacement
  - replacement of all screws and sacrificial anodes
  - greasing of all gearings
  - formatting of flashcard
  - deep clean
  - compass check and possible calibration
  - reballasting for required ocean water density

- Recalibration of sensors between deployments by manufacturers
- Iridium transmissions using RUDIX

Data processing and calibration

- Real-time data are available straight away by ftp
- Delayed mode data are calibrated and cleaned up
- Flight model regressions to optimise data quality and calculate dive-average currents
- Flags for good/bad/modified data
- Thermal lag corrections for conductivity cell
- Lag corrections for dissolved oxygen optode
- Compare with CTD data for absolute calibrations
- Calibrate dissolved oxygen, chlorophyll against samples
- Vertical and horizontal gridding

New Sensors for Gliders

- New **passive acoustic monitoring** (PAM) sensor being integrated into Seaglider by Kongsberg
- For marine mammal detection and monitoring of anthropogenic noise (2-50 Hz)

- New **pH and pCO2** sensors being integrated into Seaglider at UEA
- For ocean acidification and marine carbon cycling

- We are undertaking trials of both sensors in Mediterranean in June 2014 in conjunction with CMRE on RV *Alliance*

- In future: microstructure sensors for turbulent mixing, ADCPs

The Way Forward?

- Ocean gliders can measure physics, chemistry and biology of the ocean simultaneously
- Offer the opportunity to measure in remote areas and during rough weather, including near-surface values
- Complement existing technologies such as moorings and HF radar
- Real time data
- Deployment from small boats or ships of opportunity

- The next one to talk was Timo Tamminen (SYKE), who emphasized the use of **ferryboxes.**

The strengths of ferrybox research infrastructures are the following:

- Smooth delivery of data for various needs
- Extensive spatial coverage possible
- Support for scientific research
- On-line data for public & customers
- Platform for developing new products for monitoring and science
- Cost-effective platform for ground truth data collection for Earth Observation Systems (EOS) and oceanographical model validation
- Sensor configuration easily upgradable

Just like any other component, the ferryboxes face new challenges such as data availability, quality, accessibility, interpretation and harmonization, which are essential for all EU-level RI networks.

To respond to these challenges, ferryboxes can collect new data for biogeochemically relevant components and processes, by developing new technologies (i.e. emerging technologies for phytoplankton biomass, biodiversity and production measurements, embedded experimental modules).

The team for SYKE presented to the audience an example of the Finnish Marine Research Infrastructure FINMARI (integration of Ferrybox with other platforms):

- Cross-administrative and cross-sectoral consortium nominated on national RI Roadmap 2014-2020
- Integrates 'all' national marine RI with a joint mission (universities, research institutes)
- Research vessels, Alg@line, Utö station, university field stations, buoy fleet, gliders, Argo floats, ice breaker platforms, experimental laboratories
- Partnership: Finnish Environment Institute SYKE (coordination), Finnish Meteorological Institute FMI, Geological Survey of Finland GTK, Universities of Helsinki, Turku, and Åbo Akademi, Arctia Shipping Ltd (Partnership represents Finnish participation in JERICO, Euro-Argo and EMBRC).

JOINT EUROPEAN RESEARCH INFRASTRUCTURE NETWORK FOR COASTAL OBSERVATORIES

Workshop on future strategies – NIVA HQ 7.5.2014

Future possible use of Ferrybox RI: Strengths, challenges, integration, interfaces?

Timo Tamminen, Seppo Kaitala, Jukka Seppälä I SYKE
Lauri Laakso I FMI
Kai Sørensen I NIVA

FUTURE OF FERRYBOX

Strenghts of Ferrybox Research Infrastructures

- *Smooth delivery of data for various needs*
- *Extensive spatial coverage possible*
- *Support for scientific research*
- *On-line data for public & customers*
- *Platform for developing new products for monitoring and science*
- *Cost-effective platform for ground truth data collection for Earth Observation Systems (EOS) and oceanographical model validation*
- *Sensor configuration easily upgradable*

FUTURE OF FERRYBOX

Challenges

- *Data availability, quality, accessibility, interpretation and harmonization – essential for all EU-level RI networks*
- ***New data for biogeochemically relevant components and processes** – research component essential*
- *Variability allocation to (at least) spatial and diurnal components*
- *Coupling with other data streams/requests (models, EO)*
- *Seamless **integration of platforms** incl. scientific, technological and economical optimization, links to other RI's*

FUTURE OF FERRYBOX

***New data** for biogeochemically relevant components and processes: Development of new technologies*

*From scattered observations and trials to **well-designed joint demonstrations and sustainable operative systems***

- *Basin-specific strategies (incl. responsibilities) for testing and implementation*
- *Coordinated and focused campaigns with variety of instrumentation and technologies*
- *Close academia-industry cooperation for technology development*
- *Transnational access to platforms, instrumentation and data (and expertise) should be continued*
- *Documentation of best practices for new technologies extremely important, documentation of trials (incl. negative results and problems)*
- *Transfer of knowledge, workshops*

FUTURE OF FERRYBOX

***New data** for biogeochemically relevant components and processes: Development of new technologies*

*Examples: Emerging technologies for **phytoplankton biomass, biodiversity & production** measurements*

- *Point source integrated cavity spectrophotometer (PSICAM) for more accurate estimation of Chla*
- *Spectral fluorometry for taxonomic classification of phytoplankton*
- *Imaging flow-cytometry for phytoplankton species recognition*
- *Fluorescence induction techniques (PAM, FRRF) for photosynthetic rate measurements*
- *Spectral reflectance methods to derive optically active components*
- *Genetic barcoding (e.g. toxic species)*

FUTURE OF FERRYBOX

***New data** for biogeochemically relevant components and processes: Development of new technologies*

*Examples: **Embedded experimental modules***

- *Automated sampling devices and miniaturized experimental modules can in principle widen measurement portfolio into **process data requiring manipulation of samples***
- *Phytoplankton nutrient limitation, growth rates, nutrient affinities and uptake, etc.*
- *Can significantly extend knowledge on biological communities, their functioning and functional diversity effects*
- *Ongoing R&D work*

FUTURE OF FERRYBOX

***Integration** of Ferrybox with other platforms*

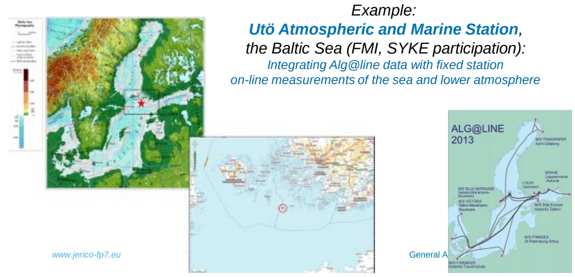
Smart network of observatories (incl. links to other RI's)

- ***Multiple platforms** yield seasonal & spatial and surface & profile data streams, allowing more accurate modeling of biogeochemical processes*
- *Basin-wide coordination of efforts incl. specialization*
- ***Transnational and trans-institutional access of RI** for synergies and cost-efficiency*
- *Requires open data, intercalibrations, shared best practices*
- *New combinations required for Earth Science, e.g. **coupling of marine and atmospheric processes***

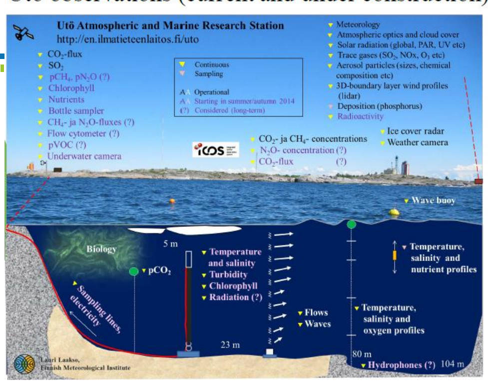
FUTURE OF FERRYBOX

***Integration** of Ferrybox with other platforms*

Example:
***Utö Atmospheric and Marine Station**,*
the Baltic Sea (FMI, SYKE participation):
Integrating Alg@line data with fixed station on-line measurements of the sea and lower atmosphere



Utö observations (current and under construction)



FUTURE OF FERRYBOX

***Integration** of Ferrybox with other platforms*

*Example: **Finnish Marine Research Infrastructure FINMARI***

- *Cross-administrative and cross-sectoral consortium nominated on national RI Roadmap 2014-2020*
- *Integrates 'all' national marine RI with a joint mission (universities, research institutes)*
  - *Research vessels, **Alg@line**, **Utö station**, university field stations, buoy fleet, gliders, Argo floats, ice breaker platforms, experimental laboratories*
- *Finnish Environment Institute SYKE (coordination)*
- *Finnish Meteorological Institute FMI*
- *Geological Survey of Finland GTK*
- *Universities of Helsinki, Turku, and Åbo Akademi*
- *Arctia Shipping Ltd*
- *Partnership represents Finnish participation in JERICO, Euro-Argo and EMBRC*

FUTURE OF FERRYBOX

***Integration** of Ferrybox with other platforms and European RI networks (H2020?)*

***Examples: Horizon 2020** strongly promotes integration of RI networks in the current Work Program (INFRADEV, INFRAIA categories)*

***ESFRI** Roadmap will be revised by 2016, new project possibilities*

- *"Approximately 16 projects will not be implemented by 2015/16 so there will be room for 8-10 new projects on NEW roadmap" (John Womersley, Chair of ESFRI, Presentation of RI Roadmap for Finland, March 2014)*

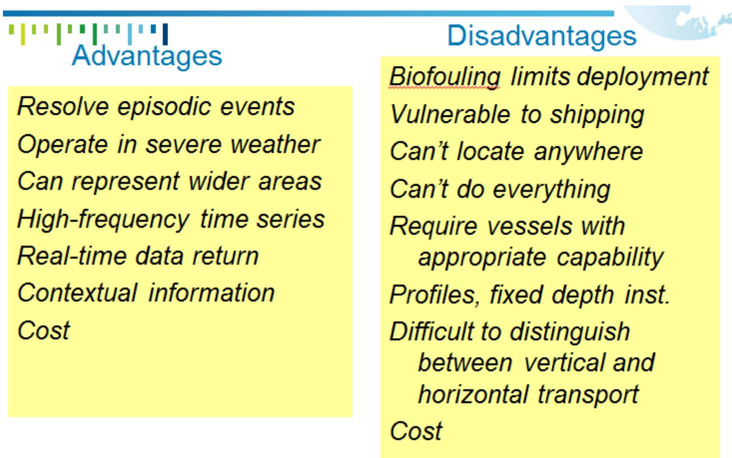
- *… What will JERICO interfaces be in H2020?*

- The last one to talk on this matter was David Mills (CEFAS), focusing his speech on fixed **platforms**.

David Mills started his presentation by talking about ecosystem based management, to sustain healthy marine ecosystems and the fisheries they support, by:

- Avoiding degradation of ecosystems as measured by indicators of environmental quality and system status
- Minimizing risk of irreversible change to communities and ecosystem processes
- Maintaining long-term socioeconomic benefits without compromising the ecosystem
- Generating knowledge of ecosystem processes sufficient to understand the likely consequences of human action.

David Mills also explained the advantages and disadvantages of moorings and other fixed point observations (see screenshot below):



Future Possible Use Fixed Platforms

Jo Foden| Cefas| jo.foden@cefas.co.uk

FIXED PLATFORM

Buoys, platforms, coastal stn, stand alone

- *Caged instruments beneath buoy*
- *In line instruments with surface floats and seabed anchor*
- *U-shaped mooring*
- *Tethered line*
- *Spar buoy, Doughnuts, others*
- *'Virtual' moorings*

ECOSYSTEM BASED MANAGMENT

PIKICH ET AL., 2004 SCIENCE

to "sustain healthy marine ecosystems and the fisheries they support "

Avoid degradation of ecosystems ***as measured by <u>indicators</u> of <u>environmental quality</u> and system <u>status</u>;***

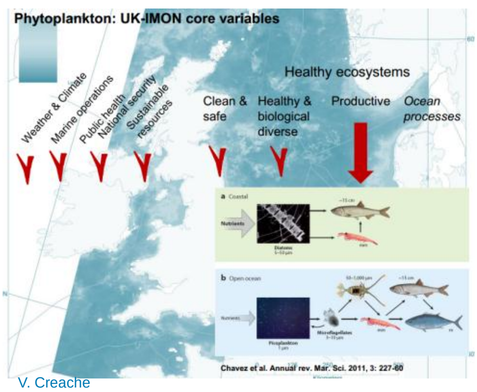
Minimize risk of irreversible change to communities and ecosystem processes;

Maintain long-term socioeconomic benefits without compromising the ecosystem;

Generate knowledge of <u>ecosystem processes</u> sufficient to <u>understand</u> the likely consequences of <u>human action</u>.

Core Variables - Biological

		Weather & climate	Marine operations	Natural hazards	National security	Public health	Healthy ecosystems				Sustained resources
							Clean & safe	*Healthy & biologically diverse*	*Productive*	*Ocean processes*	
Biological	Chlorophyll						✓	✓			
	Pathogens				✓	✓		✓			✓
	Phytoplankton species	✓	✓		✓	✓	✓ (Indicator spp.)	✓			✓
	Zooplankton abundance							✓			✓
	Zooplankton species					✓		✓			✓
	Shellfish toxins?					✓	✓				✓
	Incidence of fish kills						✓ (fish kills)	✓	✓		✓
	Fish species							✓	✓		✓

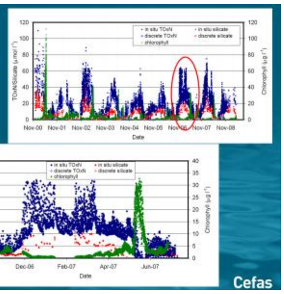


V. Creache

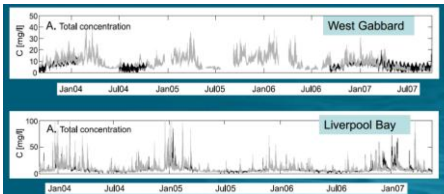
BIOGEOCHEMISTRY

13 years continuous high frequency monitoring in the Thames

Seasonal and inter-annual variability



OPTICAL PROPERTIES



- SPM controls underwater light climate in coastal locations
- Timing of spring bloom

van der Molen et al. (2009) Cefas

SENSOR METHODOLOGIES

Methodologies

- Optical
  - Nitrate
- Optodes
  - Methane
  - Oxygen
  - pCO_2
  - pH
- Electrochemistry
  - Oxygen
- Lab on a chip
  - Nutrients
  - Trace metals
  - pH, TA, DIC, pCO_2
  - Small organics, e.g. PCBs
  - Proteins and large organics
  - Nucleic Acids
  - Cytometry

M. Mowlan

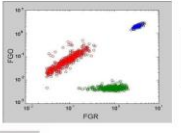
PML Automated Technologies

Instrument systems for characterising planktonic ecosystems

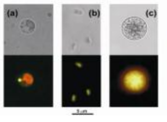
Automated Flow Cytometer (AFC)	Sort particles from the sample stream, measure body size and identify particles by analysing particle pulse shape and by using neural networks.	Heterotrophic bacteria 0.2 – 2um Picophytoplankton 0.2 – 2um Nano- and microphytoplankton 2 – 20um Microzooplankton to 20um
Phytoplankton video microscopy	Currently manual – scope for automated image analysis using LiZA software suite.	Phytoplankton classification by species and size
FlowCAM	Automated imaging - phytoplankton & microzooplankton - size spectra in autotrophic / heterotrophic groups with possible separation of feeding groups	Phytoplankton 20 -200um Microzooplankton 20-200um
Optical Plankton Counter	Automated particle sizing of mesozooplankton.	Mesozooplankton 200um – 16mm
LiZA System	Automated acquisition and analysis of mesozooplankton samples – size spectra and taxonomic classification.	Mesozooplankton 100um – 16mm

LAB ON A CHIP (LOC)

Optical cytometry on a chip



- Optical scatter
- Polarisation
- Fluorescence



- Diagnostics (blood counts)
- Environmental science
- Life Science R&D

M. Mowlan

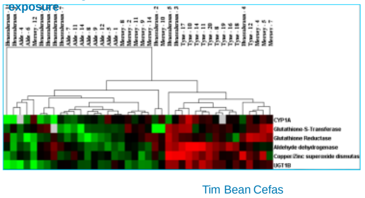
MOLECULAR BIOLOGICAL TECHNIQUES

(SEQUENCING AND PROBE BASED)

Recommendation

Transition molecular biological techniques (sequencing and probe based) from research tools to an operational capability for monitoring microbial diversity, contaminant impact and non indigenous species.

Genes relating to PAH exposure



MBARI Environmental Sample Processor

DNA probe arrays and analysis

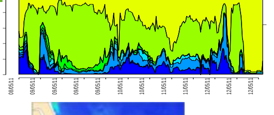
Tim Bean Cefas

OPTICAL IMAGING

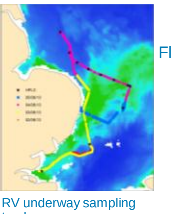
Recommendation

Multi-optical approach for plankton abundance, distribution and composition from > 1µm - > 1mm

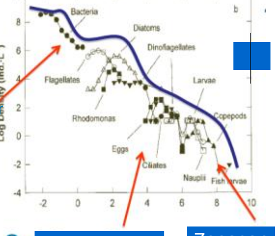
Plankton Life Forms



Flowcytometer



RV underway sampling track

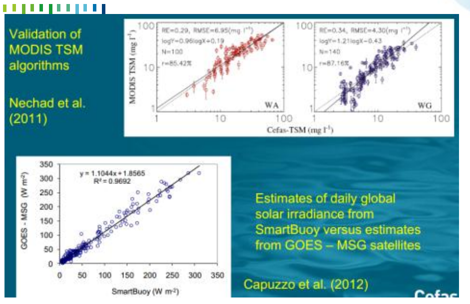


2: Flowcam Zooscan

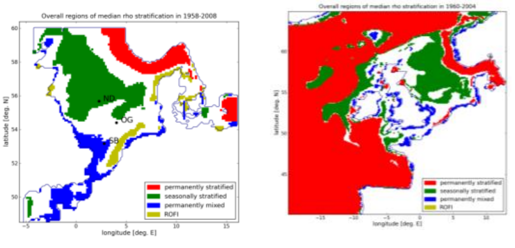
L. Stemmann, et al.,OOV CNRS-UPMC (Janvier 2013)

HOLOGRAPHY

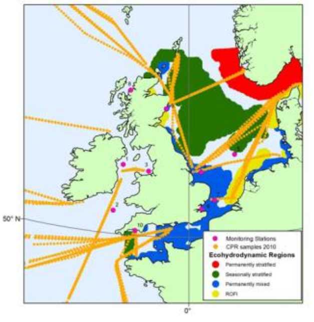
SEATRUTH



ECO-HYDRODYNAMIC REGIONS



PLANKTON 'LIFEFORM' MONITORING



MOORINGS AND OTHER FIXED POINT OBSERVATIONS

Advantages	Disadvantages
Resolve episodic events	*Biofouling limits deployment*
Operate in severe weather	*Vulnerable to shipping*
Can represent wider areas	*Can't locate anywhere*
High-frequency time series	*Can't do everything*
Real-time data return	*Require vessels with appropriate capability*
Contextual information	*Profiles, fixed depth inst.*
Cost	*Difficult to distinguish between vertical and horizontal transport*
	Cost

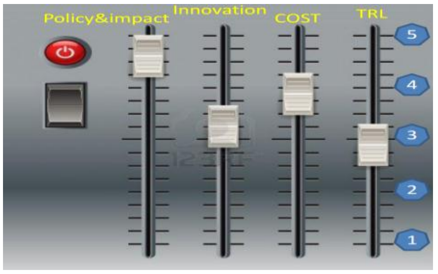
RESOLVING THE BIOLOGY

- automated in-situ sampling of the whole planktonic size-spectrum, resolving trophic groups.
- satellite remote sensing
- computer simulation modelling, **enabling:**

- Production of real-time aggregated ecosystem functional descriptors
- Interpretation and validation of remotely sensed data.

- Responsive-mode and targetted sampling.
- Effective data assimilation into size-based ecosystem models with an improved level of aggregation.

FUTURE PERSPECTIVE & CHALLENGES



(Jean-François Rolin, Ifremer)

THANKS FOR LISTENING..

2. Session 2: Discussion on H2020 proposal

1) Sub bottom observatory (J. Del Rio, UPC)

Joaquin del Rio (UPC) presented the work done at the University of Barcelona regarding their sub-bottom observatory, OBSEA.

The infrastructure is located in a marine protected area (Natura 2000) and has the following specs: 20m depth, 4km offshore, 16 wetmate connectors for instrumentation (power, communications, synchronization). It is offered under transnational access in FixO3.

Currently, the infrastructure can host the following instruments: Underwater: CTD, seismometer, ADCP, hydrophone, pH (prototype based on ISFET sensor), video camera. There is a possibility to deploy new instrumentation for testing: installation procedures, data communication, data management, performance, robustness, etc…

Monitoring of marine biodiversity is of increasing importance: marine ecosystems and biodiversity are the new focus point. Data are needed for assessments and implementation of sensors is indicative for biodiversity state in the foreseen Jerico observatory network.

Biodiversity sensing is not straightforward:

- Image technologies, passive acoustics, active acoustics
- Sufficient temporal resolution
- Cost effective (multiparametric)

Moreover, in-situ monitoring is essential: for example, methodologies with potential to sense biodiversity (acoustic telemetry, camera autodetection, photo/video analyses, hydrophones) and imaging technologies (camera autodetection, and photo-or video analyses).

Biological assessment with video cameras and cabled observatories is an emerging technology: best practices for image acquisition and processing are necessary:

- No agreed common methodology: suitable for JRA
- How to deal with biological DDBBs: suitable for JRA

TNA in cabled coastal observatories can be done for instrument research based on high power consumption and high bandwidth instrumentation like video cameras, hydrophones and others. An update instrumentation in buoys, moorings and gliders represent a big effort in terms of communication protocols integration. Interoperability at instrument level has to be improved.

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

JOINT EUROPEAN RESEARCH INFRASTRUCTURE NETWORK FOR COASTAL OBSERVATORIES

2nd General Assembly – NIVA HQ

Coastal sub-sea observatories. OBSEA

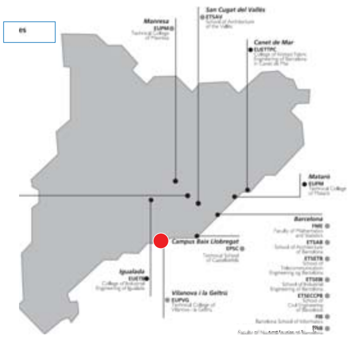
Dr. Joaquín del Río I Universitat Politècnica de Catalunya I joaquin.del.rio@upc.edu

May 5 to 7 2014 / Oslo / Norway

OUTLINE

- UPC, SARTI research group and related activities
- Expandable Seafloor Observatory: OBSEA
- OBSEA Related Projects
- Proposals to be included in Jerico NEXT

The Technical University of Catalonia (UPC)



Localization: **Barcelona – Spain**
Schools: **23**
Departments: **40**
Campus: **7**
Students: **40000**
Lectures & researcher: **2642**
Research Institutes: **3**

TECHNICAL SCHOOL OF ENGINEERING OF VILANOVA I LA GELTRÚ

SARTI Research group: members

Artero Delgado, Carla	Tècnic d'aplicacions hardware
Bghiel, Ikram	Becaris i Doctorands
Cadena Muñoz, Javier	Tècnic d'aplicacions hardware
Carreras Pons, Normandino	Becaris i Doctorands
del Río Fernández, Joaquín	Cap de projectes electrònics, PDI
Garcia Benadí, Albert	Tècnic d'aplicacions hardware
Hidalgo Castro, Alberto	Tècnic d'aplicacions informàtiques
Mànuel Làzaro, Antoni	Director, PDI
Nogueras Cervera, Marc	Cap de projectes electrònics
Santamaria Català, Josep	Responsable de qualitat
Sarrià Gandul, David	Tècnic d'aplicacions hardware
Toma, Daniel Mihai	Becaris i Doctorands
Vidal Oliveras, Neus	Cap de formació
Spartacus Gomariz	PDI
Rafael Ramos	PDI
Mariano Lopez	PDI
Oriol Pallares	Tècnic
Ivan Masmitja	Tecnic

SARTI CENTRE DE DESENVOLUPAMENT TECNOLÒGIC DE SISTEMES D'ADQUISICIÓ REMOTA I TRACTAMENT DE LA INFORMACIÓ

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

SARTI membership

Red AEGIS (Ability Enlargement For Geophysicists and Information Technology Specialists)

Unidad Asociada al CSIC (Consejo Superior Investigaciones Científicas)

Grupo de Desarrollo Tecnológico de Sistemas de Adquisición Remota Aplicado a las Ciencias de la Tierra (Tecnoterra)

Instituto Ciencias de la Tierra, Jaume Almera. CSIC
Instituto Ciencias del Mar. CSIC
Unidad de Tecnología Marina. UTM-CSIC

Red Riscos Naturals (RYSKAT) DURSI

Grupo Investigación Consolidado (DURSI). 00708. Recursos marinos renovables.

EMPRESA CERTIFICADA
UNE-EN-ISO-9001
UNE-EN-ISO 17025

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

Projects with companies

-AKO, Alstom, Applus, Ecotecnia, Generalitat de Catalunya, Consell regulador del Cava, CSIC, Diputació de BCN, SIMON, FireVision, Gervall, General Cable, GNE, Gallina Blanca, Iberco, Idiada, KUKA, Itene, Insituto Astrofísico de Canarias,Legrand, Pysmian…

Related activities

MARTECH 2013

http://www.martech-workshop.org

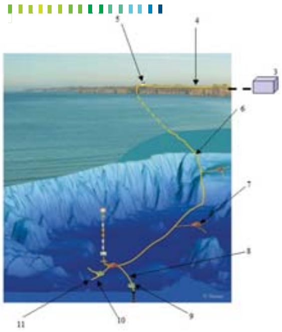
MARTECH, INTERNATIONAL WORKSHOP ON MARINE TECHNOLOGY
1st ,2nd and 3rd took place in Vilanova I la Geltrú. Barcelona.
4th Edition, 2011: Universidad de Cadiz
5th Edition, 2013: Universidad de Girona

ViCOROB Computer Vision and Robotics
Universitat de Girona

Guanay II AUV

www.cdsarti.org
http://www.youtube.com/watch?v=Nwd3k0J9uKM

Cabled Observatories



Observatorios Submarinos Cableados
Monterey Accelerated Research System (MARS), California, USA.
Victoria Experimental Undersea System (VENUS), Canada.
Neptune Canada Cabled Observatory (NEPTUNE), Canada.
Aloha Observatory (ALOHA), Hawai.
Astronomy with a Neutrino Telescope and Abyss environmental RESearch (ANTARES), Francia
Dense Oceanfloor Network System for earthquake and Tsunamis (DONET), Japon.
Neutrino Ettore Majorana Observatory, NEMO-SNI (NEMO), Italia.
Marine e-Data Observatory Network (MEDON), Francia.
Martha's Vineyard Coastal Observatory, (MARTA), Massachusetts, USA.
Marine Cable Hosted Observatory (Hsu,S.-K. et al.2007), Taiwan.
New Millenium Observatory (MILLENIUM), Oregon, USA.
Observatorio Submarino Expandible OBSEA, (Mànuel A. et al 2010), España.

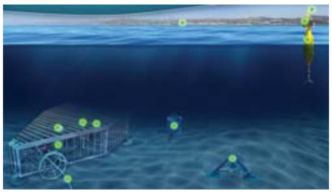
Leyenda
3 - Estación Terrestre
4 - Red terrestre
5 - Terminación de la Estación Terrestre. Inicio infraestructura submarina.
6 - Cable de comunicación y alimentación submarino
7 - Nodo o extensión de una ramificación del Cable de comunicaciones submarino
8 - Ramificación de la red
9 - Junction box (nodo de conexión)
10 - Enlace a un instrumento
11 - Instrumentos

Figura Cortesía de Ifremer, Instituto Francés de Investigación para la Explotación del Mar.

www.jerico-fp7.eu

OBSEA SCHEMA

- *Located in a Marine Protected area: Natura 2000*
- *20m depth, 4km offshore, 16 wetmate connectors for instrumentation (power, communications, synchronization)*
- *Operations by scuba divers and small boats.*
- *The infrastructure is offered under transnational access in FixO3 (TNA).*

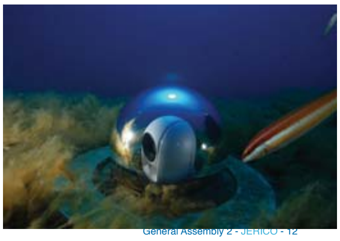


Observatory. OBSEA, UPC Test Site

- *Possibility to deploy new instrumentation for testing: installation procedures, data communication, data management, performance, robustness, etc…*
- *Real-time access to data instrumentation.*
- *Present instruments: **Underwater**: CTD, seismometer, ADCP, hydrophone, pH (prototype based on ISFET sensor), video camera. **Surface buoy**: meteo station, video camera.*

FixO3 nexos TNA JERICO Associate partner

Obsea photos



Aguzzi et al. 2011. Sensors 11: 5850-5872.

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OBSEA BUOY

IP Camera: 704x576 pixels; 25 fps; 10x Optical Zoom
Solar panels: 4 x 20W
Weather station:
- Position, velocity and GPS time
- Speed and wind direction
- Pressure and temperature
- magnetic compass
- 3-axis accelerometer for Pitch and Roll angles

Buoy signalling light, self-powered:
- High efficiency yellow LED light
- Reach 3 nautical miles

Junction box
- Electronic Control
- 3G Modem Communication

Battery Box
- Battery: 12v & 65Ah
- Solar charge controller: 6A

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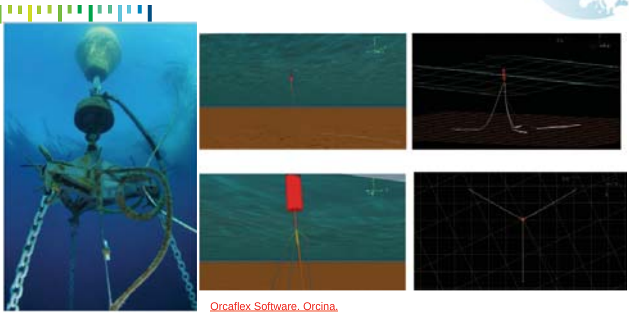
OBSEA BUOY



Orcaflex Software. Orcina.

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KEY POINTS FROM PREVIOUS PRESENTATIONS:

It was already mention that:

Monitoring of marine biodiversity is of increasing important: marine ecosystems and biodiversity

Data are needed for assessments.

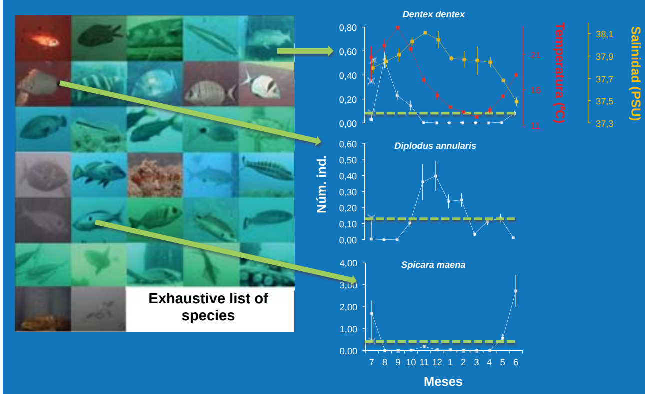
Implementation of sensors indicative for biodiversity state in the foreseen Jerico observatory network

Biodiversity sensing is not straightforward:
- *Image technologies, passive acoustics, active acoustics*
- *Sufficient temporal resolution*
- *Cost effective (multiparametric)*

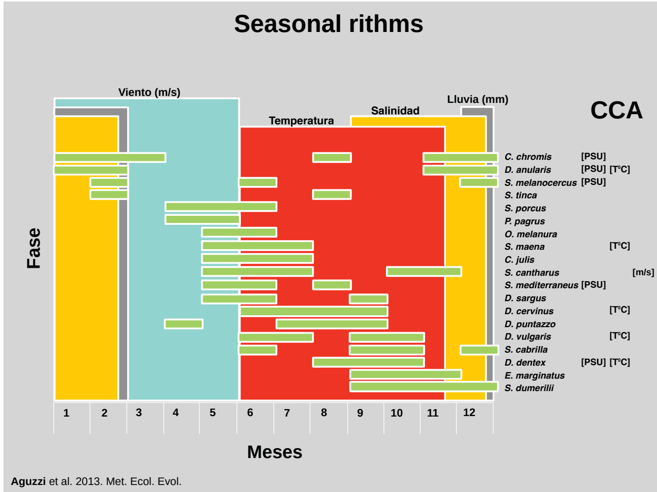
In situ monitoring is essential: methodologies with potential to sense biodiversity: acoustic telemetry, ***camera autodetection****, photo/video analyses, hydrophones.*

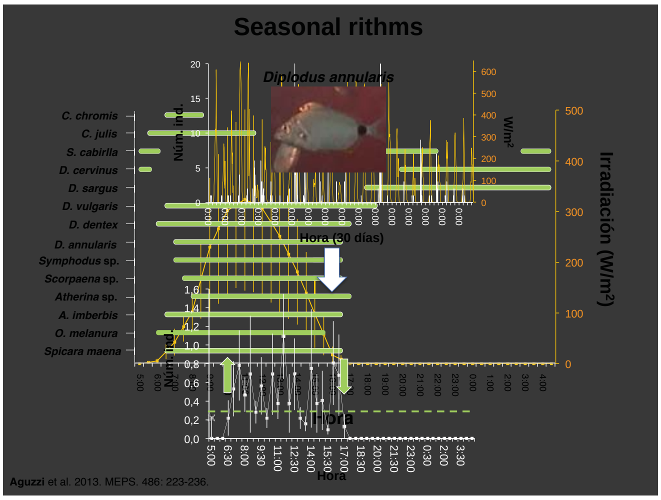
Imaging technologies (camera autodetection, and photo-or video analyses):- high potentional indicator value
Applicable from variety of platforms (not all: power consumption and bandwidth are a constrain)

Continous monitoring over 12 months



Condal, **Aguzzi** et al. 2012. Mar. Biol. 159: 2809-2817.





Citizen Science OBSEA Project: open to public

JOURNALS: PAPERS PUBLISHED WITH OBSEA DATA

Methods in Ecology and Evolution
Marine cabled video observatories for in situ ecological studies
Video observatories for fish ecological monitoring

Marine Ecology
Diel activity rhythms in temperate rocky coastal fishes: insights from a cabled observatory video-monitoring

Marine Biology
Seasonal rhythm in a Mediterranean coastal fish community as monitored by a cabled observatory

Marine Biology
Movement patterns of adult spiny lobster (Palinurus mauritanicus) and spider crab (Maja squinado) by acoustic tracking in an artificial reef

Sensors
A New Colorimetrically-Calibrated Automated Video-Imaging Protocol for Day-Night Fish Counting at the OBSEA Coastal Cabled Observatory

Sensors
A New Laboratory Radio Frequency Identification (RFID) System for Behavioural Tracking of Marine Organisms

LAST CONFERENCES

IEEE UNDERWATER TECHNOLOGIES 2013. UT13 JAPAN

Citizen Science and marine community monitoring by video-cabled observatories: the OBSEA Citizen Science Project. 978-1-4673-5948-1/13/$31.00 ©2013 IEEE

The use of coastal cabled video-observatories to monitor seasonal changes in shallow water fish community. 978-1-4673-5948-1/13/$31.00 ©2013 IEEE

MSFD D1: Biodiversity

Data coming from the AWAC:

Monitoring sediment dynamics at the boundary between the coastal zone and the continental shelf: OCEANS 2011.

Breeze influence on waves and vertical current profile in the coastal area based on EOF analysis (Vilanova I la Geltrú, Barcelona). MARTECH 2013

SARTI: LIDO DATA PROVIDER. LAB Expertise in:

-Regulation and International Initiatives
-Biological Sensory Systems
-**Passive Acoustic Monitoring**
-Modeling

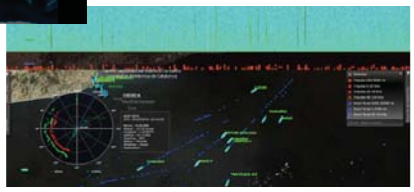
Country/Location	Platform	Data stream
FRANCE	ANTARES	36 x 250 kHz
NEPTUNE CANADA	Folger Passage	1 x 96 kHz
NEPTUNE CANADA	Barkley Canyon	1 x 96 kHz
NEPTUNE CANADA	Barkley Slope	1 x 96 kHz
SPAIN (MED SEA)	OBSEA	1 x 96 kHz
JAPAN (JAMSTEC)	Hatsushima	1 x 100 Hz
JAPAN (JAMSTEC)	Kushiro	3 x 100 Hz
ITALY (ESONET)	NEMO TSS/TSN	2x 4 x 96 kHz
SPAIN (ATLANTIC)	BIMEP	1 x 96 kHz
CTBTO	11 HA	11 x 200 Hz
IRELAND	Shannon Estuary	1 x 96 kHz

Cabled observatories
Offer unlimited power and
Bandwidth:

Noise measurements (MSFD D11) and Mammals detection.

listentothedeep.com (LAB UPC)

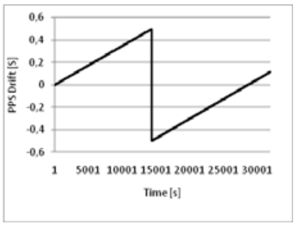
Obsea provides data Streaming to LIDO



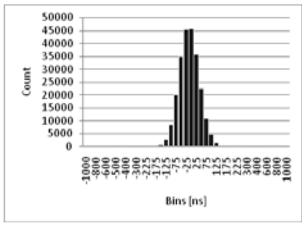
OBSEA CABLED SEISMETER IS PART OF THE NATIONAL (IGN) AND REGIONAL (IGC) SEISMOMETER NETWORK

OBSEA CABLED SEISMETER IS PART OF THE NATIONAL (IGN) AND REGIONAL (IGC) SEISMOMETER NETWORK

Clock drift without network synchronization

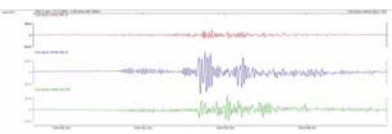


Drift histogram with PTPd active



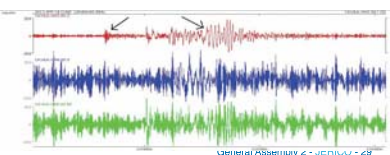
OBSEA CABLED SEISMETER IS PART OF THE NATIONAL (IGN) AND REGIONAL (IGC) SEISMOMETER NETWORK

Seismic data acquired and trusted by IGC (Institut Geològic de Catalunya)

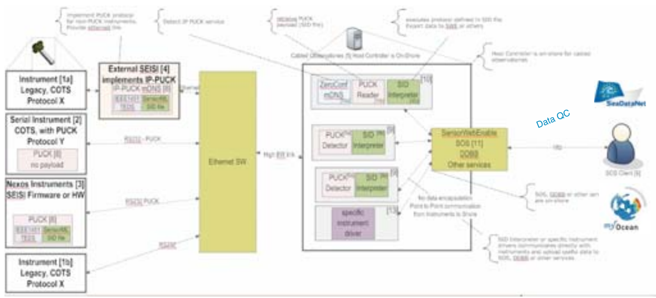


- Local event
  - Sant Pere de Ribes (Spain) July 2012

- Teleseism
  - Sant Pere de Ribes (Spain) July 2012



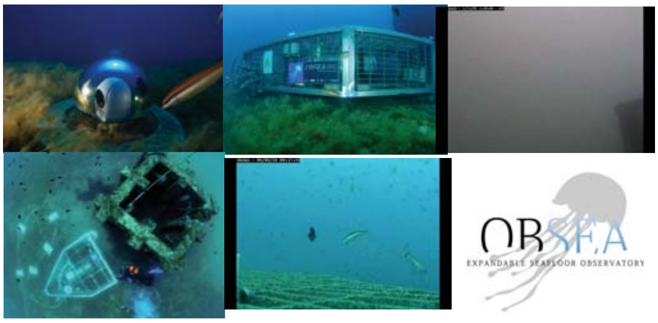
INSTRUMENTS AND DATA INTEROPERABILITY



CONCLUSIONS AND SOME IDEAS FOR JERICO NEXT

- *Biological assessment with video cameras and cabled observatories is an emerging technology: best practices for image acquisition and processing are necessary:*
  - *No agreed common methodology: suitable for JRA*
  - *How to deal with biological DDBBs: suitable for JRA*
- *TNA in cabled coastal observatories can be done for instrument research based on high power consumption and high bandwidth instrumentation like video cameras, hydrophones and others:*
  - *Update instrumentation in buoys, moorings and Gglidders represent a big effort in terms of communication protocols integration. Interoperability at instrument level have to be improved.*
- *Multiplatform intercol·laboration projects: docking station attached to fixed platforms for AUV, Crawlers or ROVs are emerging now and some proposals were submitted to H2020BG*
- *UPC-OBSEA can contribute to WPs and tasks related with Cabled Observatories*

THANK YOU FOR YOUR ATTENTION



2) HF Radar (J. Mader, AZTI)

Julien Mader (AZTI) described the potential use of HF Radar and its place in the upcoming H2020 proposals.

Ocean currents determine the movement of surface waters, providing critical information to support pollutant tracking, search and rescue, harmful algal bloom monitoring, navigation route optimization, etc. There is then a need to improve accuracy of existing operational products on ocean currents.

Observing technologies like HF radar and underwater gliders are now currently added to the existing systems. HF Radar is recognized as a cost-effective solution in important coastal observatories. Their benefits are described below:

- (In the OO framework): Real time high resolution and synoptic assessment of sea conditions ; Direct Real Time products and Short Term prediction products ; Validation / data assimilation for numerical models

- (Scientific interest): Cover a wide range of spatial-temporal scales in a synoptic way to study ocean processes (HF, spatial structure)

There is one main challenge: HFR network integration

- Integration with other in situ coastal platforms (gliders, fixed, ferrybox,…)

- Integration with in situ open ocean platforms

- Integration with Ocean Surface Currents (OSC) satellite products; collaboration with GLOBCURRENT

HF Radars are part of the strategy for ocean current monitoring and progress in the design of an optimum observing system along the European coast.

They take into account the capacity of coastal ocean modeling for extrapolation, the use of HFR for process-oriented validation, data assimilation and diagnostic for high resolution open boundary conditions for coastal grids.

To conclude, HF Radar component in an INFRAIA project would provide:

- Technical input to this European network of users (Best practices, procedure harmonization, format standardization)

- Integration of this key technology in the coastal observing network

- Reinforcing the European role in the international community (led by US and AUS)

- Integrating technological knowledge and developments (often academic) on HFR to make available actual operational solutions

JOINT EUROPEAN RESEARCH INFRASTRUCTURE NETWORK FOR COASTAL OBSERVATORIES

FUTURE STRATEGY IN COASTAL OBSERVATION INFRASTRUCTURE

HF Radar, Discussion on H2020 proposal

Julien MADER I AZTI-Tecnalia I jmader@azti.es
Patrick GORRINGE I EuroGOOS I patrick.gorringe@eurogoos.eu

FIRST IDEAS TO ANSWER THE FOLLOWING QUESTIONS

What are the challenges in Europe about HF Radar technology?

How HFR can be integrated in the coastal observatory network?

What can be the possible tasks in networking activities (Best practices)?

Can we propose access to infrastructure (TNA) to do what or virtual access ?

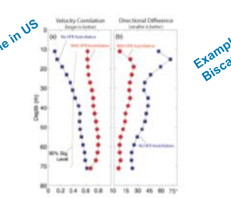
Is there any technological developments we can integrate in the Joint Research Activities (JRA)?

CONTEXT
HFR, KEY TECHNOLOGY FOR OCEAN CURRENT MONITORING (& APPLICATIONS)

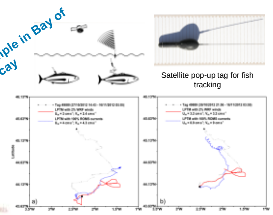
Ocean currents determine the movement of surface waters, providing critical information to support pollutant tracking, search and rescue, harmful algal bloom monitoring, navigation route optimization, etc.

NEED TO IMPROVE ACCURACY OF EXISTING OPERATIONAL PRODUCTS ON OCEAN CURRENTS

Example in US



Example in Bay of Biscay



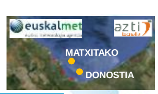
CONTEXT
HFR, KEY TECHNOLOGY FOR OCEAN CURRENT MONITORING (& APPLICATIONS)

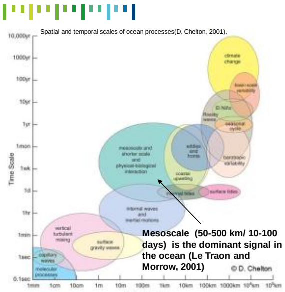
Observing technologies like HF radar and underwater gliders are now currently added to the existing systems.

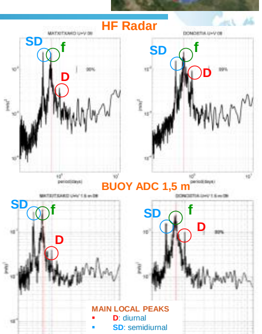
Benefits:

- In the OO framework:
  - Real time high resolution and synoptic assessment of sea conditions
  - Direct Real Time products and Short Term prediction products
  - Validation / data assimilation for numerical models
- Scientific interest:
  - Cover a wide range of spatial-temporal scales in a synoptic way to study ocean processes (HF, spatial structure)

KEY TECHNOLOGY TO PROVIDE INCREASED SPATIAL AND TEMPORAL RESOLUTION

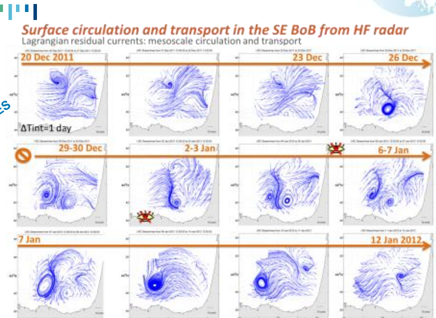






KEY TECHNOLOGY TO PROVIDE INCREASED SPATIAL AND TEMPORAL RESOLUTION

NEW PERSPECTIVES ON COASTAL PROCESSES



HF RADAR IS RECOGNIZED AS A COST-EFFECTIVE SOLUTION IN IMPORTANT COASTAL OBSERVATORIES

THREE KEY COMPONENTS FOR IOOS

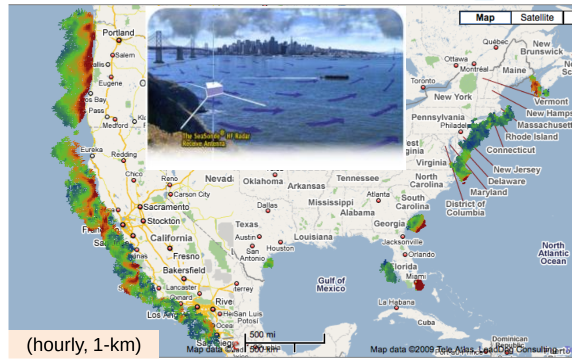
Observing

High-Frequency (HF) Radar (operational)

Gliders (being developed)

Animal Telemetry Network (ATN, planning)

HF RADAR AS A LEADING COMPONENT
FOR COASTAL OCEAN OBSERVING SYSTEM



HF RADAR AS A LEADING COMPONENT
FOR COASTAL OCEAN OBSERVING SYSTEM

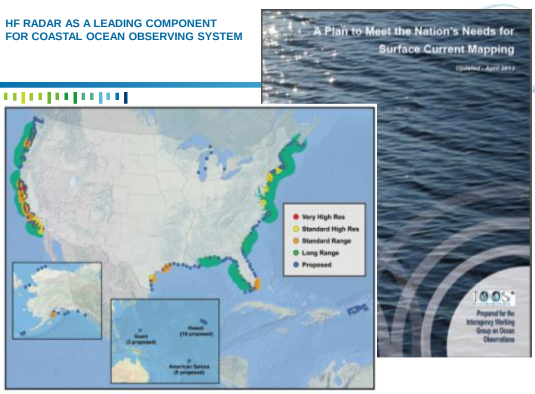
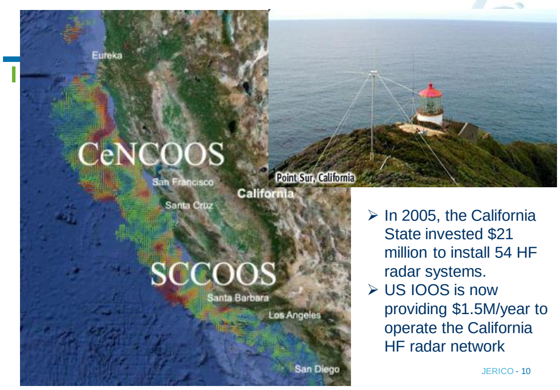


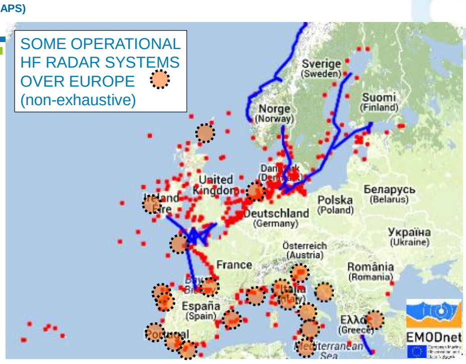
Figure 3: Existing Network & Proposed Sites for Full 5-Year Build-out.

CALIFORNIA HIGH-FREQUENCY (HF) RADAR NETWORK



- In 2005, the California State invested $21 million to install 54 HF radar systems.
- US IOOS is now providing $1.5M/year to operate the California HF radar network

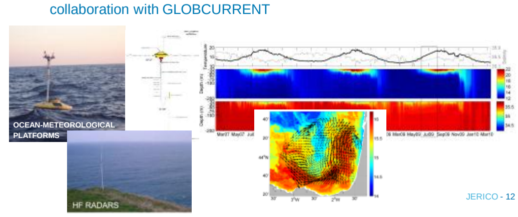
THERE ARE A SIGNIFICANT NUMBER OF HFR SYSTEMS ALONG EUROPEAN COAST BUT UNTIL NOW NOT A GLOBAL STRATEGY NEITHER VIEW OF THE COVERAGE (AND GAPS)



TOWARDS AN INTEGRATED EUROPEAN OCEAN OBSERVING SYSTEM

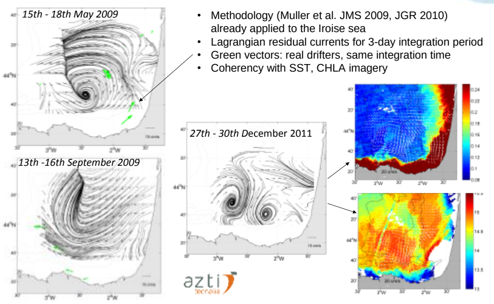
One challenge: HFR network integration

- Integration with other in situ coastal platforms (gliders, fixed, ferrybox,…)
- Integration with in situ open ocean platforms
- Integration with Ocean Surface Currents (OSC) satellite products; collaboration with GLOBCURRENT



EXAMPLE OF USEFULL METHODOLOGY FOR INTEGRATION
SURFACE CIRCULATION AND TRANSPORT IN THE SE BAY OF BISCAY

- 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
- Coherency with SST, CHLA imagery



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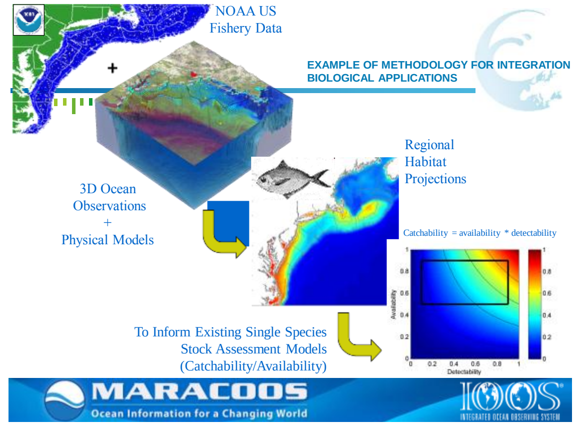
EXAMPLE OF METHODOLOGY FOR INTEGRATION
BIOLOGICAL APPLICATIONS



TOWARDS AN INTEGRATED EUROPEAN OCEAN OBSERVING SYSTEM

Strategy for ocean current monitoring and progress in the design of an optimum observing system along the European coast

Taking into account the capacity of coastal ocean modelling for extrapolation, the use of HFR for process-oriented validation, data assimilation and diagnostic for high resolution open boundary conditions for coastal grids.

HF RADAR, KEY TECHNOLOGY FOR PROCESS ORIENTED VALIDATION

Answer state-of-the-art questions from an integrated point of view:

- ✓ **Spatial and temporal variability of shelf/slope surface currents and wind-current interactions (scientific and operational interests)**
- ✓ **Contribution of the IPC to the surface transport, spatial and temporal variability**
- ✓ **Contribution of processes as tides and vertical motions an other (local forcings/processes) to the shelf/slope circulation**

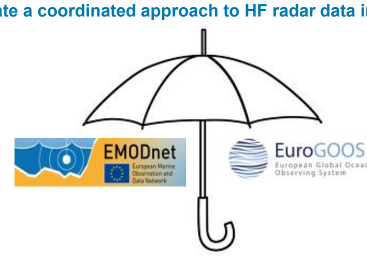
Main Processes:
Wind induced current
Slope current
Tides, internal waves, upwelling
Other (local) processes
River plumes dynamics, …

NEED TO PUSH THE INTEGRATION OF HFR PLATFORMS AT EUROPEAN LEVEL

→ A first initiative:
European HF Radar Networking for data sharing and delivery

HF Radar Group

EuroGOOS has been asked, within EMODnet Physics to:
"Initiate a coordinated approach to HF radar data in Europe"



User-driven European Network of HF radar experts

contacts@emodnet-physics.eu

HF Radar Group

- *1st informal meeting as a side event at the MyO Annual Meeting in Athens (27th March) to establish the group, discuss common issues, and presentations from group members ~ 18 attendees*
- *Splinter session on EMODnet Physics/HF Radars at EGU, 29th April, Vienna*
- *Next meeting as a side event to the EuroGOOS Conference in Lisbon*

http://eurogoos2014.hidrografico.pt

Interested to join?
Contact: patrick.gorringe@eurogoos.eu

HF Radar Group

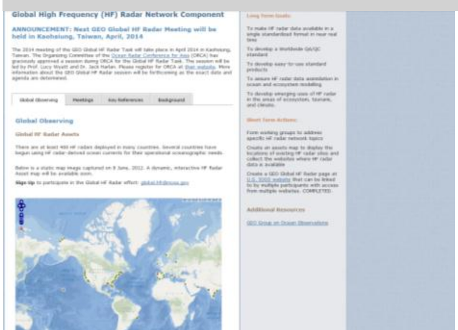
Endorse a task to plan a European HF Radar Network for data sharing and delivery.

First step, make an inventory of existing networks in Europe.

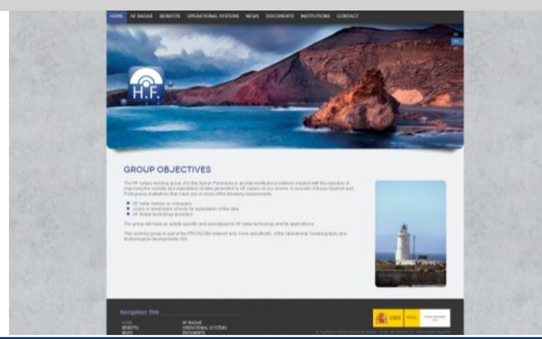
Then discuss some of the challenges such as:
- Data file formats
- Data distribution and exchange
- Data assimilation into operational models
- Make use of the EuroGOOS ROOSs and available ROOS data portals for dissemination of data

Link to other similar ongoing initiatives on a regional and global scale……such as:

GEO HF RADAR GLOBAL TASK, WWW.IOOS.NOAA.GOV/GLOBALHFR/WELCOME.HTML



THE IBERIC NETWORK OF HF RADARS, WWW.IBEROREDHF.ES



NEED TO PUSH THE INTEGRATION OF HFR PLATFORMS AT EUROPEAN LEVEL

HF Radar group driven by EuroGOOS - EMODnet Physics
→ European HF Radar Networking for data sharing and delivery

HF Radar component in an INFRAIA project would provide:
- Technical input to this European network of users (Best practices, procedure harmonization, format standardization)
- Integration of this key technology in the coastal observing network
- Reinforcing the European role in the international community (led by US and AUS)
- Integrating technological knowledge and developments (often academic) on HFR to make available actual operational solutions

POSSIBLE TASKS IN NETWORKING ACTIVITIES (BEST PRACTICES)
OVERVIEW OF REGIONAL COMPONENTS
OVERVIEW OF TECHNOLOGIES & HARMONIZATION
OPERATION AND MAINTENANCE HARMONIZATION

1) Good practices for operating HFR radar; Frequency sharing & coordination with ITU
Inventory of technologies; best practices & identification of limitations and difficulties
Supplement the GEO task database with the up to date relevant information on each HFR in Europe
Scheme for the sharing of the frequencies bands with the neighbor countries to avoid interference

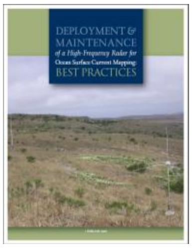
2) Data formats, processing, quality & management
Manual on HFR data format and processing on each step of the product levels
Manual on data validation and data quality
Agreement on a common format taking account of any existing international standards
List of protocols for the cross-validation and complementarities with in situ instruments and satellite observations

3) Applications & innovation
Inventory of end-user applications (lagrangian products, drift short term forecasting)
Review of scientific applications (descriptive physical oceanography and applications);
Assimilation techniques in forecasting models

4) Dissemination
Document on possible extensions of the radar network
Document on synergetic use of HF radar with other observation platforms (e.g. satellites, tide gauges)

FIRST: WE WILL LOOK AT PREVIOUS EXPERIENCES!
AT LEAST FROM USA AND AUS. THEN ADD EUROPEAN SPECIFICITIES

Southern California Coastal Ocean Observing System
(www.sccoos.org)



Australian Coastal Ocean Radar network (ACORN)
(http://imos.org.au/acorn.html)


Best practices in Deployment and Operation: Capacity Building

Lucy R Wyatt
ACORN, James Cook University,
Townsville, Australia

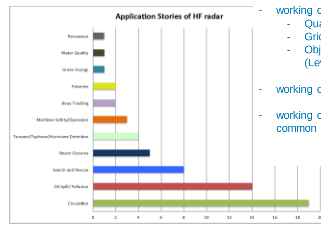
What were the main issues during the installation phase?
- Site Selection and Approvals
- Radar choice
- Environmental Concerns – electromagnetic
- Environmental Concerns – impacts on ground, plants, animals, views
- Power
- Communications

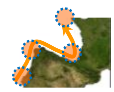
Operations, monitoring and maintenance
- Calibration
- Power outages and communication failures
- Air-conditioning
- Radar system robustness
- Security

CAN WE PROPOSE ACCESS TO INFRASTRUCTURE (TNA)?
VIRTUAL ACCESS ?

Operational stations difficult to tune for specific purposes

But Access to HFR Infrastructure for:
- working on raw data for technological comparisons
- working on Data products
  - Quality controlled radial currents plus error (Level 1)
  - Gridded total vector velocities (Level 2)
  - Objective analysis of gridded surface current maps (Level 3)
- working on Application products
- working on process oriented study sharing data in a common or similarly driven area





INNOVATIVE TECHNOLOGICAL DEVELOPMENTS

Technological developments for new technological solutions

- Rapid Deployable HF Radar (NOFO Technology Development Program (CODARNOR, CODAR, the Norwegian Meteorological Institute and QUALITAS)
- New products for wave data, wind data, ship detection, etc.
- New developments (Pierre Flament, Louis Marié…)
- …

HF RADAR, FUTURE STRATEGY IN COASTAL OBSERVATION INFRASTRUCTURE

azti EuroGOOS

Wed May 7th 2014, Oslo

3) Coastal profilers (P. Farcy, Ifremer)

Patrick Farcy (Ifremer) presented the characteristics of coastal profilers and the long-term observation of the whole water column.

In the Bay of Biscay/English Channel, there are two groups of profiles:

- autonomous profilers: “ARGO” designed for shallow waters (ARVOR-C or ARVOR-Cm). A coastal profiler in this region allows observing a wide water mass over the shelf.

- sensors on vessels of opportunity: RECOPESCA project with CTD sensors on fishing gears.

The main benefits of these two groups are the accuracy and the controlled deployment (ARGO) and measurements of opportunity and “low cost” sensors (RECOPESCA).

It is the opposite for the drawbacks of these profiles: the cost of ARGO is high and the accuracy of RECOPESCA has to be improved.

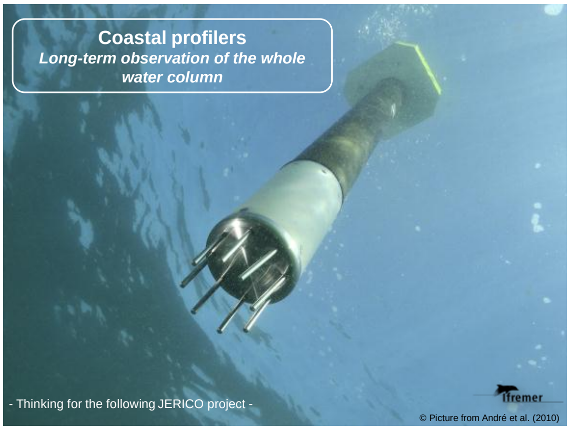
To conclude, we can say that we need complementary observing networks, integrated with numerical modelling solutions.

For *in situ* measurements, the main solutions might be to:

- Deploy accurate systems (e.g. ARVOR-C) in key regions (e.g. homogeneous water masses),

- Combine with coastal moorings for the measurements of more variables,

- Include complementary information from “low cost” (e.g. opportunity) platforms.

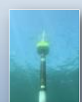


Coastal profilers – *2 families with benefits and limitations*

Two groups of profiles
Example in the Bay of Biscay / English Channel

Autonomous profilers

« ARGO » designed for shallow waters: ARVOR-C or ARVOR-Cm

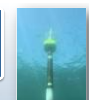


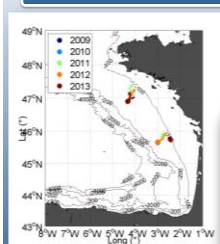
Sensors on vessels of opportunity

RECOPESCA project with CTD sensors on fishing gears

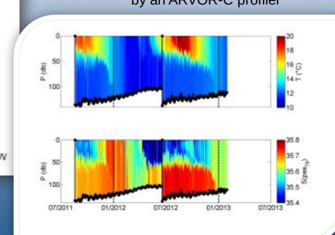
Autonomous profilers

« ARGO » designed for shallow waters: ARVOR-C or ARVOR-Cm



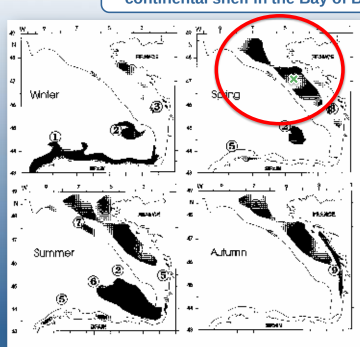


The seasonal stratification "seen" by an ARVOR-C profiler



Contribution from L. Marié in Charria et al. (2014)

Observing the water masses over the continental shelf in the Bay of Biscay



Koutsikopoulos and Le Cann, 1996

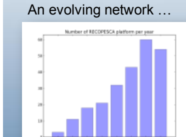
A coastal profiler in this region allows observing a wide water mass over the shelf.

Approximate position of the deployed ARVOR-C

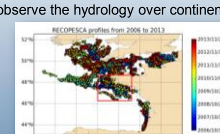
Sensors on vessels of opportunity

RECOPESCA project with CTD sensors on fishing gears

An evolving network …



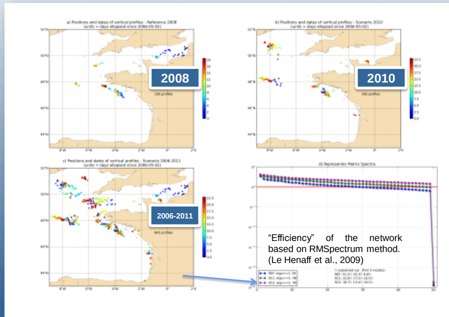
… to observe the hydrology over continental shelf.



Interannual budgets over given regions to describe hydrology variability.

Charria et al. (2014)

Scenarii to design an opportunity network – *RECOPESCA (part of WP9 contribution)*

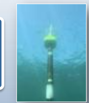


Kourafalou et al., GODAE COSS-TT paper, submitted to JOO, 2014

Two groups of profiles
Example in the Bay of Biscay / English Channel

Autonomous profilers

« ARGO » designed for shallow waters: ARVOR-C or ARVOR-Cm



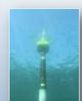
+ - Controlled deployment and then controlled geographical position
  - Accuracy (Seabird CTD - T: ~0.002° C, S: ~0.002, P: ~2dbar)

− - Cost (~16k€/float ARVOR-C, ~30k€/float ARVOR-Cm)

Two groups of profiles
Example in the Bay of Biscay / English Channel

Autonomous profilers

« ARGO » designed for shallow waters: ARVOR-C or ARVOR-Cm



+ - Controlled deployment and then controlled geographical position
  - Accuracy (Seabird CTD - T: ~0.002° C, S: ~0.002, P: ~2dbar)

− - Cost (~16k€/float ARVOR-C, ~30k€/float ARVOR-Cm)

Sensors on vessels of opportunity

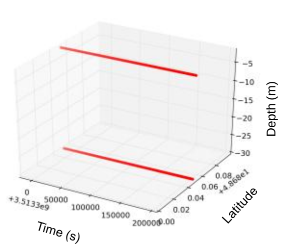
RECOPESCA project with CTD sensors on fishing gears

+ - Measurements of opportunity
  - "low cost" sensors

− - Accuracy (NKE STPS sensor - T: ~0.05° C, S: ~0.1)
  - More difficult to target areas of interest

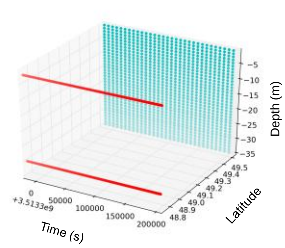
A complementarity between in situ platforms …

A complementarity between *in situ* observations



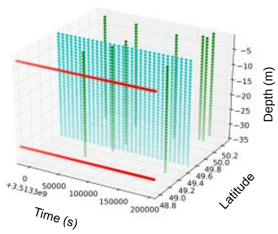
Bouée fixe

A complementarity between *in situ* observations



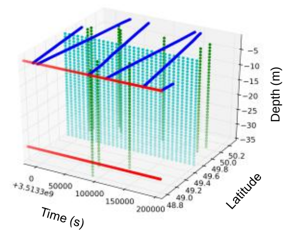
Bouée fixe + ARVOR-C

A complementarity between *in situ* observations



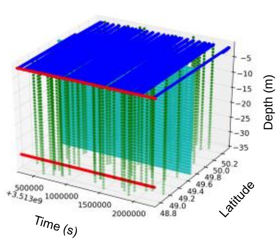
Bouée fixe + ARVOR-C + RECOPESCA

A complementarity between *in situ* observations



Bouée fixe + ARVOR-C + RECOPESCA + Ferry

A complementarity between *in situ* observations



Bouée fixe + ARVOR-C + RECOPESCA + Ferry

« Take home message »

Knowing that:

- Coastal environment can't be fully observed (or not needed in some places),
- The wide range of applications implies a wide range of observed variables,
- Funding is limited.

We need complementary observing networks (integrated with numerical modelling solutions).

For *in situ* measurements a solution is:

- Deployment of accurate systems (e.g. ARVOR-C) in key regions (e.g. homogeneous water masses),
- Combined with coastal moorings for the measurements of more variables,
- Including complementary information from "low cost" (e.g. opportunity) platforms.

4) Conclusions: the JERICO 2 approach and calendar (P. Farcy & I. Puillat, Ifremer)

Patrick Farcy and Ingrid Puillat (Ifremer) presented the possible approach for a JERICO 2 project, by describing the proposal to be defined and the next steps.

JERICO-Next (*New European eXpertise for coastal observaTories*, as defined by the coordination team), will answer to the "Research Infrastructures for integrated and sustained coastal observation" category.

This activity should further harmonize observation techniques in several European coastal and shelf seas, integrating key observing platforms as well as developing further the collection of biological data, in particular exploiting synergies with marine biological observatories. It should link with appropriate ESFRI projects such as EURO-ARGO, EMSO and EMBRC and aim at a single European channel for all physical, chemical and biological coastal data.

The aim of the proposal is to expand from JERICO to a wider European and data coverage, in particular for biological data and in Mediterranean areas.

What characterizes the coastal areas is the greater sensitivity to anthropogenic effects: climate change modifies natural biotic and abiotic cycles while the human land-based activity generates fluxes of nutrients, contaminants and carbon dioxide which have a great impact on the structure and function of marine ecosystems.

The coastal area is a highly dynamic region with strong spatial and temporal variability. While the physical properties (hydrography) of our coastal sees are well described, our understanding of the links between physics and biology is poor.

The biological production is more than 50% of the total marine biological one, and the processes are more important (and less known) in coastal areas than in the deep seas. The coastal systems present a large biological diversity and a high productivity.

The marine ecosystem health, the trophic chain, the loss of biodiversity and the coastline erosion are some of the main societal nowadays questions.

For characterising the coastal zone, we need to have:

- well adapted sensors, observing systems, control and processing procedure to have validated in-situ information,
- coherent spatial and time sampling strategies of core variables dedicated to the each research and/or monitoring question that may be different for different regions.
- identification of measurable proxies (or couple of correlated parameters) if the parameter we want to survey is not measurable,
- well adapted forecasting models,
- constant improvement through well supported technical research and development to provide new, cheaper, more energy efficient and reliable observing systems.

In JERICO, we are not totally out the biology requirements. Even if a major part of JERICO (FP7) activity is more technical (WP3 and 4), JERICO also focused on achieving defined research goals. JERICO research tasks were broad in scope covering physics, bio-geo-chemistry but also biology.

We focused on the acquisition, processing, control, and quality of the core parameters. This objective has to be strengthened in two ways.

First, to reinforce the European cooperation to interoperate existing JERICO observing systems and new ones, by testing new sensors and promoting more best practices on the core parameter observing systems, but also by testing, qualifying new kinds of observatories as coastal profilers, sea bottom observatories, HR radar in order to integrate them into the coastal observatory network.

But the second objective should be how to link biological processes with these core physical and chemical parameters in order to better understand the strong interaction between physics and bio-geo-chemistry, and to understand how the marine ecosystems react to the global change.

There are two possible contributions for the future:

1) JERICO Consortium can build a bridge with the biodiversity community to include some parts of the biodiversity observation systems in already existing JERICO observation systems (but both are working at very different scales)

2) It can be considered JERICO environmental observation could be dedicated to the analysis of biodiversity changes.

In the afternoon, I. Puillat proposed a WP and task structure for the JERICO NEXT proposal and a time line of action to end up with a proposal to be submitted the 2nd September 2014.

2nd General Assembly – NIVA HQ

WORKSHOP ON STRATEGY – H2020 REQUIREMENTS

Patrick FARCY I Ifremer I patrick.farcy@ifremer.fr

INFRAIA-1-2014/2015: Integrating and opening existing national and regional research infrastructures of European interest

Specific challenge:

European researchers need effective and convenient access to the **best research infrastructures** in order **to conduct research for the advancement of knowledge and technology**. The aim of this action is to bring together, integrate on European scale, and open up key national and regional research infrastructures to all European researchers, **from both academia and industry**, ensuring their optimal use and joint development.

'Advanced Communities'

whose research infrastructures show **an advanced degree of coordination and networking at present**, in particular, through Integrating Activities awarded under previous Framework Programmes. The strongest impact for these communities will be expected typically to arise **from focusing on innovation aspects** and on **widening trans-national and virtual access provision**. Proposals from Communities that have benefitted from EU funding for Integrating Activities before will have to clearly demonstrate **the added value** and the **progress beyond current achievements** of a continuation project.

INFRAIA-1-2014/2015: Integrating and opening existing national and regional research infrastructures of European interest

Research Infrastructures for integrated and sustained coastal observation.

This activity should further harmonise observation techniques in several European coastal and shelf seas, integrating key observing platforms as well as developing further the collection of biological data, in particular exploiting synergies with marine biological observatories. It should link with appropriate ESFRI projects such as EURO-ARGO, EMSO and EMBRC and aim at a single European channel for all physical, chemical and biological coastal data.

INFRAIA-1-2014/2015: Integrating and opening existing national and regional research infrastructures of European interest

For the criterion Excellence, in addition to its standard sub-criteria,

[Excellence – Impact – Implementation], the following aspects will also be taken into account;

- The extent to which the Networking Activities will foster a culture of co-operation between the participants and other relevant stakeholders.
- The extent to which the Access Activities (Trans-national Access and/or Virtual activities) will offer access to state-of-the-art infrastructures, high quality services, and will enable users to conduct excellent research.
- The extent to which the Joint Research Activities will contribute to quantitative and qualitative improvements of the services provided by the infrastructures.

JERICO_NEXT

New European eXpertise for coastal observaTories

List of topics with high potential (grade A) and with merit for future Horizon 2020 actions for integrating and opening existing national research infrastructures

Integrated and sustained coastal observation network (expand from JERICO for a wider European and data coverage, in particular biological data and Mediterranean areas).

JERICO_NEXT

What characterises the coastal areas?

Greater sensitivity to anthropogenic effects: climate change modifies natural biotic and abiotic cycles while the human land-based activity generates fluxes of nutrients, contaminants and carbon dioxide which have a great impact on the structure and function of marine ecosystems.

The coastal area is a highly dynamic region with strong spatial and temporal variability.

While the physical properties (hydrography) of our coastal sees are well described our understanding of the links between physics and biology is poor.

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The marine ecosystem health, the trophic chain, the loss of biodiversity and the coastline erosion are some of the main societal nowadays questions.

JERICO_NEXT

What are the needs for the coastal observation purposes?

For characterising the coastal zone, we need to have:

well adapted sensors, observing systems, control and processing procedure to have validated in-situ information,

coherent spatial and time sampling strategies of core variables dedicated to the each research and/or monitoring question that may be different for different regions.

identification of measurable proxies (or couple of correlated parameters) if the parameter we want to survey is not measurable,

well adapted forecasting models,

constant improvement through well supported technical research and development to provide new, cheaper, more energy efficient and reliable observing systems.

JERICO_NEXT

In JERICO 1, we focused on the acquisition, processing, control, and quality of the core parameters. This objective has to be strengthened in two ways:

first, to reinforce the European cooperation to interoperate existing JERICO observing systems and new ones, by testing new sensors and promoting more best practices on the core parameter observing systems.

then by testing, qualifying new kinds of observatories as coastal profilers, sea bottom observatories, HR radar in order to integrate them into the coastal observatory network.

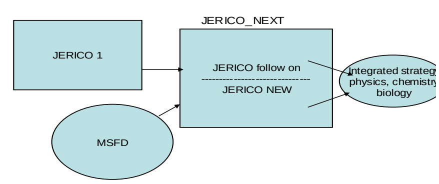
But the second objective should be how to link biological processes with these core physical and chemical parameters in order to better understand the strong interaction between physics and bio-geo-chemistry, and to understand how the marine ecosystems react to the global change.

JERICO_NEXT

<u>In JERICO, we are not totally out the biology requirements. Even if a major part of JERICO activity is more technical (WP3 and 4), JERICO is also focussed on achieving defined research goals. JERICO research tasks were broad in scope covering physics, bio-geo-chemistry but also biology as detailed below</u>:

1) *Task 1.4 focussed on how coastal observatories can help to monitor marine biodiversity and proposing a long term implementation strategy.*
2) *WP8 to valorise the observing infrastructure facilities.*
3) *Task 10.1, development of new tools for monitoring the biological components, that include phytoplankton, zooplankton, suprabenthos, and benthic organisms.*
4) *Task 10.2, implementation of physical-chemical sensors on Ferryboxes (mainly): for contaminants, algal pigments, carbonate systems (pCO2, pH and alkalinity).*

JERICO_NEXT



JERICO_NEXT

	CORE PARAMETERS	Primary	Secondary
Physical	Salinity	✓	
	Temperature	✓	
	Turbidity	✓	
	Sea level	✓	
	Surface waves		✓
	Surface currents		✓
	Optical properties (e.g. CDOM & SPM)		✓
	Noise Passive Acoustic Listener (PAL)		✓
Chemical	Contaminants		✓
	Dissolved nutrients	✓	
	Dissolved oxygen	✓	
	CO_2 partial pressure	✓	
	pH acidity or Alkalinity		✓

JERICO_NEXT POSSIBLE STRUCTURE

WP1: Scientific and regional Strategies for sustainability (NA)

<u>Task 1.1</u>: Scientific strategies Scientific topics integration: analysis of the scientific sampling strategy that would fit the above introduced objective. It should also take into account the strategy needed to answer modelling issues. Defining an effective monitoring strategy that meets the needs of multiple societal benefit areas by delivering new knowledge and better evidence

<u>Task 1.2</u>: The biological approach

Within the framework of the first phase of JERICO, we started to tackle the question of the monitoring of a set of key biological compartments and processes through the development of image analysis software. Those developments have been dealing both with benthic and pelagic ecosystems and the assessments biodiversity and functional (e.g., activity, recruitment and bio-turbation) processes. There are also clear opportunities in this field, which are for example provided by recent and promising developments in imagery, passive acoustics and eddy-covariance techniques. One first aim of JERICO NEXT will thus consist in pursuing the ***effort*** *undertaken in JERICO regarding the automation or semi-automation of biological compartments and processes. This will be carried out in a task of the JRA?*

How to take into account outcomes from the jerico1 task1.4 study by Nioz on biodiversity?

How to integrate developments of tasks 10.1 and 10.2 in the coastal monitoring

Biology needs: definition of coupled measurements between sc topics.

JERICO_NEXT POSSIBLE STRUCTURE

WP1: Scientific and regional Strategies for sustainability (NA)

Task 1.3: Regional/local strategies; identification of scientific specificities, and societal challenges linked to the MSFD, by region/local area and observation systems. Regional network optimisation
Task 1.4: Economic strategy of JERICO: sustainability
Link with national funding agencies, and regional agencies
Assessment of implementation and maintenance cost
Strategy of sustainability: financial and legal structure (ERIC, AISBL etc.)
Task 1.5: Link with open sea science and associated consortiums:
AtlantOS, FixO3/EMSO/ESONET Vi, Euro ARGO project, NEXOS, SenseNet, …
Task 1.6: Link with biological and biodiversity associated consortiums:
EMBOS, MARS, EMBRC, LifeWatch

JERICO_NEXT POSSIBLE STRUCTURE

WP2: Harmonisation of technologies and methodologies: technical strategy (NA)

Task 2.1: Inclusion of new observation vectors for harmonization purpose:
HF radar
Costal profiling systems
Coastal sea-bed observatories
Task 2.2: Inclusion of new sensor type: ex: nutrient sensors. Update after Old WP3 & WP4. Coastal biological observation systems
Task 2.3: JERICO label and science committee (label update and committee organisation)
Task 2.4: Link with private sector: JERICO FCT

JERICO_NEXT POSSIBLE STRUCTURE

WP3: Technology and methodology developments (JRA)
New sensors, new vector configurations, new methodologies (not necessary for automated purpose, but when possible yes), specifically for biology.

Task 3.1: Linked to new vector technologies: HF radar, Costal profiling systems, Coastal sea-bed observatories

Task 3.2: Linked to biological observations
Within the framework of the first phase of JERICO, we started to tackle the question of the monitoring of a set of key biological compartments and processes through the development of

1. *Flowcytometer on ferryboxes and fixed platforms?*
2. *Automation of sampling*
3. *Omics techniques used for observation (link with EMBRC)??*

JERICO_NEXT POSSIBLE STRUCTURE

WP4: Case studies (JRA)

The proposed case studies are applications dedicated to prove the feasibility (of the technology), to proof the relevancy of the methodologies related to the scientific questions identified in WP1. These case studies will be supported by models, data from satellites, … .

With regards to the optimisation of the network it could address 2 objectives: demonstrate that we have improved model results by integrating more measurements systems (= something real and done) to calibrate/validate the models, and demonstrate how it can be improved again in the future. It should also address some specific scientific and/or societal issues of WP1.

JERICO_NEXT POSSIBLE STRUCTURE

WP4: Case studies (JRA)

New methodological developments
Selection of situations/problems and sites
Justify the selection of 3 descriptors of the MSFD listed above on the basis of the relevance (loss of biodiversity, functionality, quality indicator of the environment), eutrophication: major environmental problems associated to questions as HAB or sea-bed integrity are major problem in coastal and deep environments. Contaminants?
A Priori optimization of the sampling strategy
How to couple a posteriori biological and physico-chemical data acquired at the same time and in a geographical area: spatial and geographical samplings, and spatiotemporal frequencies for which they are acquired. JERICO will dedicate a whole task on the optimization of the sampling strategy to allow the coupling between these parameters. This approach is largely based on modelling.
Validation survey (TBD)

Examples of MSFD descriptor in which we can propose case studies

Study in a geographical area (at least one per European seas regions)

***D1: Biodiversity**: (reference to Sanders 'document)*
Macrobenthos biodiversity, density of presence
Biodiversity of pelagic population and/or benthic systems
D5: Eutrophication
The Channel, north sea, Baltic; other
D6: seafloor integrity
North sea, prodelta du Rhone, vasiere Gironde,
***D7: Hydrographycal conditions**:*
Habitat evolution linked with climate change
Acidification – linked to Jerico task 10.2
***D8: contaminant and pollution effects**:*
linked to Jerico task 10.2
D11: Under water noise/ energy?

JERICO_NEXT POSSIBLE STRUCTURE

WP5: Data management

From measurement to archiving and then access (RT, DM)

Data policy (keep a place for vessels data): Clarify the policy with regards to archiving: archiving = compulsory, open access is not automated when data are archived in Seadatanet.

Links with EUROGOOS, EMBOS

Links with EMODNET physics (ENEA), EMODNET biology (VLIZ), EMODNET chemistry (OGS), OBIS.

WP6 Virtual service access

From archived data to products (ex: time series of indicators, derived maps, or integrated products with modelling, satellites and data) to a service recognized by Copernicus (MyOcean? Mercator?)

The idea is to deliver products as prototypes coming out from cases studies, not to develop an operational chain from measurements to products. So the purpose of this WP is to make available a flow of topical products to the consortium and so demonstrate that it works.

JERICO_NEXT POSSIBLE STRUCTURE

WP7: TNA (Please propose infrastructures)

WP8: Communication and outreach

Link with universities: training, dissemination – increasing human capacity

Outreach to the society: link with aquariums, web site, movie, factsheet

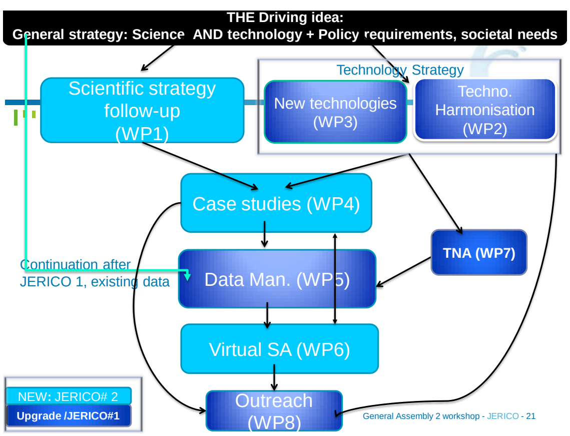
Scientific outcome: for policy makers and scientists,

Links with internationals consortiums

Links to Ocean Literacy H2020 programme

Panel comprised of representative of end-user across policy, research and operations providing feedback on products ?

WP9: coordination



2014 TIME LINE

- **2nd Sep.: Submission of JERICO-Next proposal**
- August: final amendement to the proposal <u>with snail speed!!! (hopefully at least)</u>
  Please be realistic: speed up before august!!!
- 30th july: financial information discussed and technical part updated
- 15th july: financial information received
- 30th june: Technical part drafted
- 15th june: WP description drafted on goolge doc
- Now: definition of WP leaders and co-leaders

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JERICO_NEXT

QUESTIONS AND DISCUSSION

MEETINGS TO ORGANISE

1 WEEK 25 (16 → 20 JUNE) same week of summer school

2 WEEK 27 TO FINALISE IF THE 1st METING NOT COMPLETE

3 WEEK 34 (18 → 25 AUGUST)