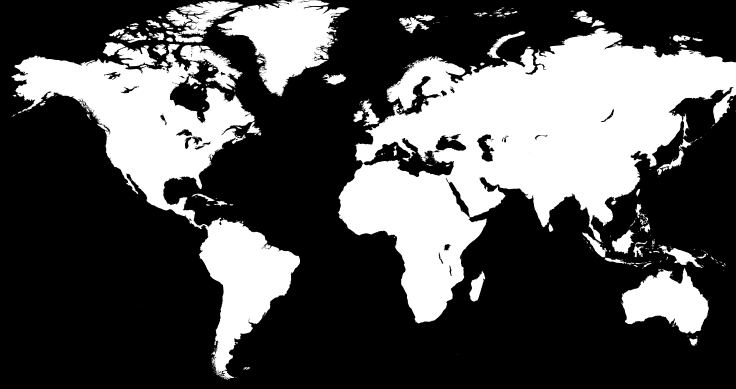
International Innovation

Disseminating science, research and technology



SOCIB: Balearic Islands Coastal Observing and Forecasting System

| 2013 |

A solid foundation for multi-platform oceanic research

Experts at the **Balearic Islands Coastal Observing and Monitoring System** are revolutionising our understanding of key questions on ocean processes, climatic change and ecosystem variability

IN 2008 THE International Union for Conservation of Nature recognised the Mediterranean as one of the global biodiversity hotspots under threat. There is no doubt that the diverse array of marine species and ecosystems in this area are facing major changes as a result of changing environments and climates. A significant level of research effort is being directed at understanding what species and ecosystems are present in the Mediterranean, as well as how climate change is likely to impact on this biodiversity. A unique observing and forecasting system has been set up in the Baleraric Islands with science-, technology- and society-driven objectives to support marine research in a novel way. The Balearic Islands Coastal Observing and Forecasting System (SOCIB) is part of a new group of marine research infrastructures which are currently establishing innovative methods of encouraging international cooperation in oceanography. Dr Joaquín Tintoré, Permanent Research Professor at the Spanish Council for Scientific Research and Director of SOCIB, is enthusiastic about their prospects: "This work will lead to major scientific breakthroughs, innovations in oceanographic instrumentation and create new pathways down which science-based coastal and ocean management can develop".

BUILDING ON TECHNOLOGICAL ADVANCES

Historically, developing an understanding of the oceans and coasts was based on data gathered from single observation platforms (ships). Today, a whole host of platforms are available to researchers, including satellites, gliders and buoys. The advent of advanced computer technologies has meant that marine observation systems have very rapidly become multiplatform and integrated. SOCIB takes full advantage of all available observation techniques to deliver cutting-edge marine information. Recently, only small teams of researchers were able to access observation data, however this information is now directly available to a wide range of global stakeholders in near real-time. As Tintoré explains: "Today, the data is quality controlled and made available in quasi real-time, which means all scientists and other stakeholders can have direct access to this information. This significantly increased accessibility is having a major impact upon the ocean observing community". The real benefit that comes with the development of these new tools is that far more effective knowledge-based decision support is provided for oceans and coastal management.

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AN ARRAY OF TECHNICAL SUPPORT AND FACILITIES

The SOCIB team has developed a number of observing facilities to support delivery of their monitoring programme. Seven major new Observing Facilities are now operational from the open ocean waters to the Balearic beaches, including open ocean moorings, a technologically advanced catamaran, a long-range high-frequency radar system in the Ibiza channel, gliders, coastal moorings, Argo profilers, surface drifters and nearshore monitoring system of beaches. These facilities

24 METRES LOA RESEARCH VESSEL SOCIB

GLIDER DEPLOYMENT

deliver a variety of data, such as surface currents, biogeochemical measurements, water temperature, freshwater storage and transport, hydrodynamics and sediment transport. Backup for all the systems is provided by a highly skilled Engineering and Technology Development Division, who provide the technical 'backbone' for all the application, development and testing of both existing technologies and those future systems currently in planning.

The SOCIB Modelling and Forecasting facility offer a range of modelling to help advance the understanding of the processes that are taking place within the western Mediterranean. This includes circulation models, ecosystem models, wave models and satellite data to support the development of coastal models. The research group is improving knowledge on the evolution or adaption of the oceanic and coastal processes under a range of scenarios, including the latest scenarios provided by the Intergovernmental Panel on Climate Change. The Modelling subsystem is presently running an operational model for ocean currents, which is nested to the wider MOON/MFS system. They have also set up a wave operational system, established together with Puertos del Estado, for the southern coast of Mallorca and the Palma harbour entrance. In addition, a pre-operational meteo-tsunami system is in operation to support the Balearic harbours authority when strong sea level oscillations occur, mostly at Ciutadella harbour in Menorca.

The Data Center is at the very core of SOCIB; work developing and implementing a general data management system to guarantee international standards, quality assurance and interoperability are core outputs. This Center is performing specific developments and tools for the different facilities when required, as Tintoré highlights: "Its main functions and capabilities range from data reception to its distribution and visualisation, via web services and THREDDS/ OPeNDAP protocols, passing through processing, quality control, documentation, standardisation, archiving and data discovery". The facility is responsible for all cataloguing and distribution of the data generated by SOCIB observations and forecasting. Strict quality procedures are applied to all data and across the whole data lifecycle. This is a complex undertaking and requires that a wide-range of international data initiatives, standards and protocols are adhered to. The Data Center develops a number of its own tools to handle such a large amount of scientific data which is being accessed by a wide range of end-users. The SOCIB Design phased spanned from 2009-10 and has been followed by the Construction phase that ends in 2012. Simultaneously, the different facilities have started to provide operational data and modelling services that are available through the SOCIB THREDDS catalogue in NetCDF format.

CONTRIBUTING TO A WIDER OBSERVATION COMMUNITY

From Tintoré's perspective their role is to support the best research and management decisions possible by delivering high-quality data. They reach out to stakeholders in a number of ways. A website has been developed which offers visitors access to a range of material as well as information on the latest news and communications from SOCIB contributors. Workshops are regularly organised to help share in new tools and processes being developed at SOCIB. One of the latest was held on marine data interoperability, sensor web enablement services and the implementation of Open Geospatial Consortium standards. Participants attended from a number of research institutions and marine observatories in Spain and the US. Seminars are also held to discuss some of the most current research and the latest developments in oceanography, as well as new technologies that are becoming available. The SOCIB consortium participates annually in several international meetings where the progress in expertise and tools are presented and shared with other researchers, scientists and stakeholders. Clearly, the range of work this group is undertaking places them in a very strong position to support the future of global oceanographic research.

1,000 M DEPTH PRESSURE CHAMBER TESTING

INTELLIGENCE

SOCIB

BALEARIC ISLANDS COASTAL OBSERVING AND FORECASTING SYSTEM

OBJECTIVES

A multiplatform distributed and integrated system that provides streams of oceanographic data and modelling services to support operational oceanography in a European and international framework, therefore also contributing to the needs of marine and coastal research in a global change context.

PARTNERS

MINECO • CSIC • IEO • Balearic Islands Government

FUNDING

Balearic Islands Government

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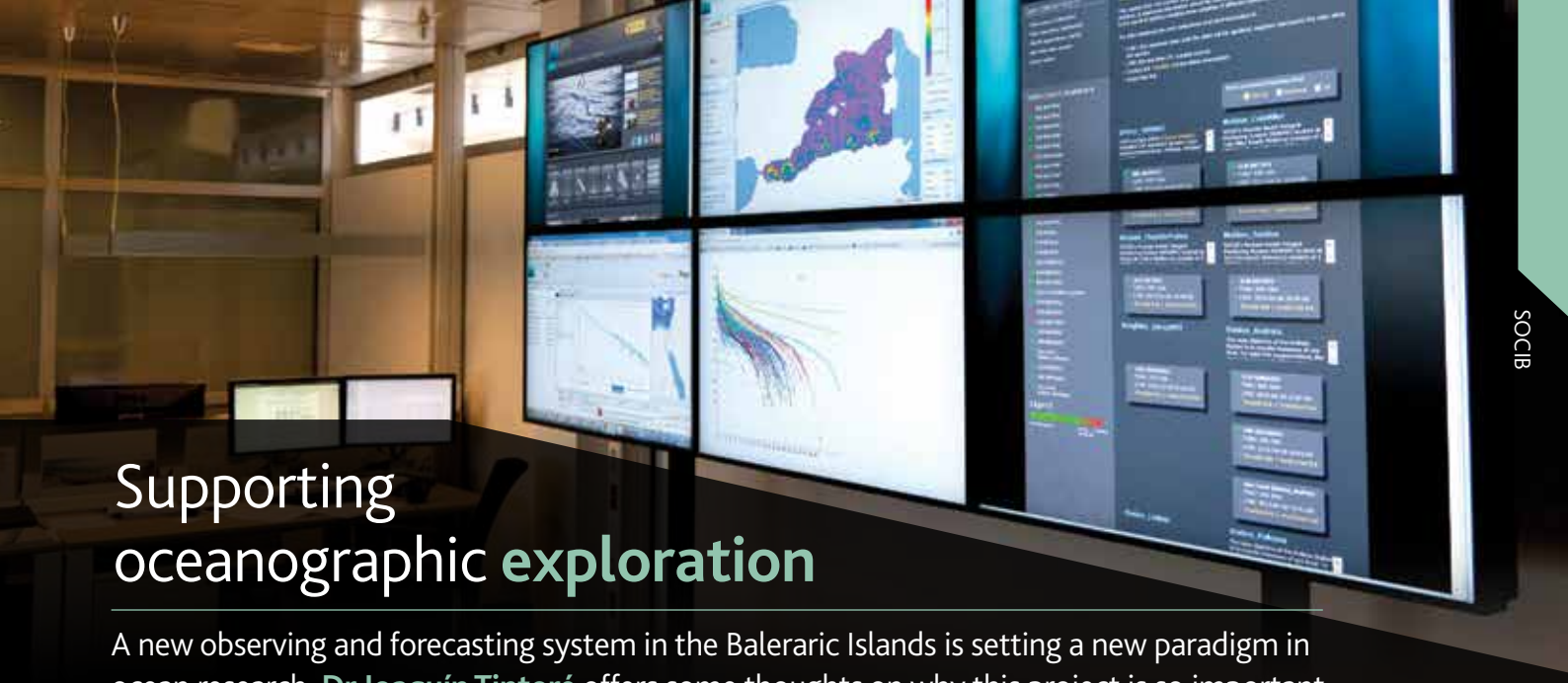
JOAQUÍN TINTORÉ is a Doctor of Physical Oceanography and Professor at CSIC at IMEDEA (CSIC-UIB) where he is Head of the Department of Marine Technologies and Operational Oceanography. Since December 2008 he has held the role of Director of SOCIB, a new Ocean Observing and Forecasting System based in the Balearic Islands. SOCIB is a facility of facilities and is part of the Large Scale Infrastructure Programme from the Spanish Ministry of Economy and Competitiveness.

SOCIB Balearic Islands Coastal Observing and Forecasting System

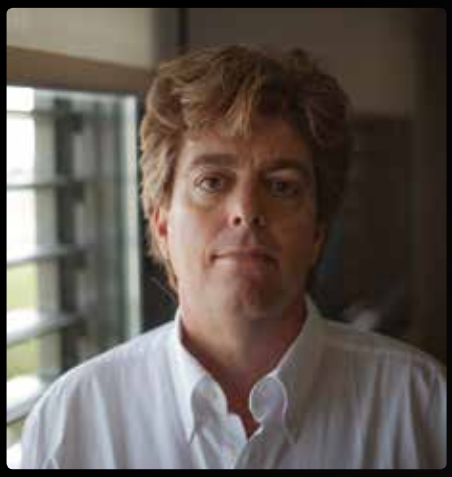
GOBIERNO DE ESPAÑA · MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

Govern de les Illes Balears



Supporting oceanographic **exploration**

A new observing and forecasting system in the Baleraric Islands is setting a new paradigm in ocean research. **Dr Joaquín Tintoré** offers some thoughts on why this project is so important



To begin, what is the Balearic Islands Coastal Observing and Forecasting System (SOCIB) and what are the key objectives of the project?

SOCIB is an Ocean Observing and Forecasting System located in the Balearic Islands in the Mediterranean. It is a new facility which is a multiplatform distributed and integrated system that provides streams of oceanographic data and modelling services to support operational oceanography in a European and international framework. SOCIB therefore also contributes to the needs of marine and coastal research in a global change context.

In line with the European Global Ocean Observing System (EuroGOOS), this project helps operational oceanography to be understood in a wider sense, which includes the systematic long-term measurements of the seas and their interpretation and dissemination, and also the sustained supply of multidisciplinary data to cover the needs of a wide range of scientific research and societal priorities. This work will allow a quantitative increase to help answer a range of key questions on oceans and climate change, coastal ocean processes, ecosystem variability, sea level rise, etc. It will also help to drive us towards a more science-based coastal and ocean management.

Where does SOCIB fit in to the European policy realm?

SOCIB, as a part of the Large Scale Infrastructures Programme from the Spanish Ministry of Economy and Competitiveness, is already an ongoing example of the new Marine Research Infrastructures that are being established internationally. This type of new marine infrastructures should be enhanced in the 2014-20 perspectives to support the European Integrated Maritime Policy and as an example the sound implementation of the Marine Strategy Framework Directive. It is also fully in line with the objectives of the new European Commission Framework Programme Horizon2020.

Could you explain why an observing and forecasting system around the Balearic Islands is needed?

The Mediterranean is a semi-enclosed sea, essentially a small-scale ocean laboratory characterised by significant changes in the circulation of currents and related ecosystem response and with a key socioeconomic impact for European citizens. The Balearic Islands are located at an important place in the western Mediterranean, the Ibiza channel being at a hotspot of biodiversity related to the interaction between Atlantic and Mediterranean waters. The main ocean processes can be studied and monitored in the ocean waters around the Balearic Islands and the findings are of global interest. At the same time, the socioeconomic importance of the Balearic Islands and tourism in the Mediterranean cannot be overlooked and accordingly, sound science and knowledge-based coastal and ocean management is requested by both residents and tourists. These society driven interests must also be addressed, related mostly to improving water quality, sound beach management, etc., for both residents' welfare and the satisfaction of tourists.

Are you employing any unique or interesting techniques and technologies in order to collect your research data?

The key phrase is really 'multiplatform integration'. Gliders are one of the new technologies implemented at SOCIB, monitoring the channels between the islands and also contributing better understanding of ocean variability through process orientated research projects. Gliders allow high resolution sampling, profiling from the surface to a depth of 1,000 m at kilometre intervals for up to three months, and have shown the existence of new features, such as sub-mesoscale eddies that are characterised by strong horizontal gradients and intense vertical motions. These structures interact with the underlying mean flow and topography and can block the general circulation or give rise to intensified upper ocean biogeochemical exchanges. These are just two examples of scientific topics of worldwide relevance in a climate change context that have been specifically addressed at SOCIB in collaboration with the Mediterranean Institute for Advanced Studies, a research centre jointly governed by the National Research Council and the University of the Balearic Islands.

To conclude, can you highlight your proudest moments working on this project so far?

We are particularly proud that SOCIB is unique among the new observing and forecasting systems in that its mission and objectives are science, technology and society driven. Multiplatform integration and data availability are the two key elements of SOCIB which we have worked hard to achieve. One particularly special component of this project is the new 24 m coastal catamaran which is providing spacious laboratory space and accommodation for up to 15 people that is also fast and cost-efficient. This mobile laboratory will be a crucial monitoring component of SOCIB.