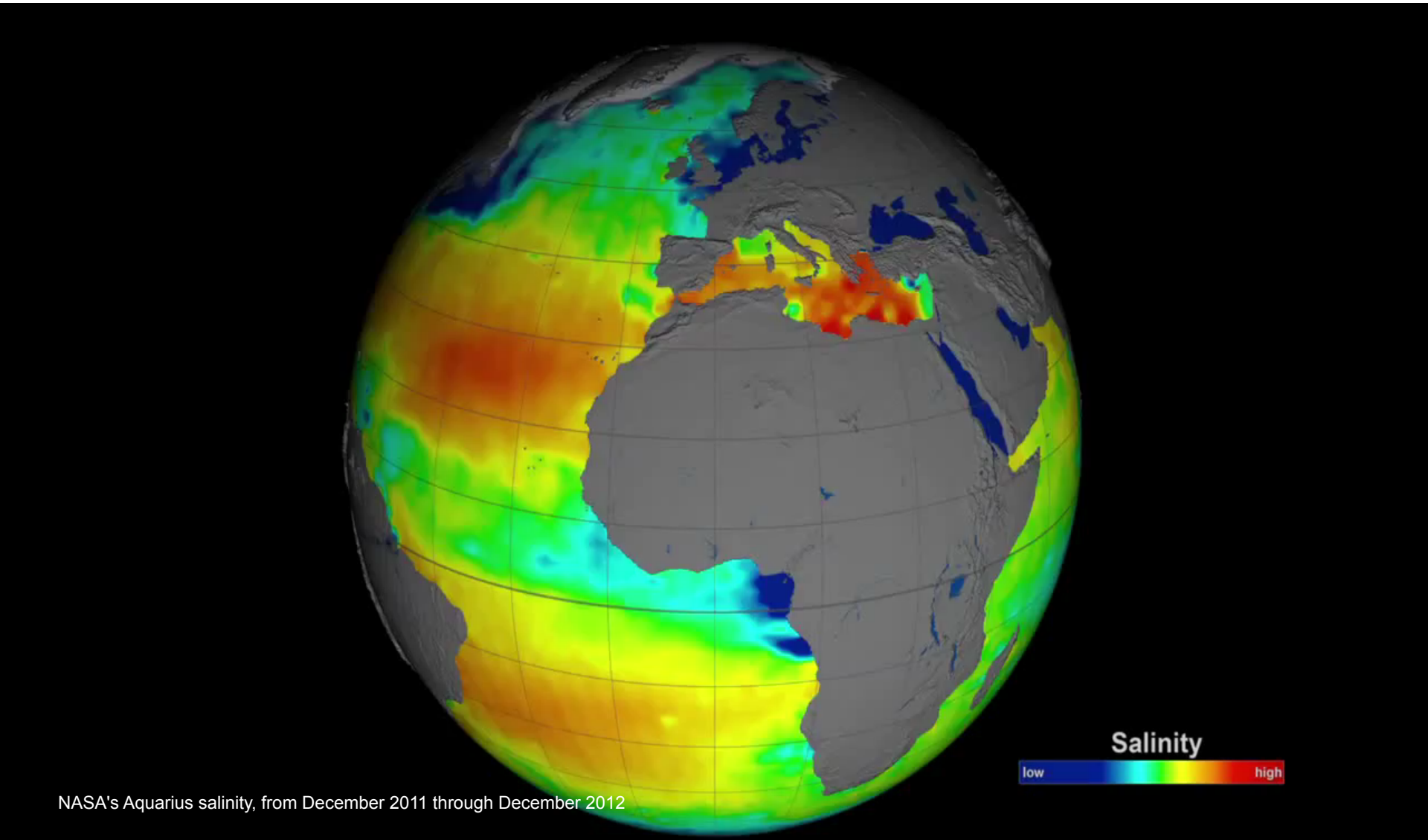
Science and Technology based Blue Growth Initiatives: the SOCIB contribution to fill the Science–Policy gap

Joaquín Tintoré, Ll. Gomez-Pujol, D. March.

OUTLINE

1. **The oceans and coastal areas, present state and variability. Lessons from last decade.**
2. **Technology and Paradigm Change in ocean observation, forecasting capabilities, Marine Research Infrastructures.**
3. **SOCIB a new MRI in the West Mediterranean; Science, Technology and Society. Nearshore / open Ocean. Multi-platform integrated approach.**
4. **Innovation and Blue-Growth, the Challenges, More listening to society: real sustainability implies solid multi-disciplinary work involving social sciences, governance: …towards bridging the "science-policy gap".**

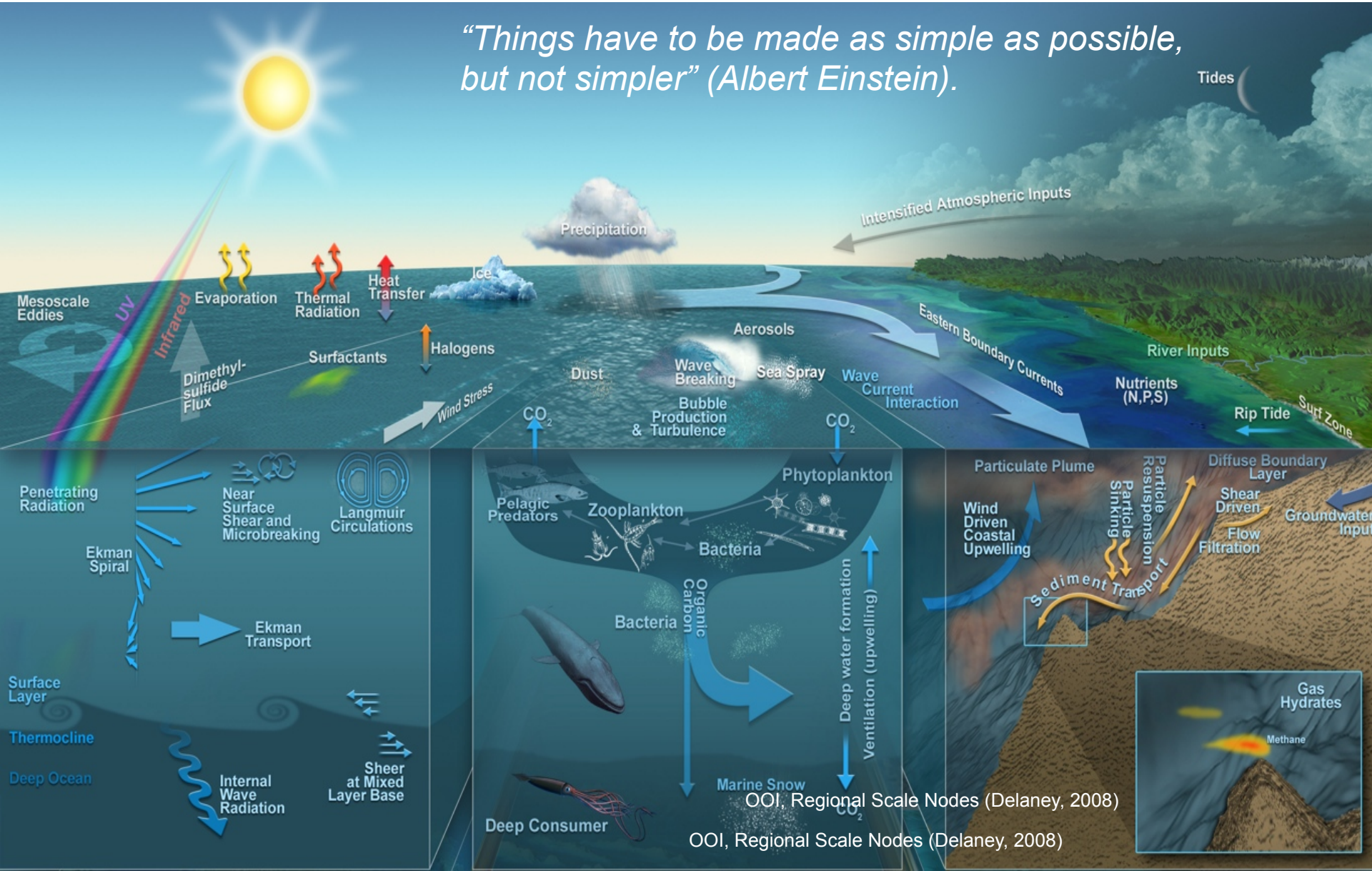
A complex system we need to understand for sound management



NASA's Aquarius salinity, from December 2011 through December 2012

NASA. Ocean current flows in the Mediterranean (2 mins. - 16 Feb 2005 through 16 January 2006). http://svs.gsfc.nasa.gov/goto?3820

Oceans and coastal interactions are complex, central to the Earth system, Management is needed. No oversimplification.



OOI, Regional Scale Nodes (Delaney, 2008)

OOI, Regional Scale Nodes (Delaney, 2008)

The coastal zone, complexity, problems and threats in a global change scenario

Environmental threats

- Climate change, sea level rises, ecosystem variability
- More frequent extreme events
- Beach erosion
- Loss of coastal dunes
- Degradation of *Posidonia oceanica* meadows
- Proliferation of invasive species
- Coastal artificialization
- Degradation of water quality, eutrofication
- Red tides, HABS
- Loss of fisheries resources
- Proliferation of jellyfish
- Marine debris
- Accidental oil spills

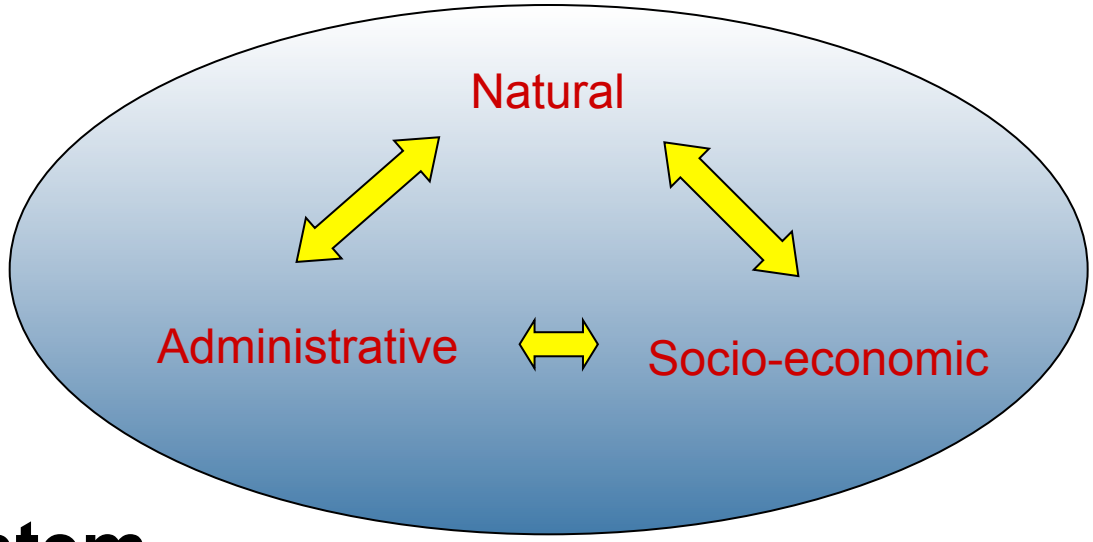
- Theses threats are already problems with significant **economic and social** effects. There is a strong pressure on the coastal zone as a resource

-**“The natural resource is not unlimited” ¡(limitation concept)**

Theses threats are not only local, **<u>global change scenario</u>**

The coastal zone, complexity, problems and threats in a global change scenario

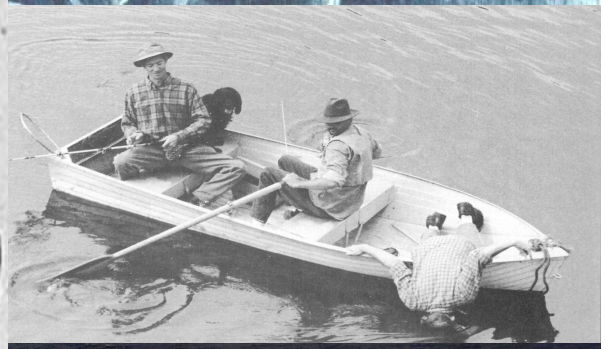
Three sub-systems:



Complex system

- **“Things have to be made as simple as possible, but not simpler” (A. Einstein)**
- **“What we measure affects what we do. If we have the wrong measures, we will strive for the wrong things” (Joseph Stiglitz 2010, Progressive Thinking, Nature Editorial).**

The oceans and the coasts are chronically under-sampled. We need: long time series and synoptic data.



Changing Ocean Circulation

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A

Phil. Trans. R. Soc. A (2012) **370**, 5461–5479
doi:10.1098/rsta.2012.0397

Changing currents: a strategy for understanding and predicting the changing ocean circulation

By Harry L. Bryden[1,*], Carol Robinson[2] and Gwyn Griffiths[3]

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[2]*School of Environmental Sciences, University of East Anglia, Norwich Research Park, Norwich NR4 7TJ, UK*
[3]*National Oceanography Centre, University of Southampton Waterfront Campus, European Way, Southampton SO14 3ZH, UK*

Within the context of UK marine science, we project a strategy for ocean circulation research over the next 20 years. We recommend a focus on three types of research: (i) sustained observations of the varying and evolving ocean circulation, (ii) careful analysis and interpretation of the observed climate changes for comparison with climate model projections, and (iii) the design and execution of focused field experiments to understand ocean processes that are not resolved in coupled climate models so as to be able to embed these processes realistically in the models. Within UK-sustained observations,

OCEANOGRAPHY

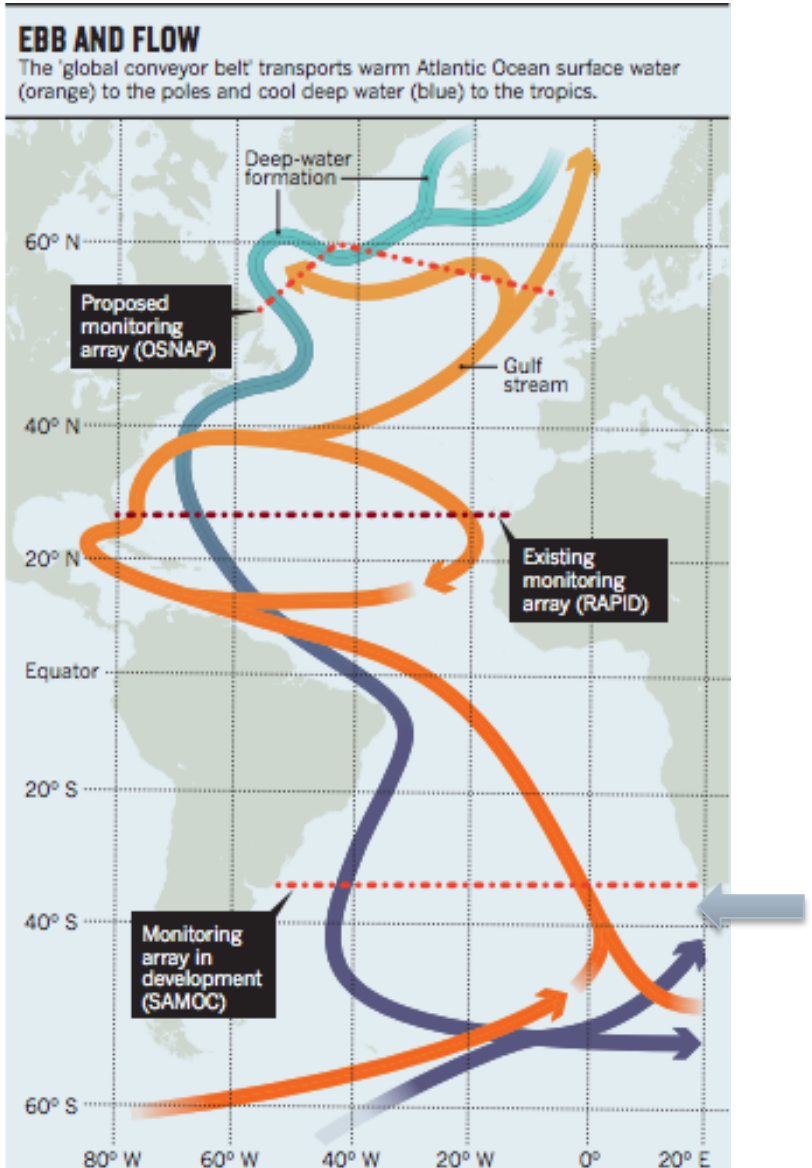
Oceans under surveillance

Three projects seek to track changes in Atlantic overturning circulation currents.

BY QUIRIN SCHIERMEIER

In April 2009, the array recorded[2] a 30% drop in average current strength that persisted for a year, reducing the amount of heat transported to the North Atlantic

a crucial component of the conveyor belt: the region of the North Atlantic in which surface



Marine research in the past 20 years has focused on defining the present day ocean circulation. From these measurements of ocean circulation, we begin to understand how biogeochemical distributions are set and how the ocean and atmosphere interact to determine the present climate [4].

The key issue for the next 20 years is to understand how the ocean circulation varies on inter-annual to decadal time scales

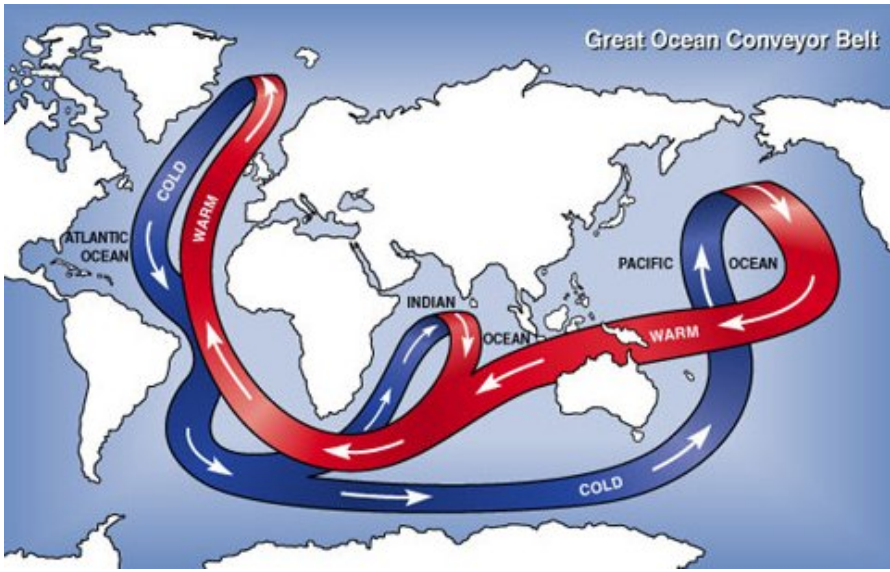
And we need… "Careful analysis and interpretation of climate changes"

> In April 2009, the array recorded a 30% drop in average current strength that persisted for a year, reducing the amount of heat transported to the North Atlantic

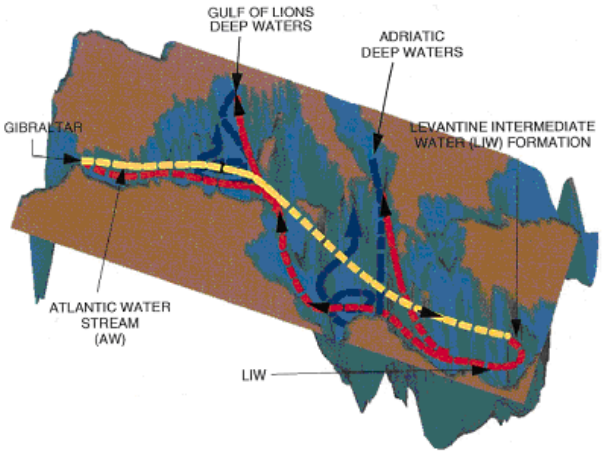
Scientific challenges: key hot topics, long term monitoring

HOT TOPICS:

- *Eastern and Western boundary Currents,*
- *Straits exchanges, Coastal ocean variability, Shelf/slope exchanges,*
- *Meso and submesoscale eddies, mean flow – eddies interactions,*
- *Upper ocean exchanges extreme events,*
- *Ecosystem response,…*



→ Importance of control points or sections…



"Long-term monitoring of ocean properties and circulation is the key to understanding climate change and to developing our ability to predict future changes". (*Bryden et al., 2012; Phil. Trans. R. Soc.*)

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New Technologies

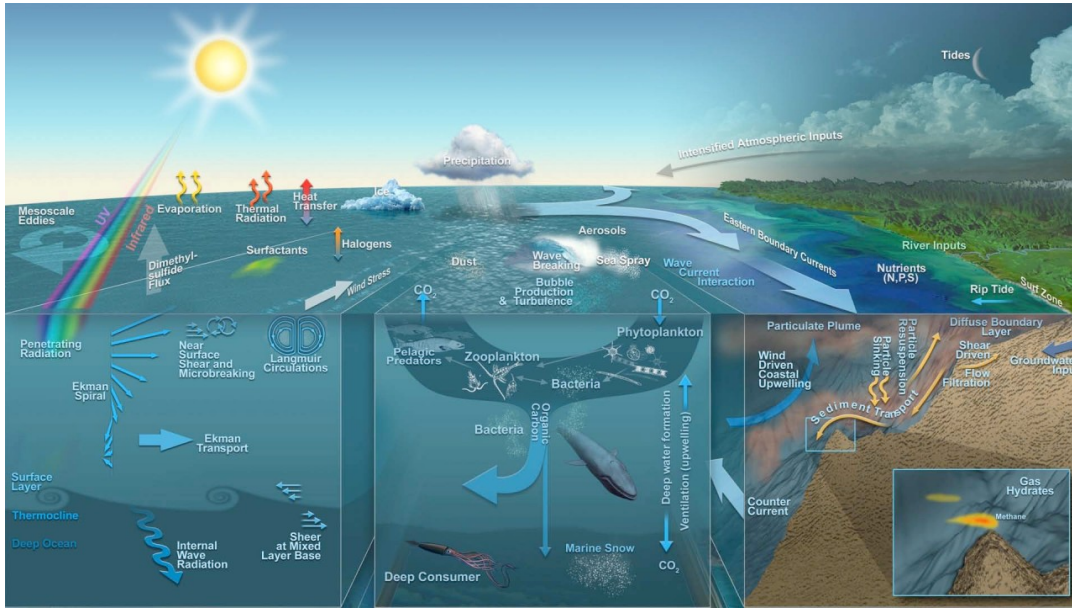
A New Approach to Marine and Coastal Research

Allow three-dimensional real time observations, that combined with forecasting numerical models, and data assimilation, …

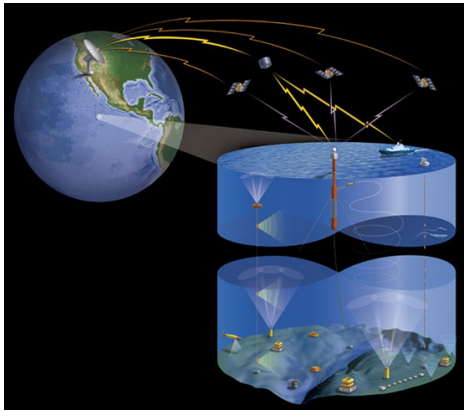
A quantitative major jump, in scientific knowledge and technology development

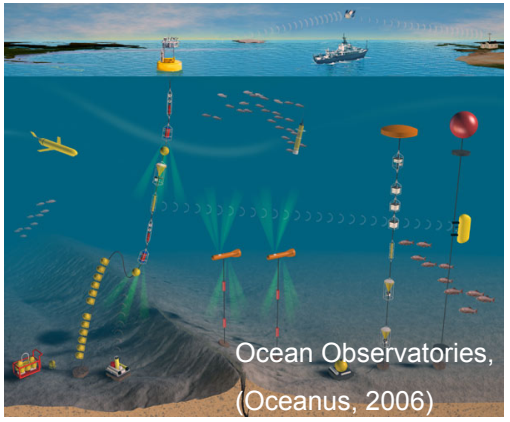
The development of a new form of Integrated Coastal Zone Management, based on recent scientific and technological achievements,

on a global change context (where climate change is one of the most important, but not the only one…), and following sustainability principles

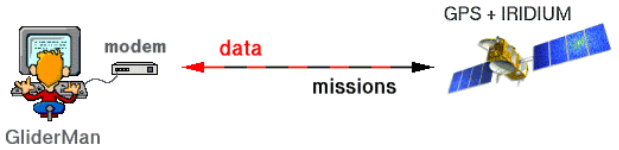


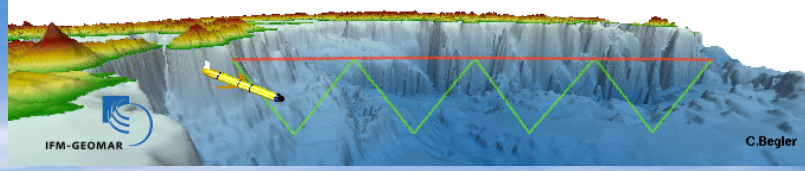
OOI, Regional Scale Nodes (Delaney, 2008)





Autonomous gliders



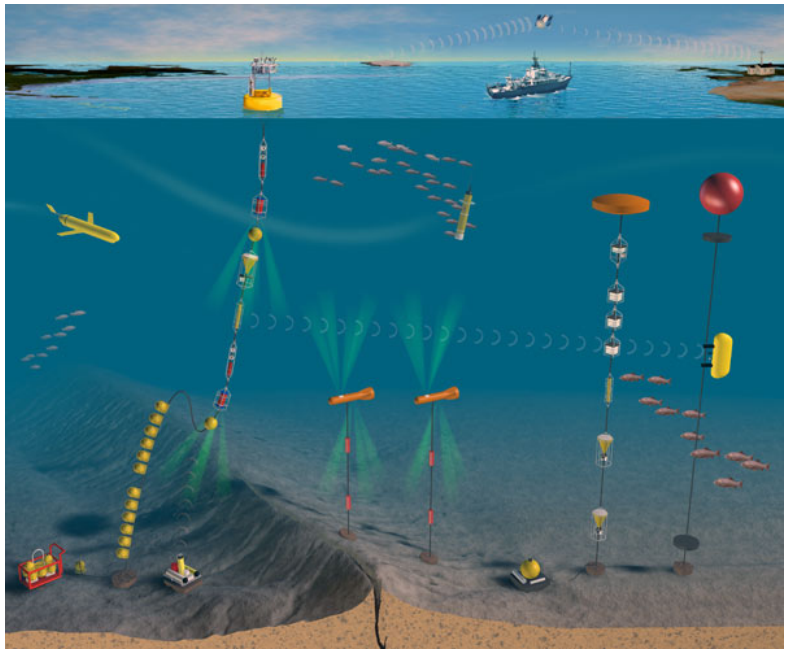


Paradigm Shift (1): Ocean Observation

From: Single Platform - Ship based observation
To: Multi-platform observing systems

Platform-centric Sensing Systems

Net-centric, Distributed Sensing Systems



(Adapted from Steve Chien, JPL-NASA)

Paradigm Shift (2): Data Availability

From: Data only available 12-24 months/years after cruises….
To: Quasi-real time quality controlled data available

Inter-comparison

Models  **Data**

With… huge increase in human potential for analysis

NEW CHALLENGES: Multi-disciplinary, multi-platform integration.

A 2020 Vision for Ocean Science

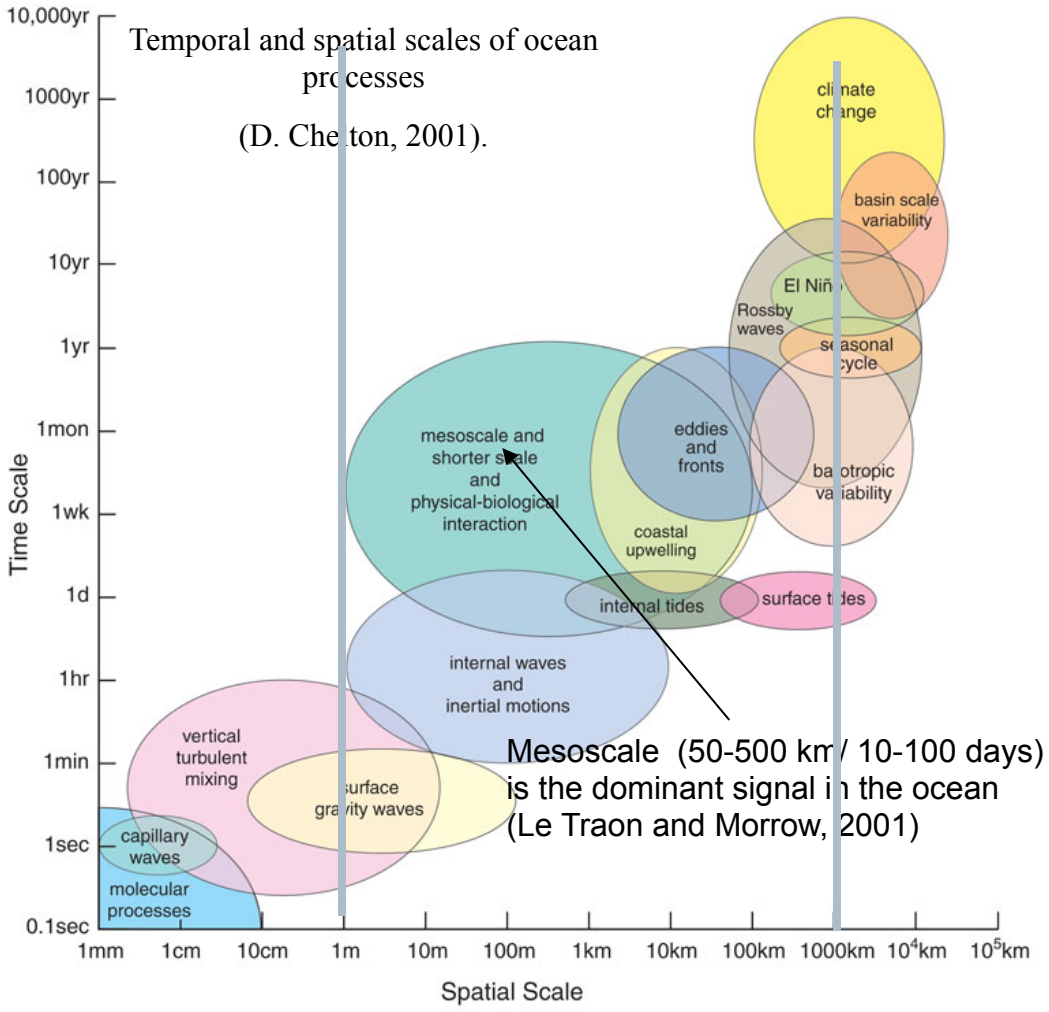
JOHN R. DELANEY
University of Washington
ROGER S. BARGA
Microsoft Research

NOW we can….ocean variability at mesoscale/sub-mesoscale, interactions and ecosystem response

Theory and observations have shown that there is a maximum energy at the mesoscale (include fronts and eddies ~10-100km),

SOCIB focus: mesoscale & submesoscale and their interactions with general circulation and their effects on vertical motions, impact on ecosystem variability.

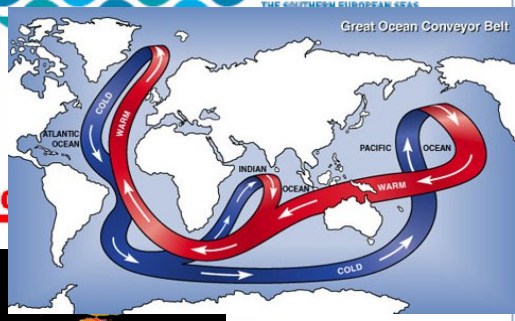
With inputs from 'both sides'....
(nearshore and coastal ocean and also seasonal/inter-annual and decadal variability)

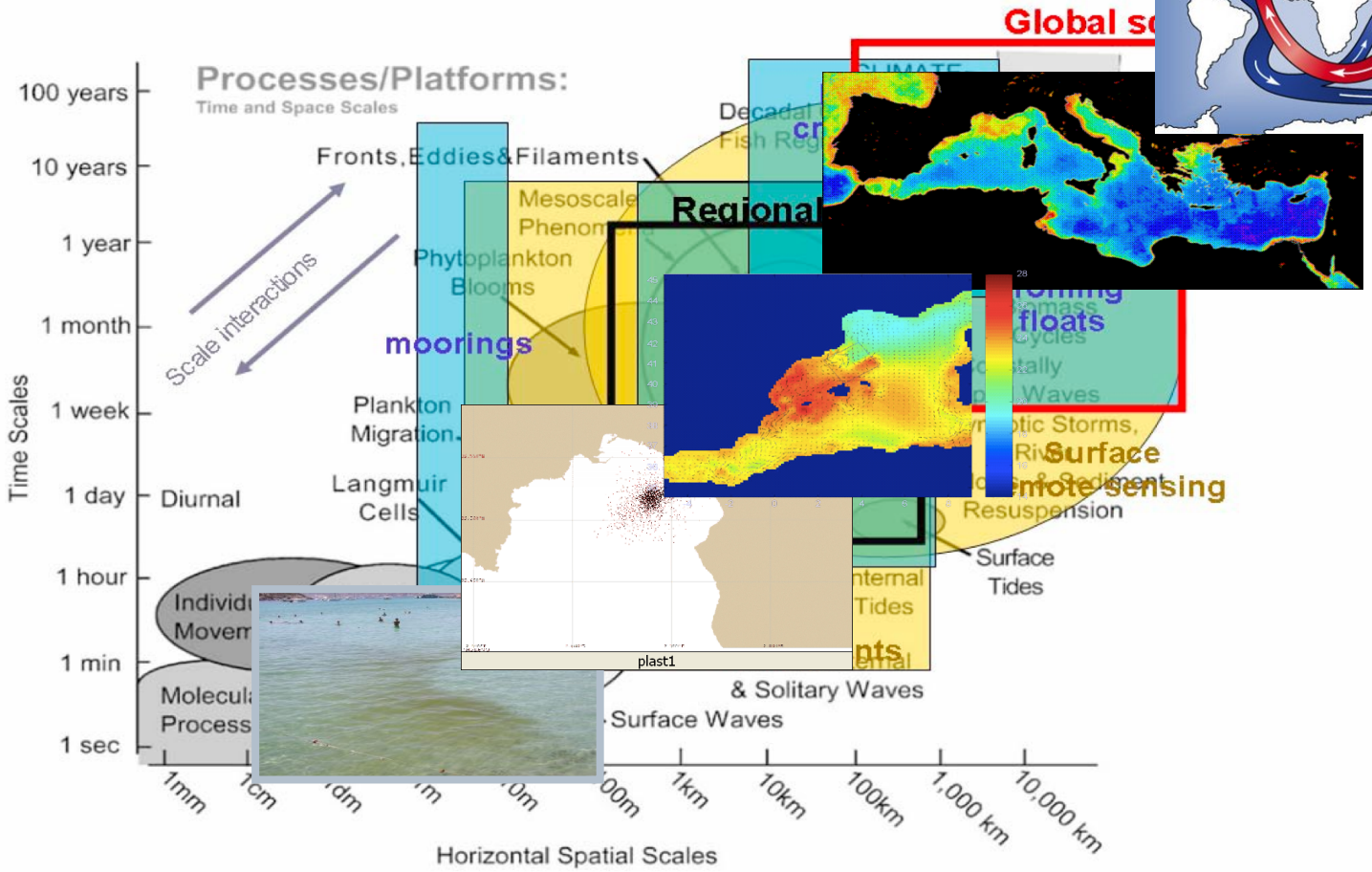


SOCIB scales

Multi-Platform integrated approach

….from local to basin scale





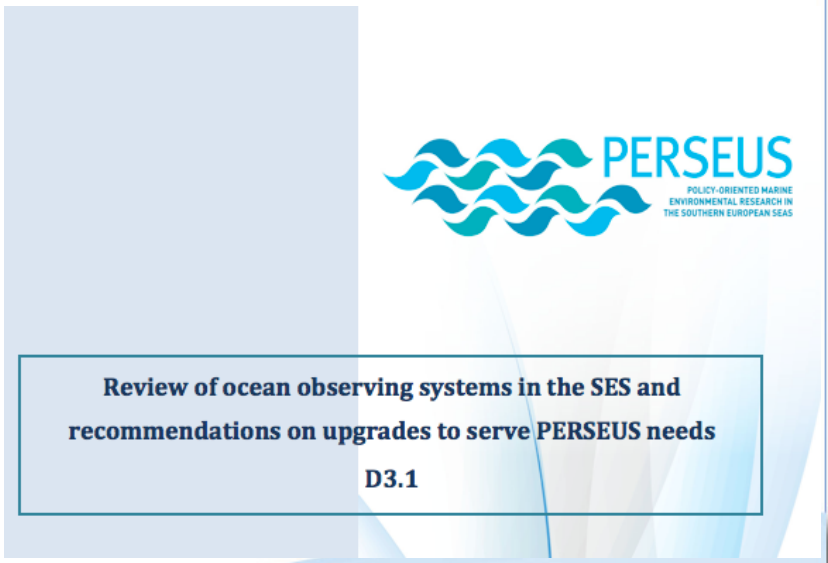
“A single ship can only be in one place at one time. We need to be present in multiple places in multiple times.” (John Delaney, Nature, Sept. 25, 2013)

Tasks 3.1 Review of Existing Observing Capacities (from local to sub-basin and basin scale variability) – Identification of needs and gaps

FINAL D3.1 Review Report

Review all the observations collected across 6 major platforms; Argo profilers, surface drifters, R/V, open water moorings, gliders, local and coastal stations, and satellites, across all the SES region

Identifies GAPS and NEEDS



Why Ocean Observatories, why SOCIB and **why now?**

New Capacities for quasi-real time observation IMPLIES CHANGES IN OUR APPROACHES

- **SCIENCE QUESTIONS**
- **TECHNOLOGY DEVELOPMENT**
- **SOCIETAL NEEDS** (sound management and response crisis)

Marcel Proust: New eyes… "Le véritable voyage de découverte ne consiste pas à chercher de nouveaux paysages, mais à avoir de nouveaux yeux", "The real voyage of discovery consists not in seeking new landscapes, but in having new eyes".

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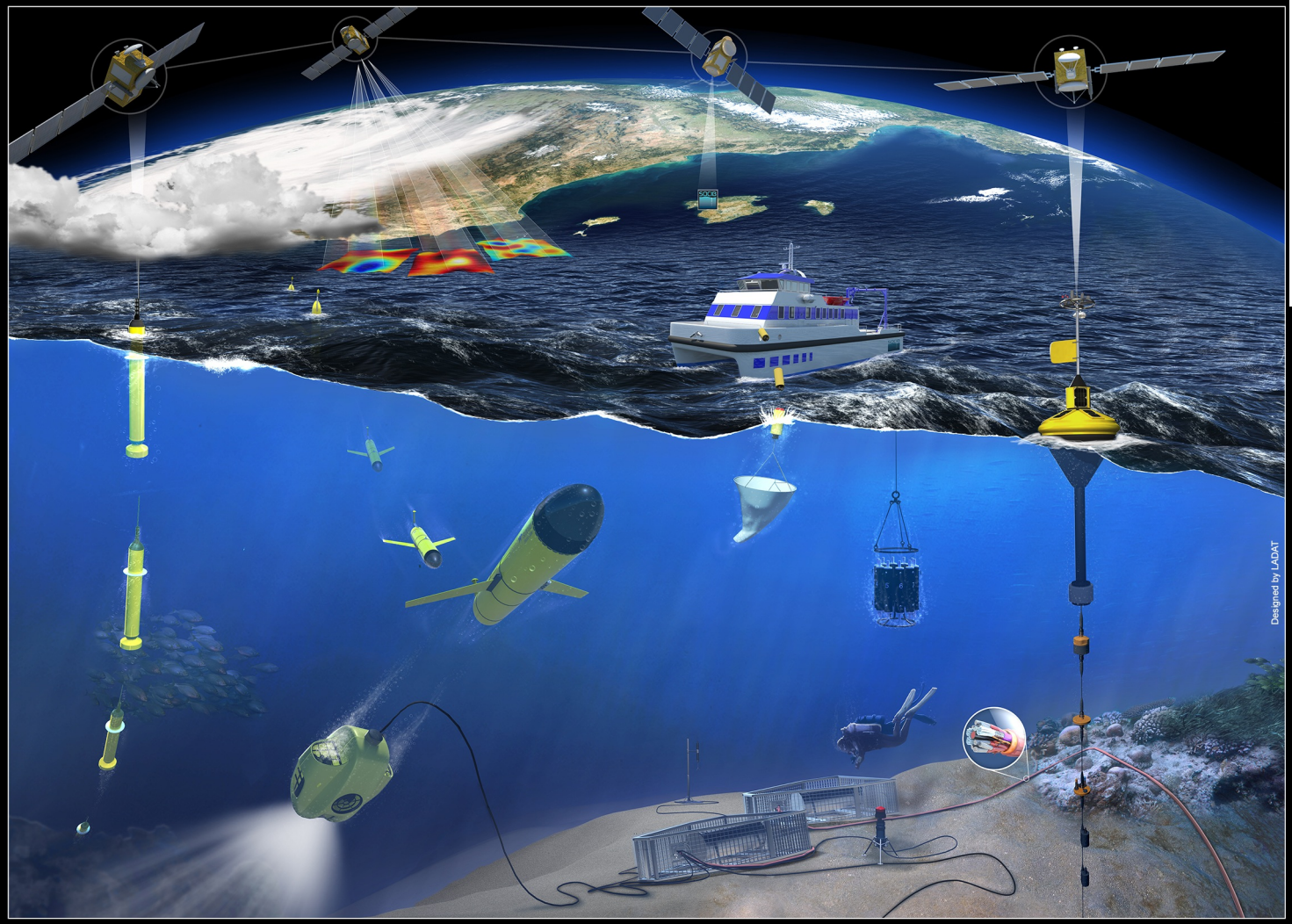
What is SOCIB? – A Multi-Platform Observing & Forecasting System based in the Balearic Islands



PAPER

SOCIB: The Balearic Islands Coastal Ocean Observing and Forecasting System Responding to Science, Technology and Society Needs

AUTHORS

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Tintoré et al., 2013: *Marine Tech. Soc. J.*, Vol. 47, N. 1, pp. 101-117

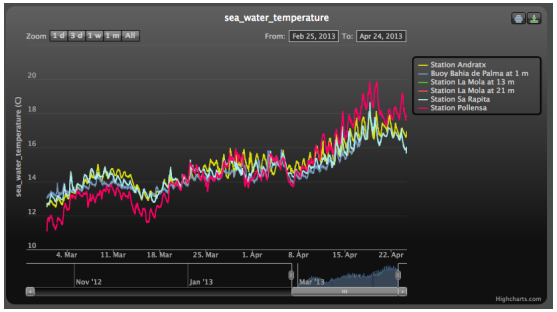
SOCIB Balearic Islands Coastal Observing and Forecasting System

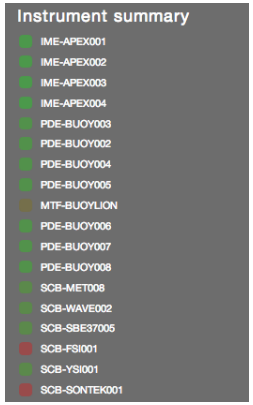
A new international Coastal Observing and Forecasting System in the Balearic Islands

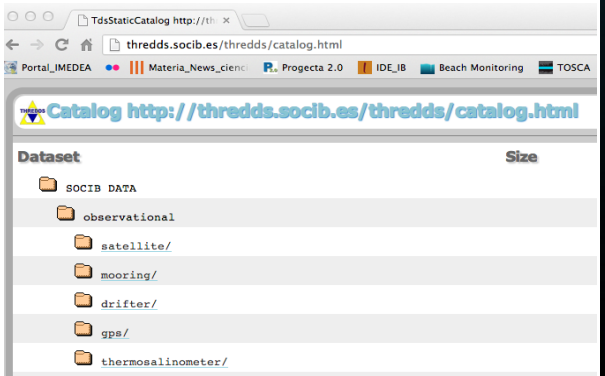
Towards a sustainable development of coastal areas based on scientific knowledge and technology development

Govern de les Illes Balears · GOBIERNO DE ESPAÑA · MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

SOCIB: Real Time, Free Access & Download, Quality Controlled Data



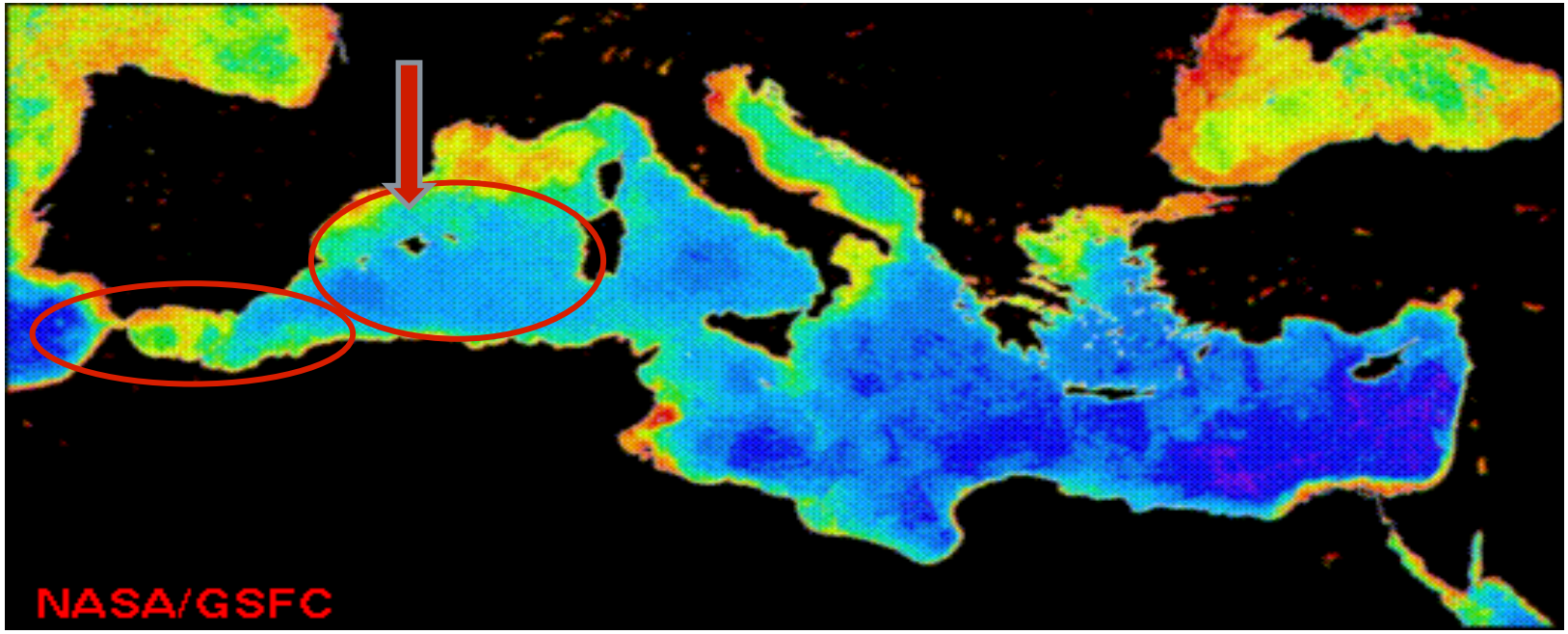




SOCIB activities; where ?

Mostly (but not only) centred in the western Mediterranean, with focus in the Balearic Islands and adjacent sub-basins (specifically Algerian and Alborán/Gibraltar) and …

Covering from the **nearshore** to the **open ocean**.



The SOCIB approach to sustained ocean observation…

To assure the real sustainability of the seas and oceans and of the observing systems, SOCIB was designed:

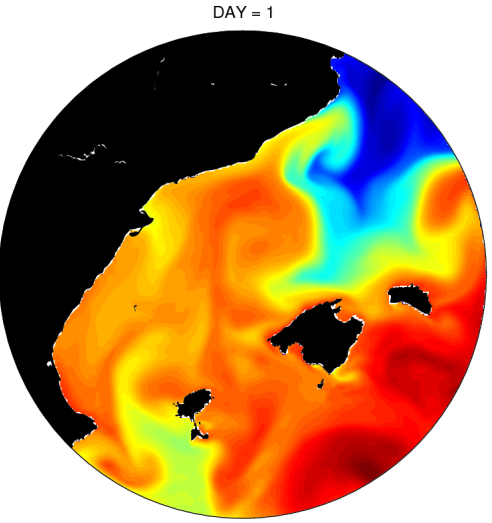
→ **RESPONDING TO 3 KEY DRIVERS**

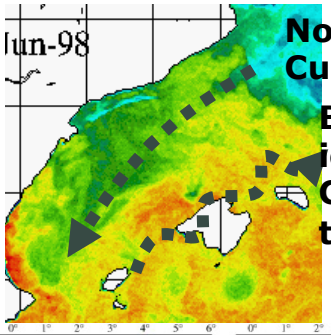
- Science Priorities
- Strategic Society Needs
- Technology Developments

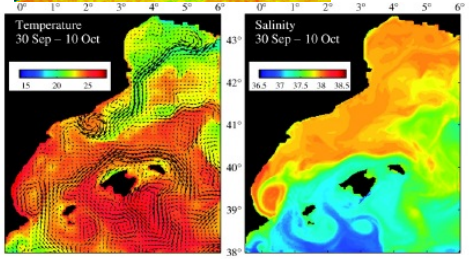
→ **BALEARIC ISLANDS, EXTENDING FROM THE NEARSHORE TO OPEN OCEAN**

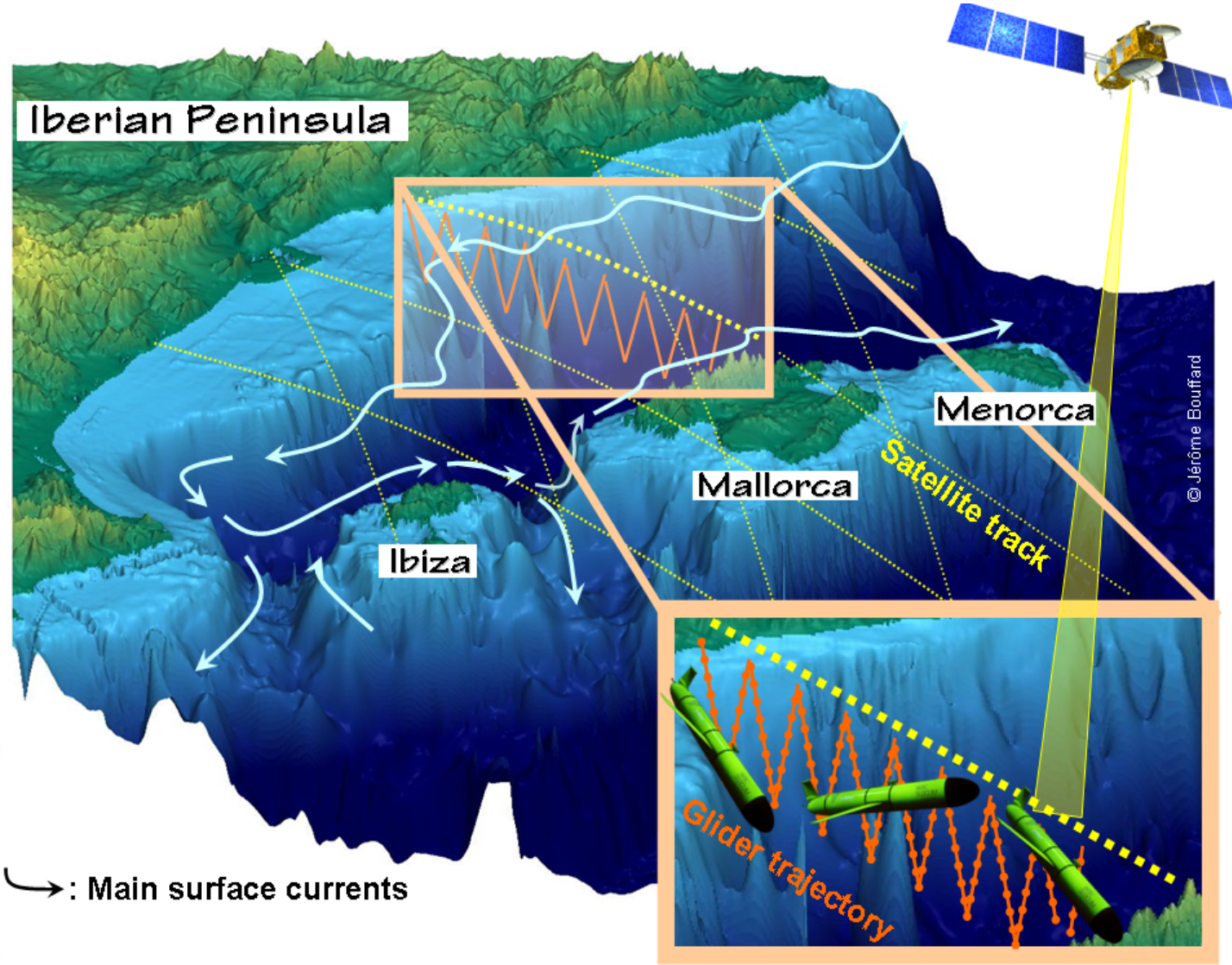
Balearic Sea (fronts, mesoscale eddies, blocking, hotspot, ecosystem response)

…. Ideal lab to study global ocean problems





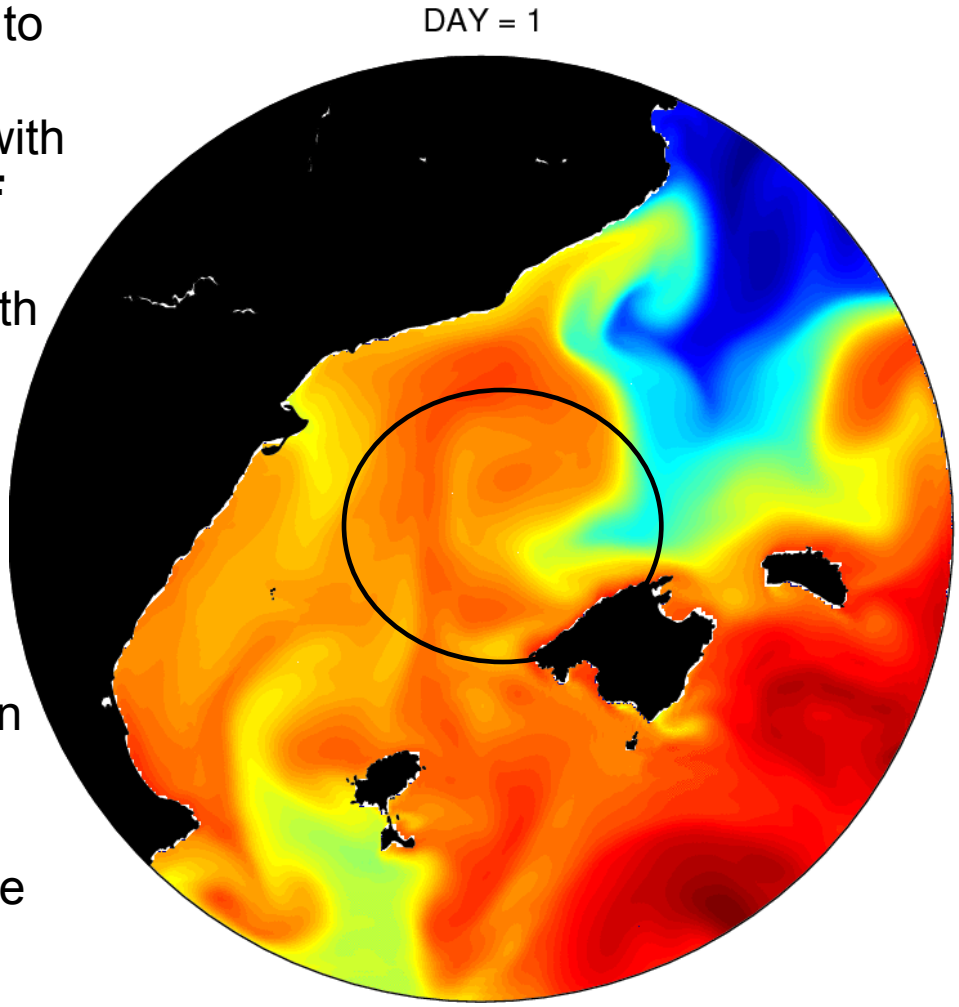




Modelling Facility

Operational Modeling: ROMS, 2km, to reproduce and maintain mesoscale features, interactions. In collaboration with PE and in the frame MFS/MOON. **WRF** Atmospheric Model. **SWAN** for coastal ocean wave Dynamics and Habors (with PE)

Aim :
- Validate the model with measurement (gliders, ...)
- From available data and model simulation (5 years), study the formation of mesoscale structures.
- Understand impact of meso/ submesoscale on circulation and on the ecosystem



SST from 11/2008

Pre-operational systems being implemented; coastal ocean and beaches

Journal of Coastal Research	26	3	503–509	West Palm Beach, Florida	

A Nearshore Wave and Current Operational Forecasting System

Amaya Alvarez-Ellacuria†, Alejandro Orfila†, Maitane Olabarrieta‡, Raul Medina‡, Guillermo Vizoso†, and Joaquin Tintoré†

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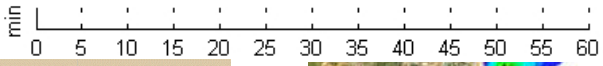
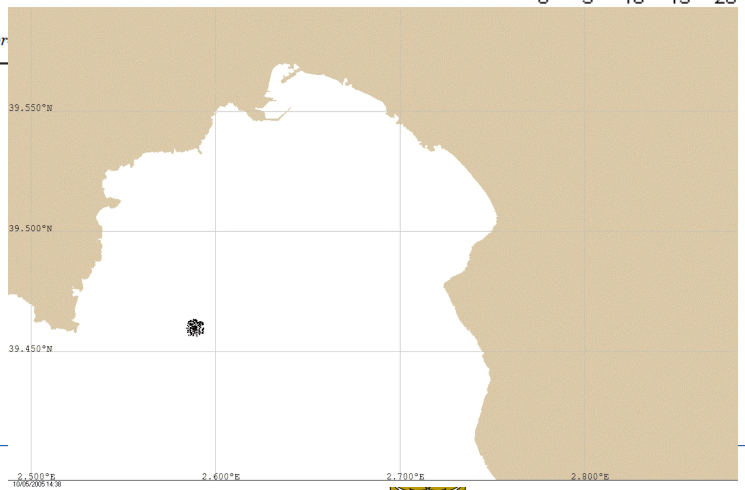
ABSTRACT

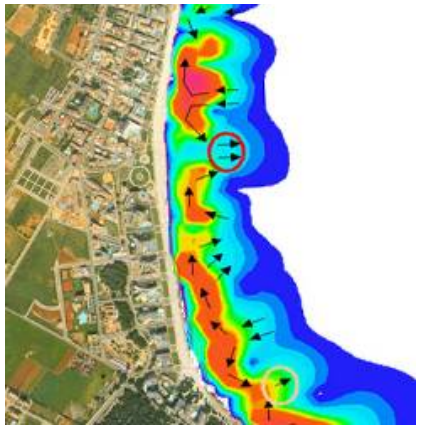
ALVAREZ-ELLACURIA, A.; ORFILA, A.; OLABARRIETA, M.; MEDINA, R.; VIZOSO, G., and TIN
A nearshore wave and current operational forecasting system. *Journal of Coastal Research*, 26(3), 503–
Beach (Florida), ISSN 0749-0208.

An operational forecasting system for nearshore waves and wave-induced currents is presented. The
tem (FS) has been built to provide real time information about nearshore conditions for beach safet
system has been built in a modular way with four different autonomous submodels providing, twice
wave and current forecast, with a temporal resolution of 1 hour. Making use of a mild slope paral
system propagates hourly deep water wave spectra to the shore. The resulting radiation stresses are
depth-integrated Navier-Stokes model to derive the resulting current fields. The system has been im
beach located in the northeastern part of Mallorca Island (western Mediterranean), characterized by i
pressure during summer season. The FS has been running for 3 years and is a valuable tool for loca
beach safety management.

ADITIONAL INDEX WORDS: *Rip currents, wave pr*







- Oil-spill mapping
- Land vulnerability
- Security in beaches – rip currents
- Prediction of trajectories from Tsunamis.

SOCIB Balearic Islands Coastal Observing and Forecasting System

CSIC Instituto Mediterráneo de Estudios Avanzados — Universitat de les Illes Balears

Govern de les Illes Balears

Gobierno de España — Ministerio de Economía y Competitividad

Residence time, coastal–open ocean exchanges, eutrophication

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Continental Shelf Research 25 (2005) 1339–1352

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Residence time and *Posidonia oceanica* in Cabrera Archipelago National Park, Spain

A. Orfila[a,*], A. Jordi[b], G. Basterretxea[b], G. Vizoso[b], N. Marbà[b], C.M. Duarte[b], F.E. Werner[c], J. Tintoré[b]

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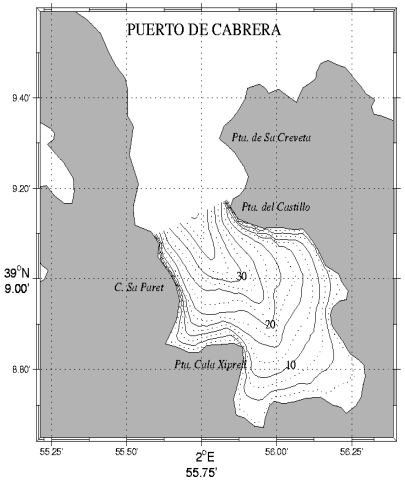
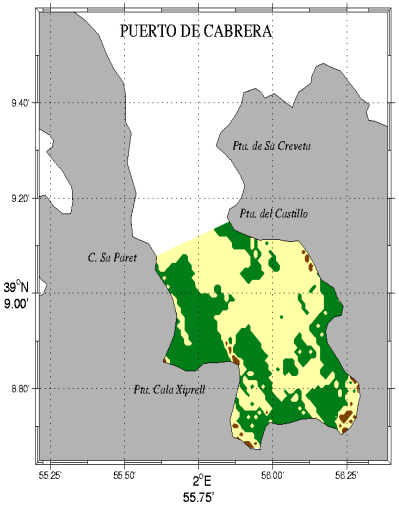
Received 20 April 2004; received in revised form 22 January 2005; accepted 25 January 2005
Available online 19 March 2005

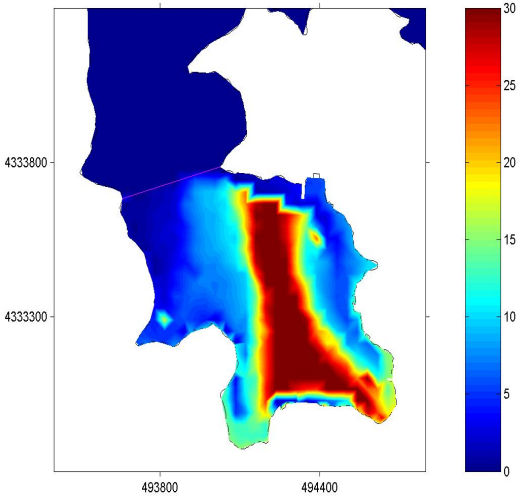
Abstract

Flushing time and residence time are studied in a small inlet in Cabrera National Park, Western Mediterranean Sea. Flushing time is studied using ADCP in situ data. Observed flushing time data are compared with the simulations from a three-dimensional coastal ocean numerical model. Residence time is assessed using virtual lagrangian particles and studying the number remaining within the analyzed domain. Results show a good agreement between observations and modeling estimations of the flushing time (i.e. 6 days from the ADCP data and 5.6 days from the numerical model). Residence time estimations yield a broad range of values, from 1 h in the Bay to over 30 days depending also on the horizontal and vertical position where particles were released. A continuous stirred tank reactor (CSTR) model for the Port yields a value of 8.7 days. Results obtained for the residence time appear to have a determinant impact over the meadows of the seagrass *Posidonia oceanica*, present inside the Port. Recirculation patterns and complex flows in coastal environments create a non-uniform distribution of the areas of accumulation of non-conservative properties that indicate that residence time concept is the correct approach when studying the impact of water transport over biological communities.

Keywords: Residence time; Flushing time; *Posidonia oceanica*







Main result: residence time and eutrofication. Water quality and relation with Posidonia Oceanica seagrass coverage in Cabrera Harbour. Implications for number of boats allowed in the moorings.

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CSIC Instituto Mediterráneo de Estudios Avanzados — Universitat de les Illes Balears

Govern de les Illes Balears

DE ESPAÑA — DE ECONOMÍA Y COMPETITIVIDAD

Tools for decision support under oil spill:

Available online at www.sciencedirect.com
SCIENCE DIRECT
Marine Pollution Bulletin 53 (2006) 361–368
MARINE POLLUTION BULLETIN
www.elsevier.com/locate/marpolbu

Scientific management of Mediterranean coastal zone: A hybrid ocean forecasting system for oil spill and search and rescue operations

A. Jordi [a,*], M.I. Ferrer [a], G. Vizoso [a], A. Orfila [b], G. Basterretxea [a], B. Casas [a], A. Álvarez [a], D. Roig [a], B. Garau [a], M. Martínez [a], V. Fernández [a], A. Fornés [a], M. Ruiz [a], J.J. Fornós [c], P. Balaguer [a], C.M. Duarte [a], I. Rodríguez [d], E. Alvarez [d], R. Onken [e], P. Orfila [f], J. Tintoré [a]

[a] IMEDEA (CSIC-UIB), Institut Mediterrani d'Estudis Avançats, Miquel Marquès 21, 07190 Esporles, Illes Balears, Spain
[b] School of Civil and Environmental Engineering, Cornell University, 14853 Ithaca (NY), USA
[c] Departament de Ciències de la Terra, UIB, Crta. Valldemossa, km 7.5, Palma de Mallorca, Illes Balears, Spain
[d] Área del Medio Físico, Puertos del Estado, Antonio Lopez 81, Madrid E-28026, Spain
[e] Institute of Coastal Research, GKSS Research Centre, Max-Planck-Strasse 1, 21052 Geesthacht, Germany
[f] D.G. Emergències, Conselleria d' Interior del Govern de les Illes Balears, Spain

Operational analysis of the circulation and shelf-slope exchanges in the continental margin of the northwestern Mediterranean

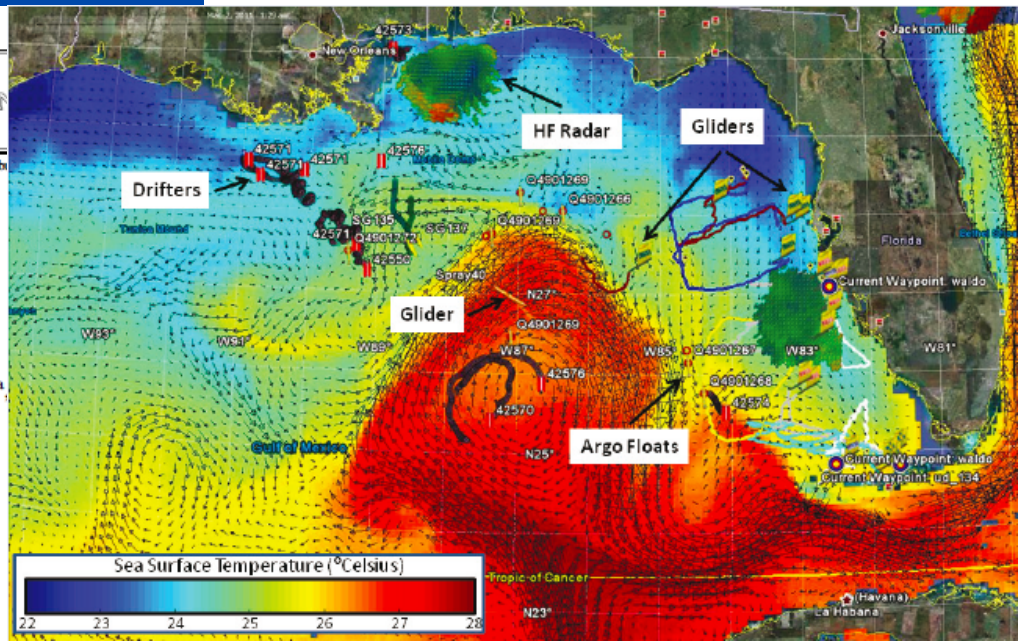
A. Jordi, G. Basterretxea, A. Orfila, and J. Tintoré
Ocean Science, 0000, 0001–8, 2006
IMEDEA (CSIC-UIB), Institut Mediterrani d'Estudis Avançats, Esporles, Illes Balears, Spain.

Abstract. In this paper, we present the results from a high horizontal resolution numerical simulation of the northwestern Mediterranean using a z-level, non-hydrostatic, primitive equation ocean model (DieCAST). The high resolution allows an accurate representation of the submarine canyons that presides in the region. The model is one-way coupled to a large scale model of the Mediterrenean Sea through open boundaries and uses the atmospheric forcing fields provided in terms of HIRLAM outputs by the Spanish National Institute of Meteorology. Results show that the model can successfully reproduce the complex general circulation characteristics of the area, including the modificacions induced by canyons in their vicinity and other phenomena observed such as instabilities and coastal trapped waves. The sea surface temperature is similar to satellite observations except that simulated temperatures are slightly warmer near the coast than observations and colder near the open boundaries. An important topic of this work is the computation of the shelf-slope exchanges, which result enough to renew shelf waters in a few months.

systems able to incorporate and analyze data in real time and by the progress in modelling and computing capabilities. An example of theses efforts in providing operational information is the European project MFSTEP (Mediterranean Forecasting System Toward Environmental Predictions) which is focused on the Mediterranean Sea.

Observational and modelling based analysis of the Mediterranean reveal a complex and variable circulation that is strongly affected by frontal dynamics through mesoscale features (Millot, 1999; Send et al., 1999; Demirov and Pinardi, 2002). This variability is the result of interactions at basin, sub-basin and local scales that results in intense mesoscale variability. In the Mediterranean Sea, mesoscale and even sub-mesoscale and local processes have profound impact on ocean dynamics and, consequently, in ocean geochemistry and ecosystems (e.g. Levy et al., 2001). The necessity of predictive tools resolving processes at these scales encompasses an integral view of the ocean system and the use of nested schemes that allow for downscaling from general to local conditions.

The northwestern Mediterranean Sea is one of the areas of



BOX 4.1
Ocean Infrastructure Needs: A Case Study from the *Deepwater Horizon* Oil Spill

The 2010 *Deepwater Horizon* oil spill in the Gulf of Mexico provides a example of how infrastructure from a diverse range of academic, federal, and commercial entities was required to respond to the disaster in a timely fashion. A notable feature is that no single sector (government, industry, or academia) had sufficient infrastructure to adequately handle the incident. Instead, assets from many sources and sectors were pooled for the effort. Response was limited to those sectors that had available resources that could be provided in a timely fashion, arguing for some infrastructure redundancy to be built into future inventories. The response to the oil spill was coordinated through the federal government, which reached out to external partners to develop an ocean observing capacity to improve field planning and forecast skill for the trajectory of the oil. The Navy provided ocean current forecasts informed by a variety of data sources. Satellite and high-frequency (HF) CODAR data provided by the federal government and universities were complemented by a wide range of in situ measurements. Ship-based measurements were supplemented by in situ drifters, underwater gliders, and remotely operated vehicles (figure, below). Data and findings were communicated through specialized web portals that were designed to facilitate collaboration between far-flung team members. For example, the glider network deployed to study the circulation represented assets from the U.S. government, industry, nonprofit groups, and universities throughout the country. The availability of web-based social networks allowed this distributed team to work together to define circulation patterns and better understand the potential dispersion of oil throughout the Gulf.

Govern de les Illes Balears

GOBIERNO DE ESPAÑA
MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

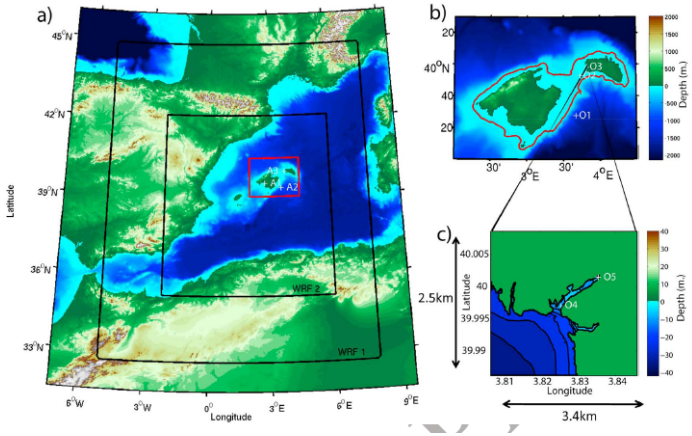
Modelling Facility; Meteotsunamis forecasting

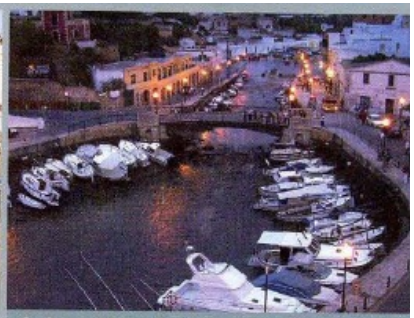
GEOPHYSICAL RESEARCH LETTERS, VOL. 38, LXXXXX, doi:10.1029/2011GL0

1 **Toward the predictability of meteotsunamis in the Balearic Sea**
2 **using regional nested atmosphere and ocean models**

3 Lionel Renault,[1] Guillermo Vizoso,[2] Agustin Jansá,[3] John Wilkin,[4] and Joaquin Tintore

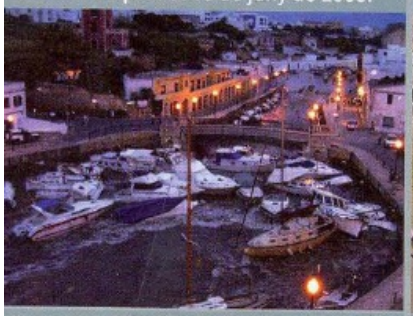
4 Received 4 March 2011; revised 29 March 2011; accepted 30 March 2011; published XX Month 2011.





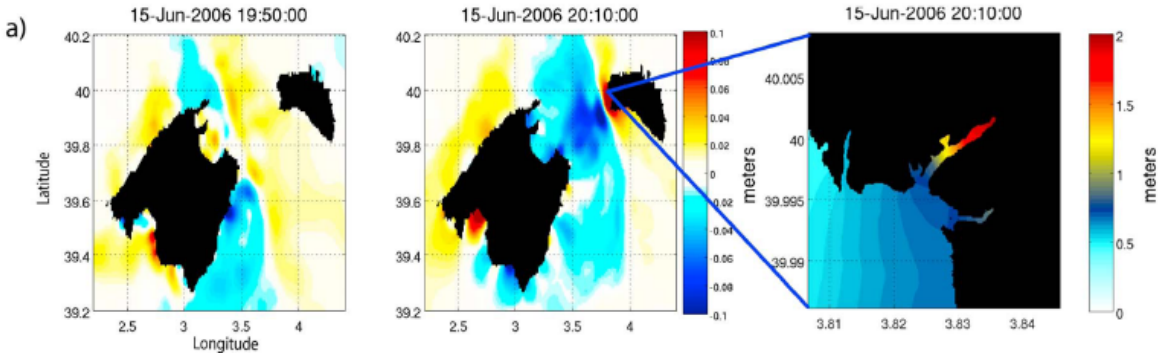
1. Vista del port el 15 de juny de 2006.

2. A les 21 h, el nivell de l'aigua era baix.



3. A les 21.06 h, l'aigua entra amb força.

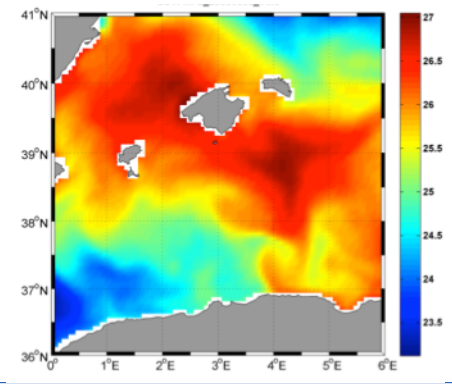
4. Destrosses el matí del dia 16 de juny.

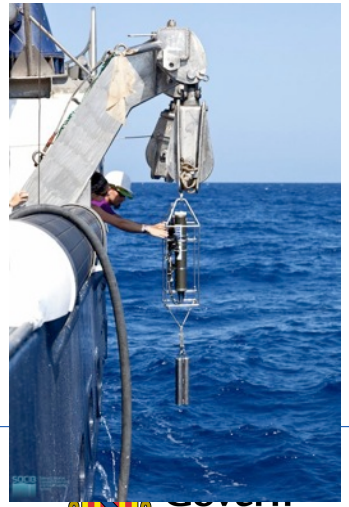


Bluefin Tuna Target Project: scientific problem solving for sustainable fisheries: at SOCIB since 2011

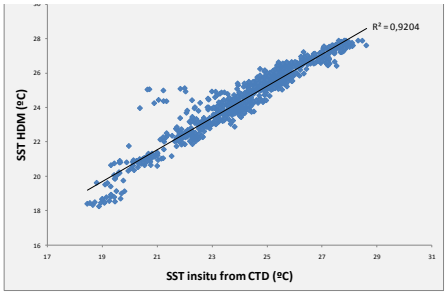
Initial Activities and First Results:

- Compilation of historical larvae data from various projects at IEO
- Link fishing data with ROMS, remote sensing and in situ hydrography
- Validate ROMS historical hydrographic data (SST and SSS) in the study area
- Development of an analysis framework and tools for modelling habitat-species relations.
- Development of field campaigns for studding specific key ecological questions
- Organize a inter-institutional working framework for data management and project flow control





ROMS derived SST vs CTD



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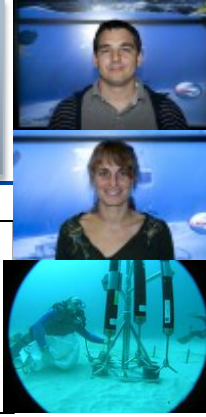
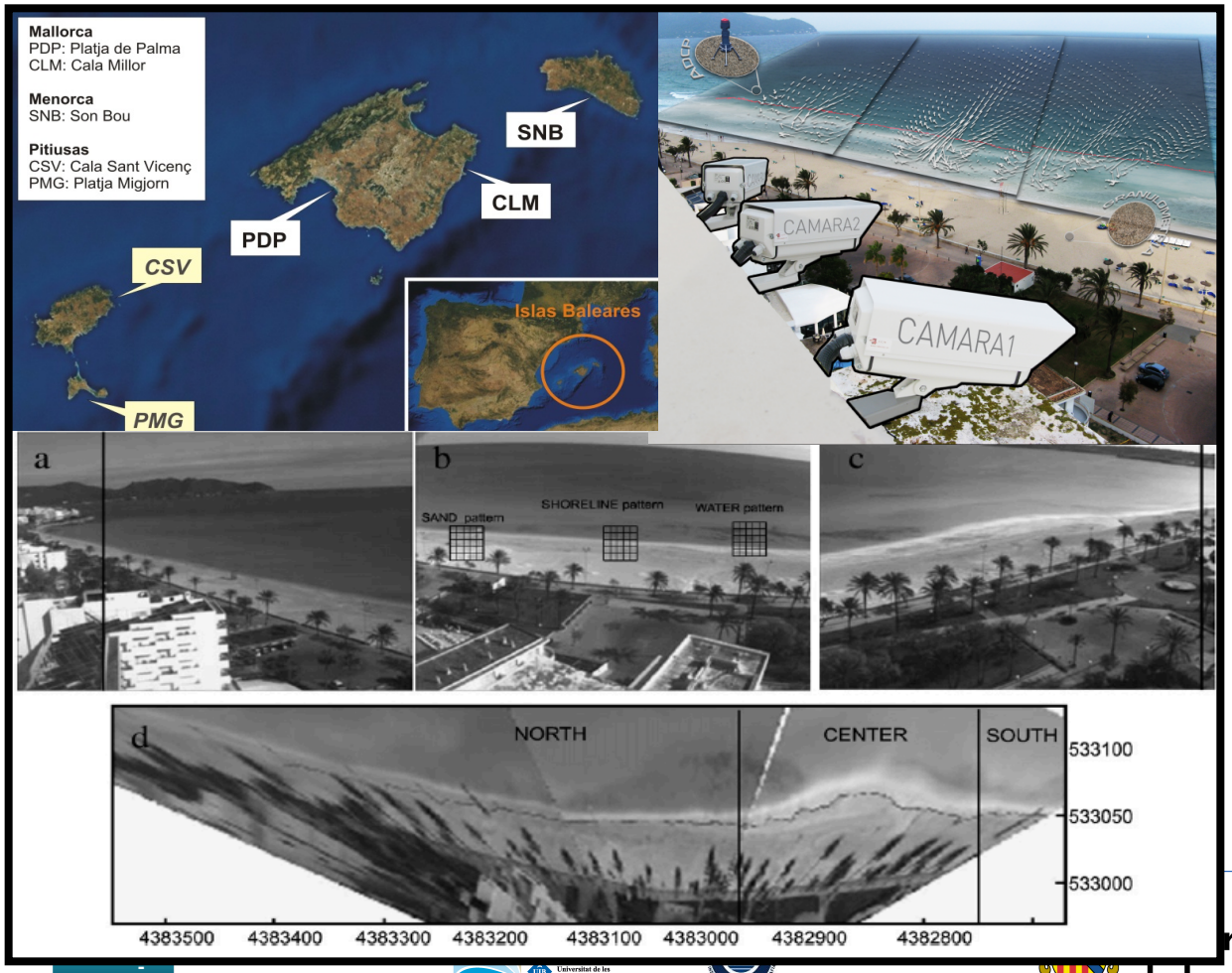
de les Illes Balears

GOBIERNO DE ESPAÑA MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

Beach Monitoring Facility



TMTBMF is a MODULAR SYSTEM designed to monitor continuously and in an autonomous way short and long term physical beach hydrological and morphological parameters.

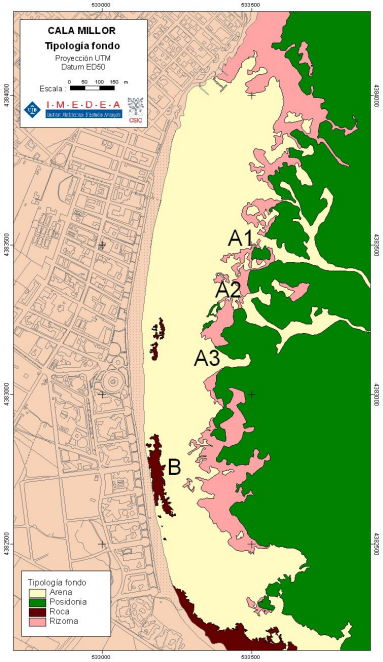


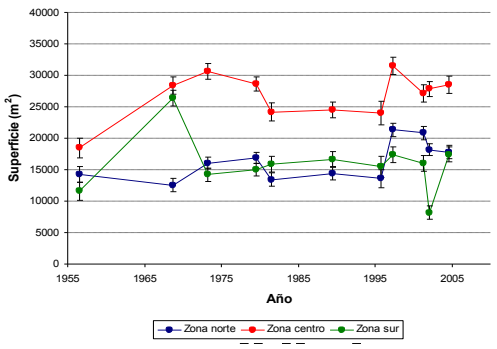
MOBIMS

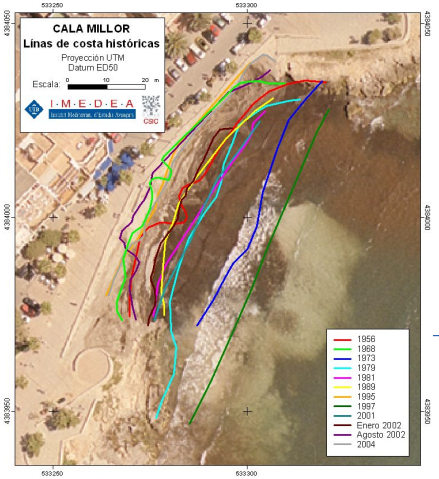
- Beach videomonitoring (SIRENA)
- Waves and currents (ADCPs)
- Bathymetry and beach profiles surveys
- Sediment parameters

PRODUCTS & SERVICES FOR BEACH MORPHODYNAMICS RESEARCH, BEACH SAFETY & COASTAL MANAGEMENT

Cala Millor NE Mallorca







Ocean & Coastal Management 52 (2009) 493–505

Contents lists available at ScienceDirect

Ocean & Coastal Management

journal homepage: www.elsevier.com/locate/ocecoaman

Integrated and interdisciplinary scientific approach to coastal management

Joaquín Tintoré [a], Raúl Medina [b], Lluís Gómez-Pujol [a,*], Alejandro Orfila [a], Guillermo Vizoso [a]

[a] IMEDEA (CSIC-UIB), Institut Mediterrani d'Estudis Avançats, Miquel Marquès 21, 07190 Esporles (Balearic Islands), Spain
[b] Instituto de Hidráulica Ambiental, IH Cantabria, Universidad de Cantabria, Av. Castros s/n, 39005 Santander, Spain

ARTICLE INFO

Article history:
Available online 7 August 2009

ABSTRACT

Coastal zones and beach management practices, regulatory decisions, and land use planning activities along coastal zones have historically been made with insufficient information concerning the dynamic coastal environment. In this study we address and integrate an interdisciplinary scientific approach to Coastal Management in a scenario where lack of this information has resulted in the alteration of the natural dune system of the beach of Cala Millor (Mallorca, Balearic Islands, Spain), and also in the perception of the beach retreat and in a parallel way, a risk for the tourism resources. In this work the detailed studies on beach morphodynamics have been developed as a basis for integrating proper beach management, beach natural dynamics and local users and economic agent interests. From this point of view a set of solutions are considered as the basis for a management policy that links beach science and beach use as a tourism resort resource.

We know that with today's knowledge, actions undertaken in the past would be done differently

(extreme storms Nov. 2001)

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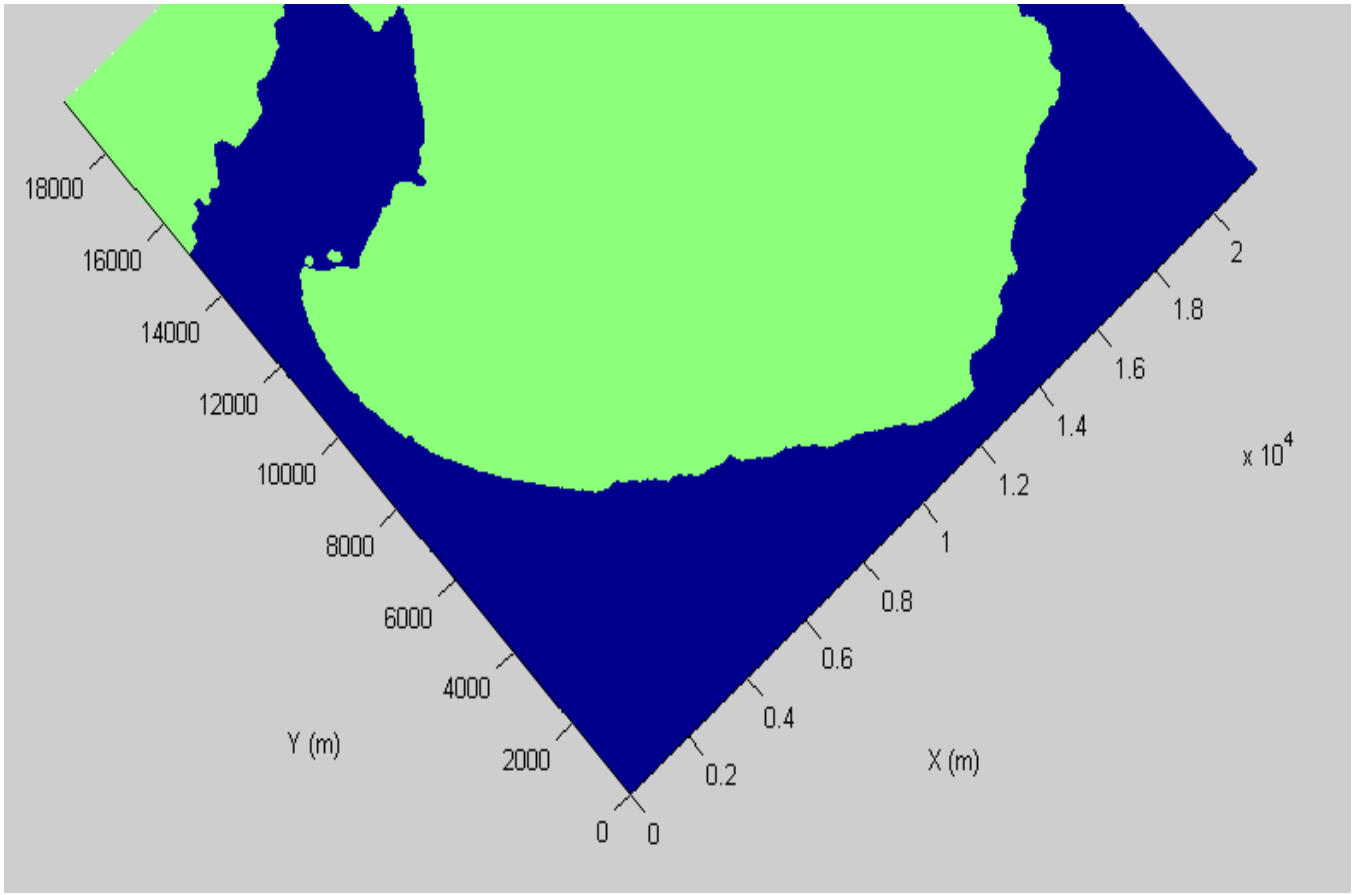
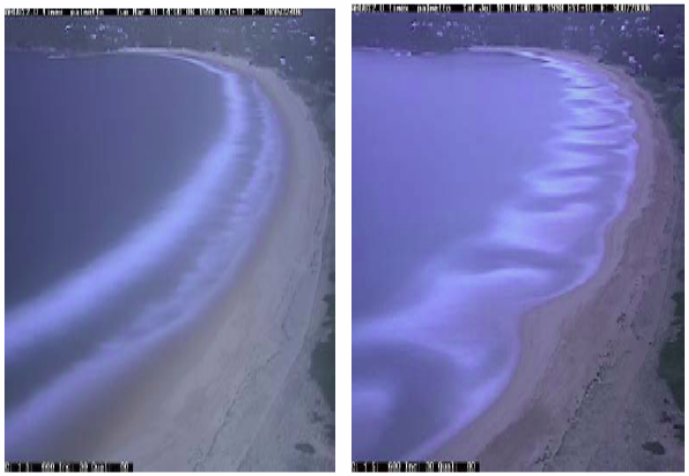
GOBIERNO DE ESPAÑA MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

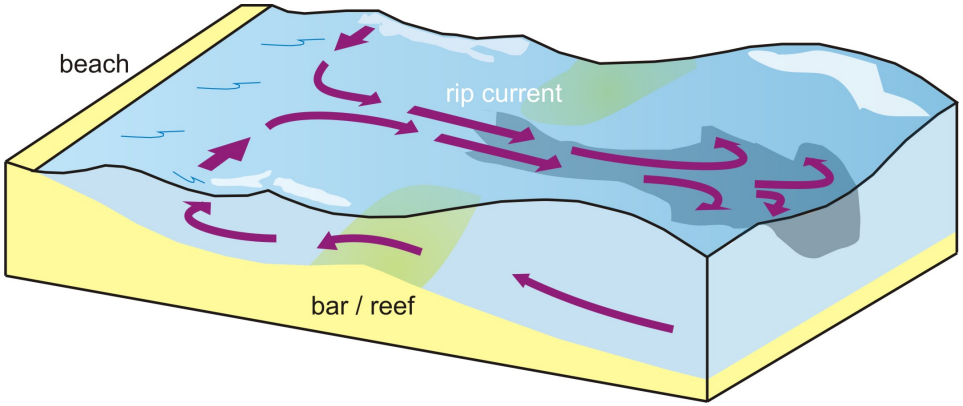
Alcudia Bay

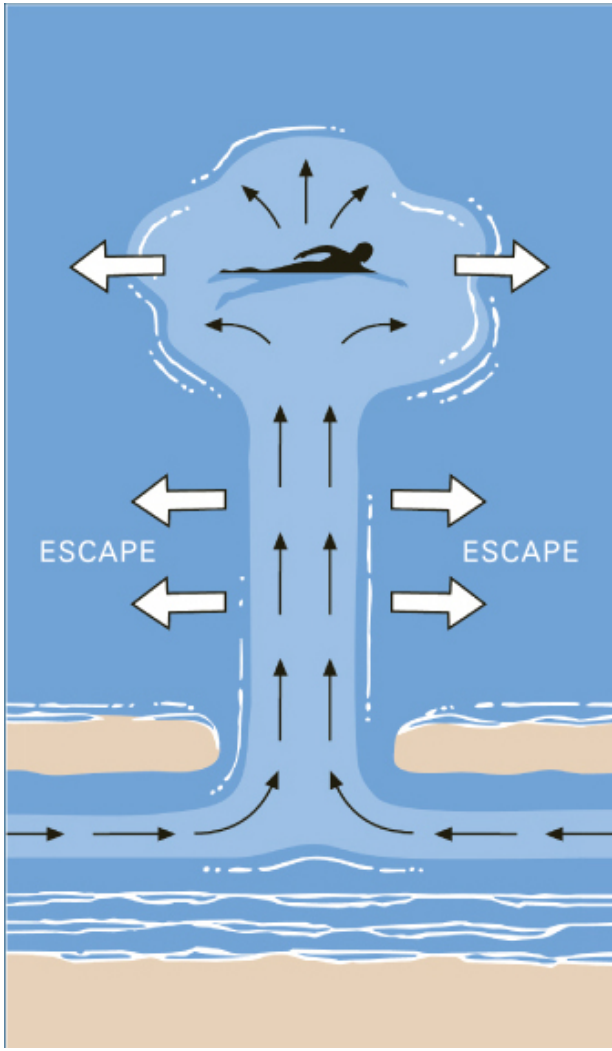


We know that with today's knowledge, actions undertaken in the past would be done differently. (extreme storms Nov. 2001)

Technology development – Beach Safety







Beach monitoring using cameras, breakers, rips, bathymetry changes, etc.

management policy and human erosion ✔

P. oceanica play an important role in many coastal processes…

Influence on sediment budget

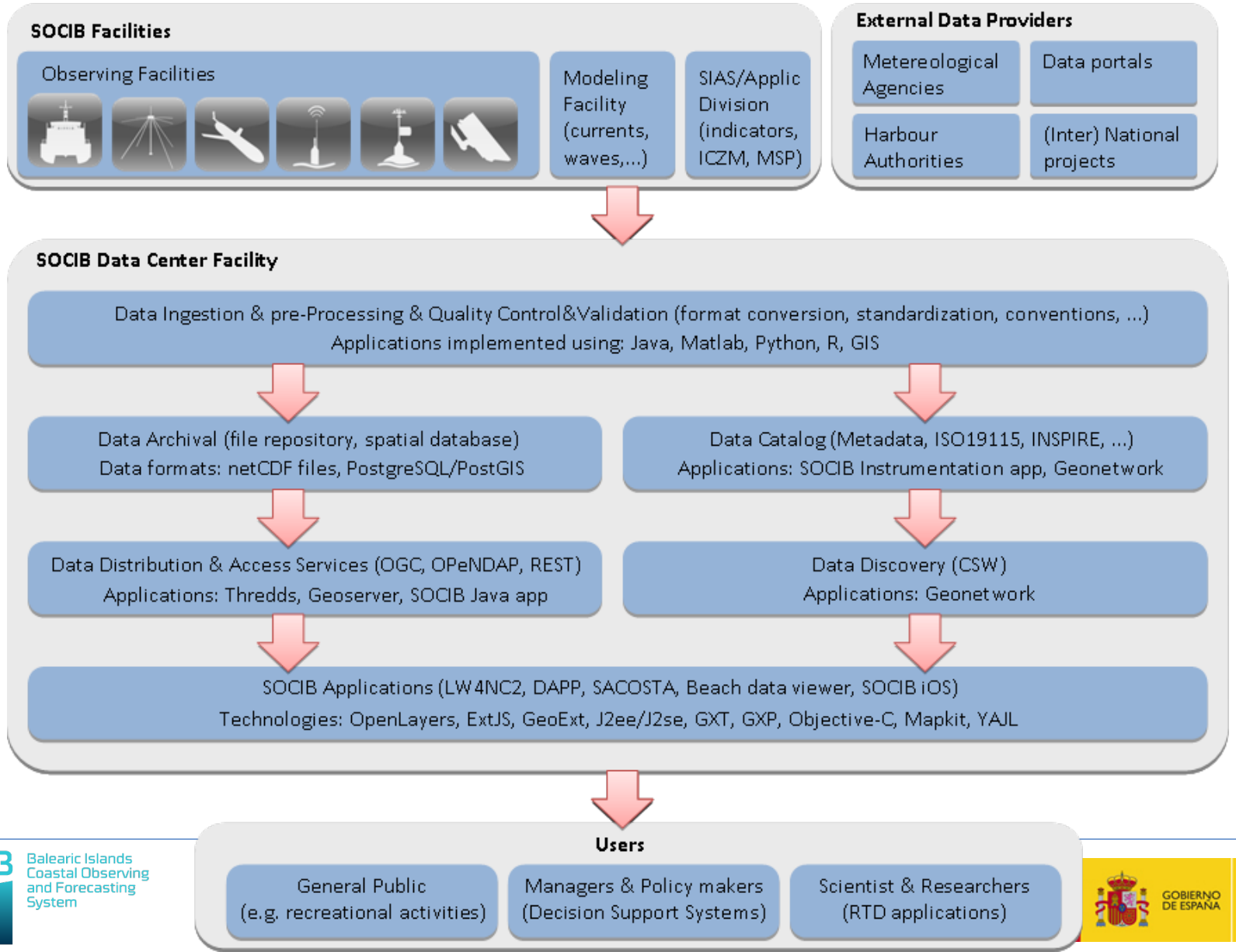
Factory of biogenic sediments ✔

Banquettes erosion protective role

Influence on beach profiled adjustment and wave attenuation (*reef effect*) ✔

???

Data Center: Life cicle data



APPLICATIONS

TECHNOLOGIES

netCDF

SOCIB API

USERS

- General public
- Researchers
- Technicians

Glider Educational Tool

http://followtheglider.com/en/

Applications Tourism

Sol Hoteles
MELIÃ HOTELS INTERNATIONAL

Be proud of your hotel!

We are pleased to inform you that this hotel contributes to beach conservation and science based coastal and ocean management. Your hotel collaborates with the Beach Monitoring Programme from SOCIB.

SOCIB Balearic Islands Coastal Observing and Forecasting System

Observation and real time data

Beach evolution

Son Bou - Cam 01: 19/03/2014 12:00

Beach overview

Son Bou - Cam 03: 19/03/2014 13:18

Beach information

Beach type: 2.5 km linear natural beach with dunes
Sediment type: medium to fine biogenic sands
Scientific interest: beachrocks, lagoon inlet, rip

Hotel weather station

Rain accumulation

0.24 mm

0.24 High **0.24** Low

Swimming conditions

No data received

More information

Forecast

Weather forecast

Light rain on Sunday and Monday; temperatures peaking at 19° on Saturday.

Today — Windy in the morning.

Temp.	Wind	Humidity	Pressure
17.9 °C 13.7 °C	25.0 km/h (N)	76 %	1022.0 hPa

Thursday — Mostly cloudy throughout the day.

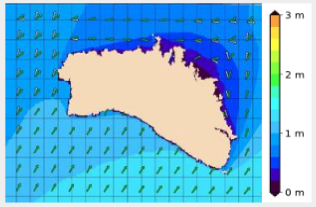
Temp.	Wind	Humidity	Pressure
18.8 °C 14.1 °C	6.4 km/h (NW)	82 %	1020.7 hPa

Friday — Clear throughout the day.

Temp.	Wind	Humidity	Pressure
18.8 °C 14.4 °C	5.8 km/h (S)	81 %	1019.6 hPa

Powered by Forecast.io

Waves forecast



Waves at 21/03/2014 11:00

SOCIB Balearic Islands Coastal Observing and Forecasting System

Govern de les Illes Balears

Puertos del Estado

Wed Mar 19 2014

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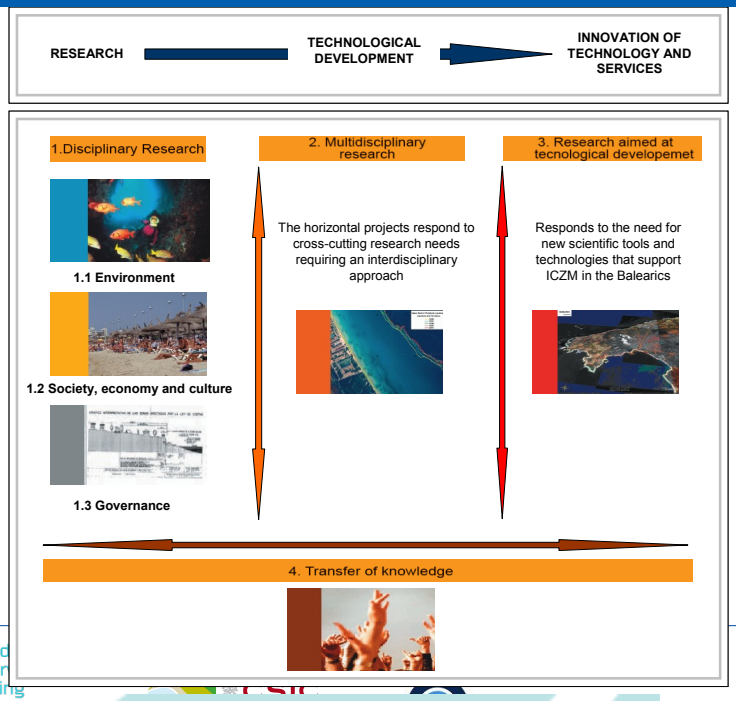
MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

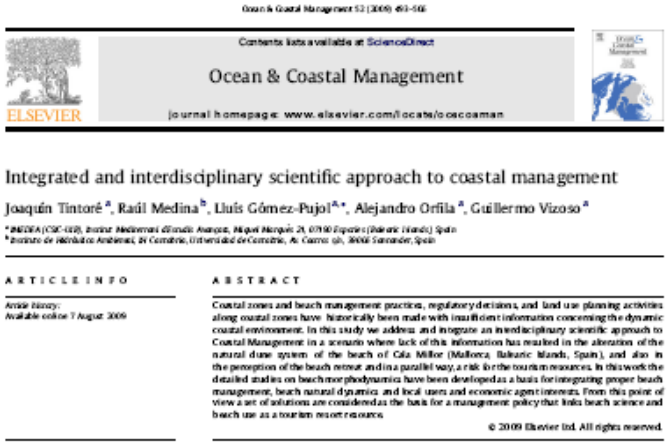
SOCIB Applications and Strategic Issues Society Division

"Bridging the science-policy gap is arguably the biggest current challenge to achieving sustainability" (Lubchenco and Sutley, 2010, Science).



Science based management technologies developed, driven by interest from Balearic Islands (gov&soc).

- Beach erosion – extreme events in 2001
- ICZM Project 2005-2008: 35 projects - **Example:** Sustainability Indicators – together with CES Council. -
- ICOM, MSP 2010


Ocean & Coastal Management

Integrated and interdisciplinary scientific approach to coastal management

Joaquín Tintoré, Raúl Medina, Lluís Gómez-Pujol, Alejandro Orfila, Guillermo Vizoso

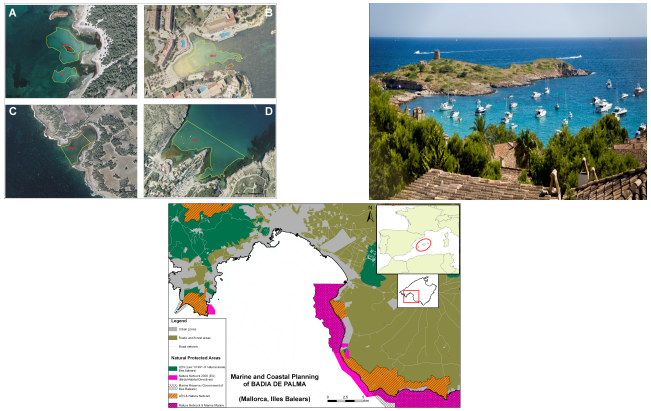
ARTICLE INFO

ABSTRACT

SOCIB Balearic Island Coastal Obser and Forecasting System

www.costabalearsostenible.es

SOCIB Applications and Strategic Issues Society Division



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[a] IMEDEA (CSIC-UIB), Institut Mediterrani d'Estudis Avançats, Miquel Marquès 21, 07190 Esporles (Balearic Islands) Spain
[b] Instituto de Hidráulica Ambiental, IH Cantabria, Universidad de Cantabria, Av. Castros s/n, 39005 Santander, Spain

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Marine Policy 34 (2010) 772–781

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

Balancing science and society through establishing indicators for integrated coastal zone management in the Balearic Islands

A. Diedrich [a,*], J. Tintoré [a], F. Navinés [b]

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[b] CES, Economic and Social Council of the Balearic Islands, Palau Reial, 19, 07001 Palma, Mallorca, Balearic Islands, Spain

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Keywords:
Indicators
ICZM
Science-policy gap
Balearic Islands
Spain

ABSTRACT

This paper explores the process by which indicators may be developed as tools for communicating science to decision-makers using the participatory approach demonstrated by the Balearic Indicators Project. This initiative reflects a series of compromises considered necessary to achieve the objective of generating an indicator system that is scientifically viable, comparative internationally yet locally relevant, and to facilitate its implementation. The article highlights questions regarding the utility of science for addressing current global issues related to sustainability and why science often fails to promote change at the societal level.

SYSTEM OF INDICATORS

for Integrated Coastal Zone Management in the Balearic Islands

Official Opinion 5/2007 of the Economic and Social Council of the Balearic Islands

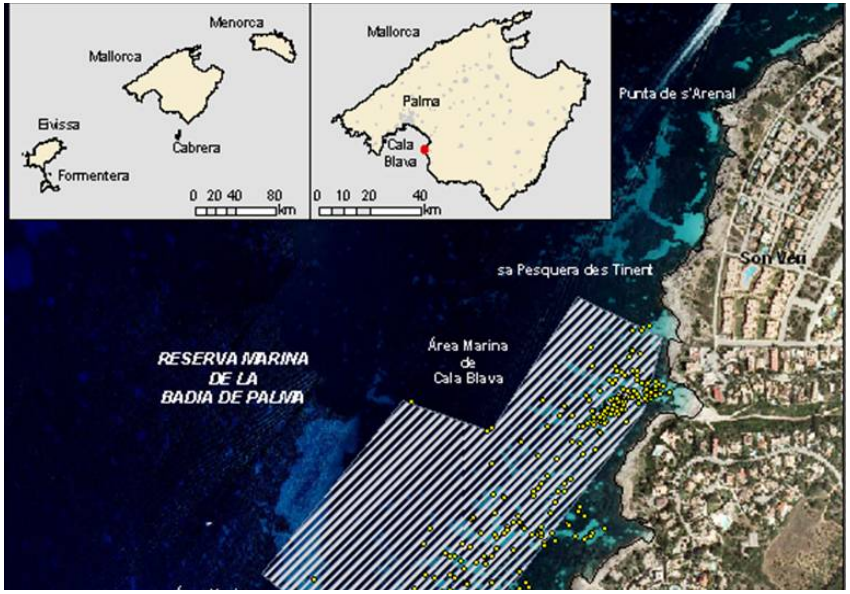
SOCIB Balearic Islands Coastal Observing and Forecasting System

CSIC Instituto Mediterráneo de Estudios Avanzados — Universitat de les Illes Balears

Govern de les Illes Balears

Gobierno de España — Ministerio de Economía y Competitividad

SOCIO-ENVIRONMENTAL STUDIES FOR DETERMINATION CARRYNG CAPACITY IN BEACHES



Coastal Management, 40:301–311, 2012

ISSN: 0892-0753 print / 1521-0421 online
DOI: 10.1080/08920753.2012.677636

Taylor & Francis
Taylor & Francis Group

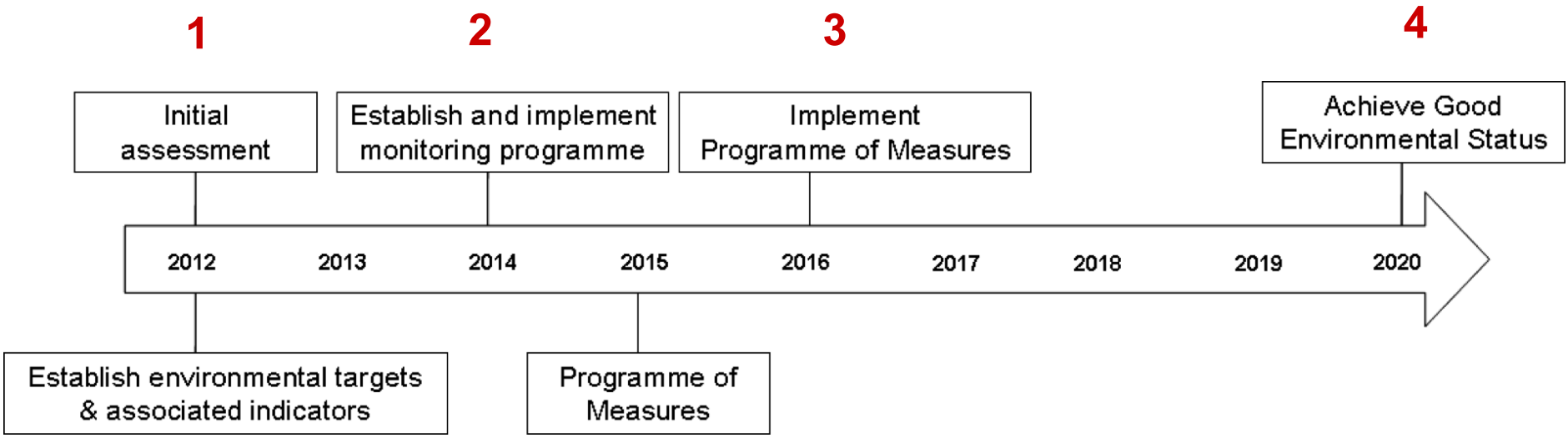
Multi-Method Approach to Exploring Social–Ecological Dimensions in a Mediterranean Suburban Beach Setting

AMY DIEDRICH[1] AND JOAQUÍN TINTORÉ[1,2]

[1]SOCIB (Balearic Islands Coastal Observing and Forecasting System)
Balearic Islands, Spain
[2]IMEDEA (CSIC-UIB) (Mediterranean Institute of Advanced Studies)
Balearic Islands, Spain

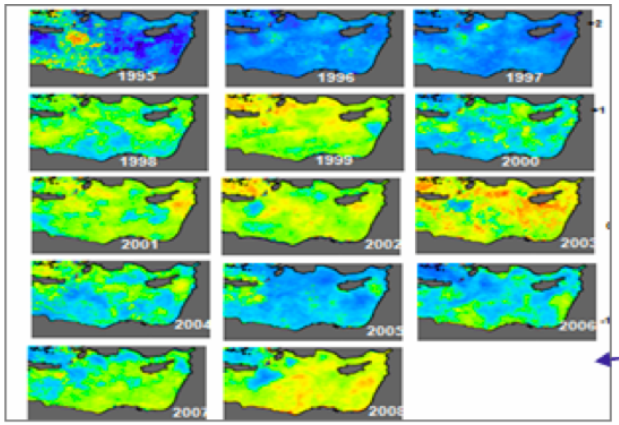
SOCIB (contribution to IMP, e.g., MSFD), PERSEUS and Know Seas EU Projects

- **<u>MSFD A KEY SOCIETAL DRIVER:</u>** requires (1) An Initial Assessment present status to guarantee achievement of (2) Good Environmental Status by means of actions that include (3) Monitoring Programs and detailed (4) Programs of management measures.

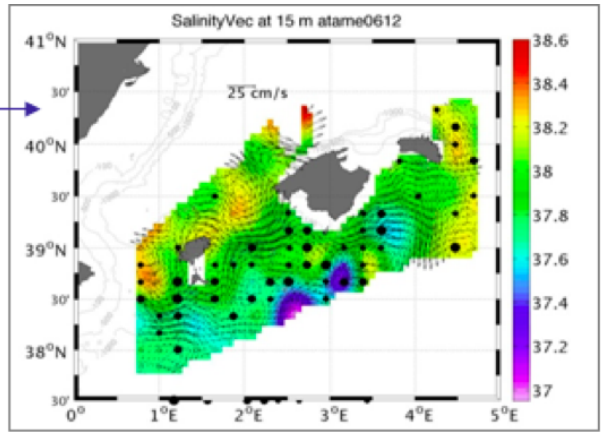


SOCIB (contribution to IMP, e.g., MSFD), PERSEUS …

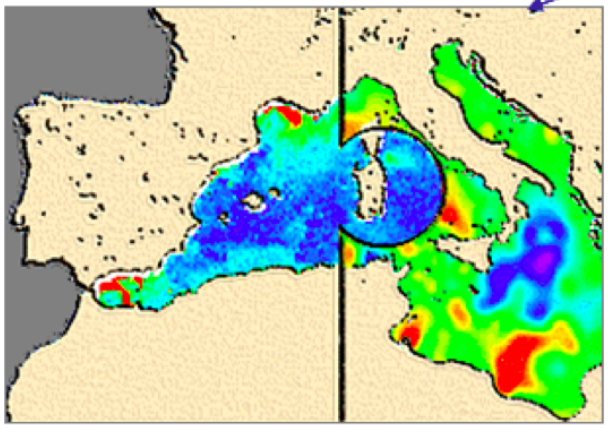
SOCIB and MRI role; by Integrating different types of monitoring platforms at different scales, and by this, providing data and tools, contribute to establish MSFD pressures & states indicators.



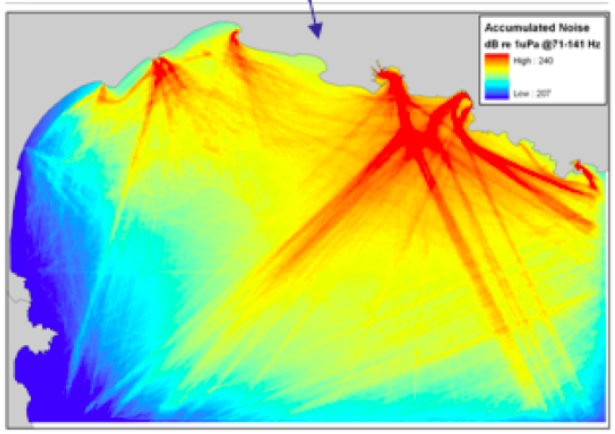
SST to assess hydrography



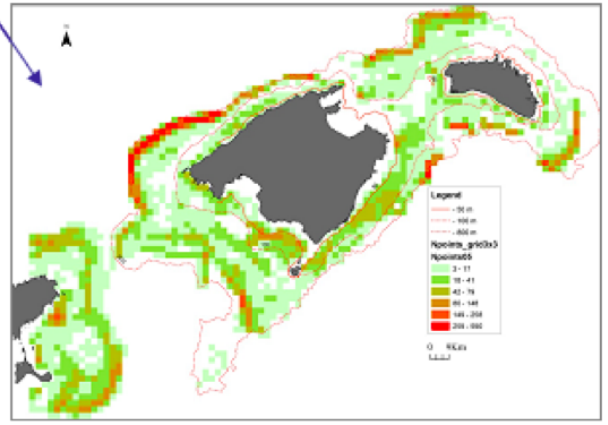
Biological models to assess biodiversity



Ocean color to assess eutrophication



AIS to assess underwater noise



VMS to monitor fishing pressure

Task 3.3 New Observing Components
Subtask 3.3.3 Fishing Fleet Vessel Monitoring System (HCMR)

Three VMS areas: Baleares, Adriatic, Aegean

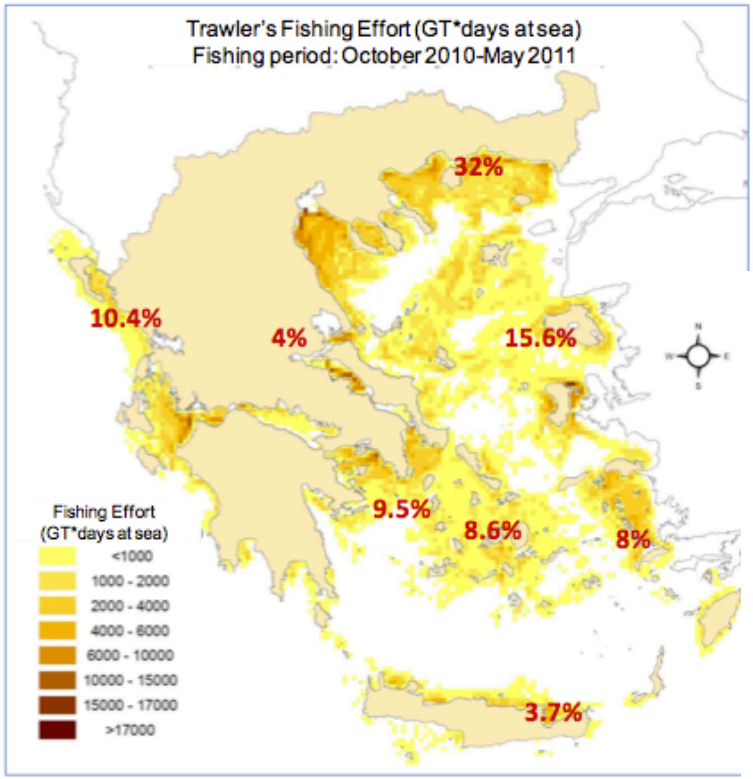


Figure 1. Total fishing effort (GT*days at sea) of trawlers in the period October 2010-May20

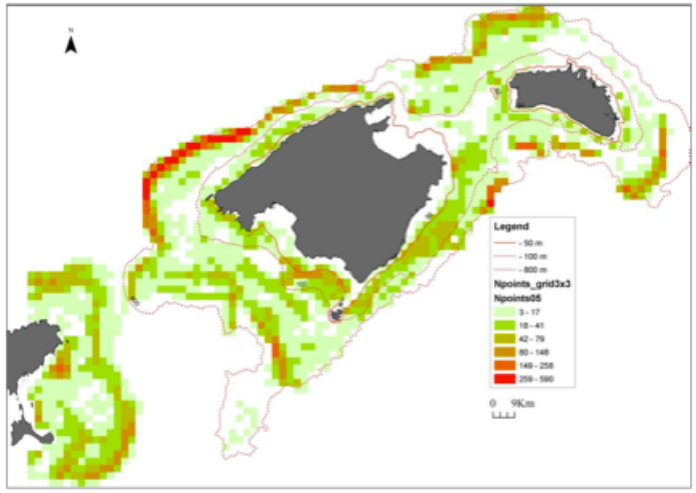


Fig. 3. Density of VMS records of trawlers around the Balearic Islands in 2005, expressed as the number of points in grids of 3x3 km.

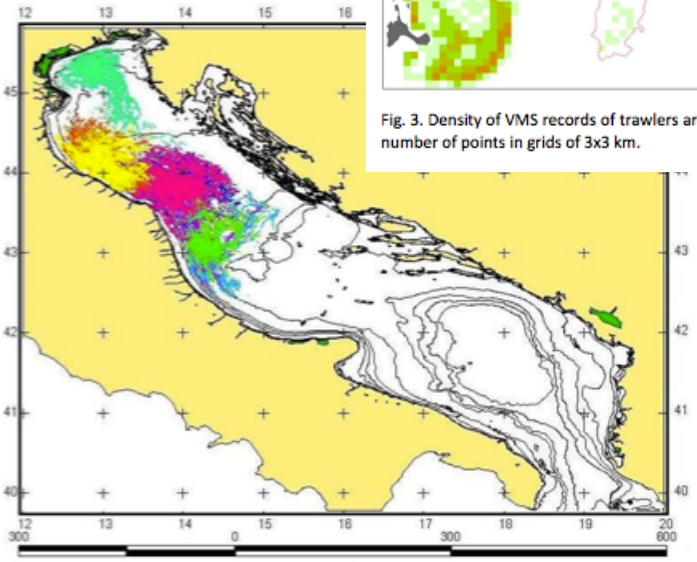


Figure 2: Record of routes of vessels monitored, collected between 2003 and 2008.

OUTLINE

1. **The oceans and coastal areas, present state and variability. Lessons from last decade.**
2. **Technology changes and Paradigm Change in Ocean Observation**
3. **SOCIB a new MRI in the West Mediterranean; Science, Technology and Society. Nearshore / open Ocean. Multi-platform integrated approach.**
4. **Innovation and Blue-Growth, the Challenges, More listening to society: real sustainability implies solid multi-disciplinary work involving social sciences, governance: …towards bridging the "science-policy gap".**

Innovation, Blue Growth and Marine Infrastructures

- Back to Gliders: innovation process, incubation time
- Innovation and changes in science-technology and society structures in Europe
  - Collaborative, multidisciplinary teams. Long term objectives. Creative champions among funding agencies and investor organizations.
  - Structural changes needed for this to take place in Europe.
- Critical mass; from science, with technology and to society…
- Data Availability:
  - New Observing Systems & Data Availability → Key for new JOBS!!! (Ocean innovation and Blue Growth, EC Communication. Marine Knowledge 2020: europa.eu/rapid/press-re…

Innovation in oceanographic instrumentation

3 elements:

- Oceans complexity imply and drive a need for improvement of instrumental capacities

- The innovation process, complexity and incubation time:

  . Incubation time: 15-30 years (computer mousse, 30 years). Gliders 10 years. WHY?

- The key to success

Innovation in Oceanographic Instrumentation

BY THOMAS B. CURTIN AND EDWARD O. BELCHER

INTRODUCTION

The tools of oceanography include instruments that measure properties of the ocean and models that provide continuous estimates of its state. Major improvements in tool capabilities lead to leaps in understanding, and this increased knowledge has many practical benefits. Advances in tool capabilities are sometimes viewed as an objective of basic research, a viewpoint reflected in the basic research funding category of "science and technology" (S&T).

The complexities of and incubation times for advancing instrumentation are often not fully appreciated, resulting in unrealistic expectations and discontinuous support. Greater understanding of the process of innovative instrument development can contribute to sustaining it. Innovation can be incremental or radical depending on performance gains (Utterback, 1994), stimulated or suppressed depending on institutional factors (Van de Ven, 1989; Office of Technology Assessment, 1995), and sustaining or disruptive depending on value propositions (Christensen, 1997). For example, going from a Nansen to a Niskin bottle was an incremental innovation, whereas going from bottle casts to CTD profiles was a radical innovation. Moored current meters incrementally advanced from film recording of gauges, to mechanically digitized signals on reel-to-reel tape, to solid-state analog, to digital conversion and memory. Radical innovation of current-field measurement came with the acoustic Doppler current profiler.

In large organizations, stimulated innovation often occurs in research departments, particularly when the projects have champions: "the new idea either finds a champion or dies" (Schon, 1963). In other parts of the same organization, innovation may be suppressed by the costs associated with re-integrating a system and minimal perceived competition. The incubation time of the computer mouse from inception to wide use was 30 years. In oceanographic observation, where synoptic coverage is an objective, a sustaining innovation would be a sampling platform with improved propulsion that doubles its speed. A disruptive innovation would be a new platform with much *slower* speed, but with much longer duration and a low enough cost to be deployed in great numbers. Here, we will focus on radical, stimulated, disruptive innovation that involves both science and engineering.

To motivate continued investment in basic research, the histories of many radical innovations, ranging from the transistor to radar to the Internet, have been documented (Bacher, 1959; Hetrick, 1959; Becker, 1980; Hove and Gowen, 1979; Allison, 1985; Abbate, 2000. The Defense Acquisition History Team at the US Army Center of Military History is also preparing a document on this subject.). These cases clearly demonstrate that "rapid" innovation in

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(Curtin and Belcher, TOS, 2008)

The innovation process (for advancing instrumentation)

3 key decision centres:

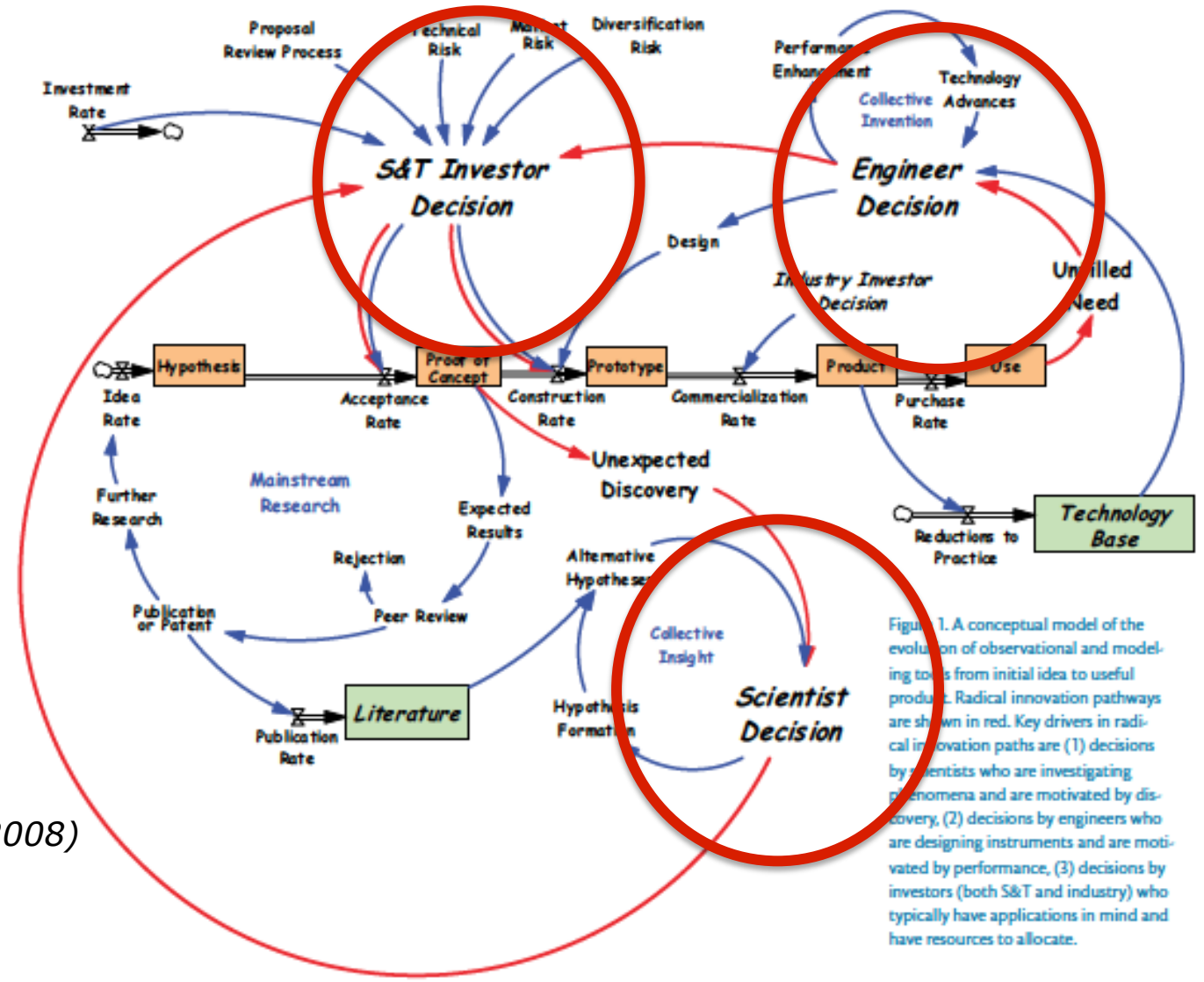


Figure 1. A conceptual model of the evolution of observational and modeling tools from initial idea to useful product. Radical innovation pathways are shown in red. Key drivers in radical innovation paths are (1) decisions by scientists who are investigating phenomena and are motivated by discovery, (2) decisions by engineers who are designing instruments and are motivated by performance, (3) decisions by investors (both S&T and industry) who typically have applications in mind and have resources to allocate.

(Curtin and Belcher, TOS, 2008)

The key to success for radical innovation in oceanographic instrumentation

1. Visionary leadership
2. Close coupling between science and engineering
3. A coherent investment strategy based on distributed, coordinated resources
4. Effective processes for communication, feedback, and contingency planning.
5. Incentive to assume responsibility for risky instrumentation development projects without undue career jeopardy.

In summary: work in collaborative, multidisciplinary teams, focused on long term objectives (while producing short-term success), and find creative champions among funding agencies and investor organizations.

SOCIB and Coastal Observatories / Marine Research Infrastructures

Economic benefits derived from achieving objectives

Societal objectives
- advance basic knowledge
- manage natural hazards
- preserve environment
- etc...

Information/knowledge
- understanding of the ocean
- climate projections
- weather and storm forecasts
- ecosystem response to forcing
- etc...

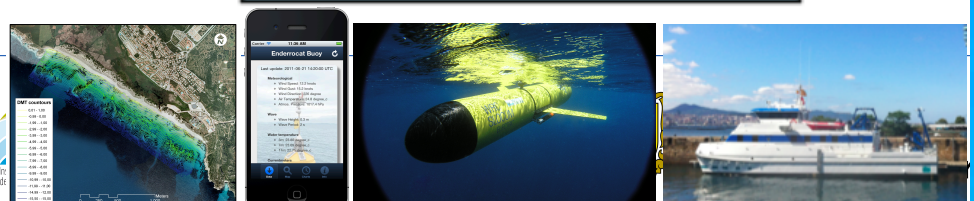
Ocean research
- Models (research and operational)
- Answers to science questions
- Data
- Research activities

Monetary investment ocean research and infrastructure funding

Infrastructure
- platforms
- sensors
- models
- data sets
- data management facilities
- enabling organizations
- people

Committee on an Ocean Infrastructure: Strategy for U.S. Ocean Research in 2030. NRC (2011)

SOCIB Balearic Islands Coastal Observing and Forecasting System



Summary and challenges

1. Technology changes drive major paradigm change ocean and coastal observation
2. Implies important changes in science and management
3. Use and integrate new technologies to characterise coastal and ocean variability: select key control sections for routine monitoring 'choke or control points'
4. Work in collaborative, multidisciplinary teams
5. Increase science-society interactions … role of social sciences key…

Question: Is the science/scientific system adequate for this change ?

Marine litter-Tourism; SUSTAINABILITY…. "Strong science for wise decision".