Strategic Plan 2010-2013

Department of Marine Technologies, Operational Oceanography and Sustainability

Department of Marine Technologies, Operational Oceanography and Sustainability

Strategic Plan 2010-2013

tmoos

MINISTERIO DE CIENCIA E INNOVACIÓN

CSIC
Consejo Superior de Investigaciones Científicas

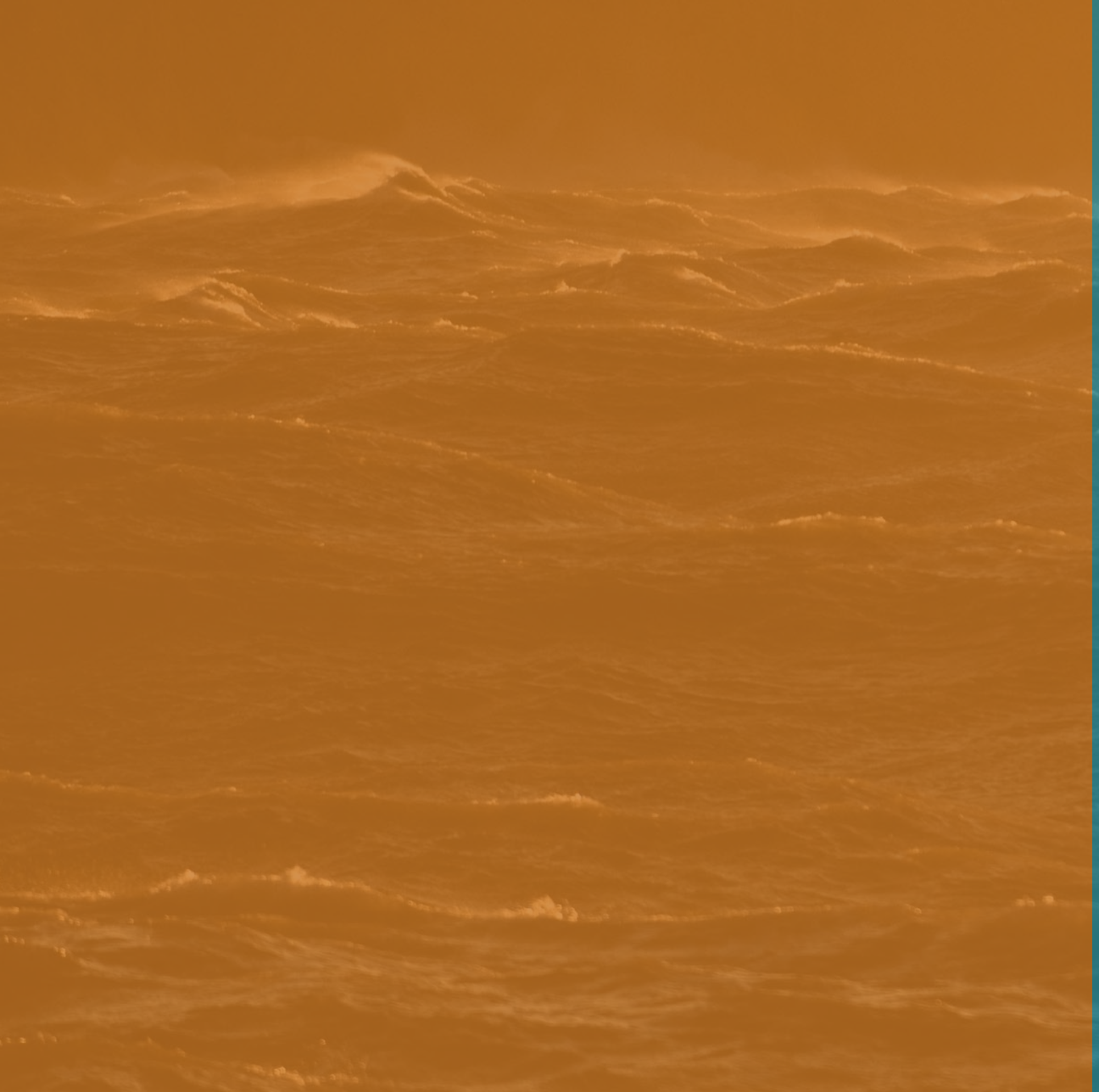
UIB

I·M·E·D·E·A
Institut Mediterrani d'Estudis Avançats

CSIC

Department of Marine Technologies, Operational Oceanography and Sustainability

Strategic Plan 2010-2013



This document follows the CSIC guidelines for Strategic Plan 2010-2013 and was written and approved by TMOOS in October 2008

INDEX

Underwater sea gliders: new technologies to sample the ocean

1. General data

1.1. Name of the research line

PHYSICS AND TECHNOLOGY OF THE COASTAL OCEAN SYSTEM: OBSERVATION, FORECASTING AND INTERACTIONS

1.2. Description

This research line is carried out at the Department of Marine Technologies, Operational Oceanography and Sustainability (TMOOS, in Spanish) and is centered on a common core: the study of the physical mechanisms that can explain the dynamics of the coastal ocean system[1] and its interactions with the near-shore and the open ocean, in a global change context. In other words, using a physical and mathematical background, we study the underlying processes and the multidisciplinary effects of a well-defined complex, multidisciplinary and vulnerable system, the coastal ocean. The variability of scales involved, from meters to thousands of kilometers and from seconds to years, and their nonlinear interactions, makes the understanding of theses mechanisms a real internationally established challenge.

We address this challenge combining theoretical, observational (in situ and remote) and numerical modeling approaches[2], in particular (but not only) in the Mediterranean Sea, an ideal laboratory small scale ocean to understand physical processes, to test new ideas and to support different maritime operations. On the shelf and open ocean area, we focus on the understanding of the mesoscale, submesoscale and mean field contributions to natural and anthropogenic oceanic variability (both in the past and from IPCC based scenarios), also addressing biophysical coupling and multidisciplinary biogeochemical effects. In the near-shore, we focus on the study between coastal dynamics and coastal morphodynamics, specifically considering the interactions between currents and waves, bottom topography and sediment transport. We also develop and implement new marine technologies specifically needed to better respond to our scientific objectives introducing new instruments (i.e., for sampling) or new techniques (i.e. modeling, visualization or data mining, data fusion and data management). We are convinced that knowledge, technology and transfer of know-how are increasing the capability to nowcast and forecast environmental conditions and open the possibility to build more reliable operational systems. Accordingly, managers and policy makers can now plan actions on the basis of scientific products and decision making tools.

This research activity is carried out in the frame of peer-reviewed research projects with strong links with international leading scientists and engineers and with progressively new links with international scientific and technological initiatives such as Coastal Ocean Observing and Forecasting Systems[3].

Our common goal is twofold: to contribute to the advancement of knowledge publishing in a variety of international leading journals and also to address and respond to specific problems and major questions raised by society in the coastal ocean in a frame given by the new sustainability science initiative from AAAS[4].

---

[1] The transition region between the open sea and the near-shore.

[2] This approach has been one of the main characteristics of our team since 1995 (beginning of IMEDEA activities) and is in line with, as more recent example, the founding principles of CLIVAR Climate Processes Modeling Teams, http://www.usclivar.org/CPT/

[3] See http://coastobs.pol.ac.uk/ - European workshop organised by NERC, in Mallorca in 2007.

[4] American Association for the Advancement of Science, http://sustsci.aaas.org/

In other words:

EXCELLENT SCIENCE

NEW TECHNOLOGIES

TRANSFER

TO CONTRIBUTE TO

ADVANCEMENT OF KNOWLEDGE

RESPOND TO SOCIETY NEEDS

1.3. General objective of the research line

The general objective is to contribute to the advancement of science in key areas and disciplines of the coastal ocean system, identifying major knowledge gaps that need to be addressed. More specifically, the objective is to characterize and understand the coastal ocean, its interactions with the deep ocean and coastal zone and its response to anthropogenic influences. One of the specific outcomes of the research should be an operational oceanographic system (observations and models) that would embed the knowledge and technology delivered by this research. This operational system should be seen as a product or a service but also as a very useful tool to address further research objectives, establishing thus a fruitful feedback.

We foresee to reach this objective making ❶ solid step by step continuous contributions (that will help to provide solid foundations to the knowledge structure) and ❷ making episodic significant outstanding contributions that can be considered major international breakthroughs. The strategy followed in the last years has been to apply the physical knowledge of the system together with observations and numerical modeling in order to get a general overview of the coastal ocean system from the outer side of the slope to the near-shore.

In summary, from an initial core of physical oceanography and coastal dynamics, our goal is to incorporate technology developments to address coastal morphodynamical studies, process studies for operational coastal oceanography, together with bio-physical processes coupling, using numerical models and observations specifically implementing new sampling technologies such as gliders. We also want to transfer the knowledge obtained to coastal managers and decision makers following real, science based, sustainability principles.

1.4. New line?

It is not a new line, since the activities around the physical oceanography core started more than 15 years ago.

However, it is important to note that around this core new scientific actions have been progressively established: Marine Technologies, Near-shore Processes, Satellite oceanography, Operational Oceanography, Sustainability Science and Integrated Coastal Zone Management.

As an example, ❶ Marine Technology actions started marginally around 2005 and were given a real endorsement with the new IMEDEA facilities (laboratories and workshops) in 2008. The same can be said for two actions of well established international scientific interest and that are also specifically requested by society (and in particular in the Balearic Islands). ❷ Near-shore processes, beach morphodynamics and sediments studies (for example, in response to extreme atmospheric events which have caused severe damage to beaches and coastal structures) and ❸ Operational Oceanography and oil spill trajectory forecasting (for example, developing tools for decision support). Similarly, preliminary actions in the area of ❹ Sustainability Science and Integrated Multidisciplinary Coastal Zone Management have been recently started, 2006-2007, with the specific aim to transfer the scientific knowledge from the last years[5] to society (coastal zone managers and policy makers, mostly, but also stakeholders in general) as a way to advance towards a more science based really sustainable (measurable, based on specific indicators) Integrated Coastal Zone Management (ICZM).

[5] We are well aware that with the advancements of science in the last 10 years, a significant number of actions in the coastal environment would presently have to be made differently and there is, therefore, a responsibility of the scientific community to carry out the transfer and implementation of new initiatives for more science based, reliable and independent ICZM.

1.5. Key words

Coastal Ocean dynamics

Mesoscale and submesoscale dynamics

Coupled bio-physical processes

Shelf-slope exchanges

Near-shore processes and dynamics

Wave-current interaction

Sediment transport

Operational Oceanography

Coastal Ocean Observing and Forecasting Systems

Remote sensing, coastal altimetry

Numerical modelling

New sampling technologies

Autonomous observing platforms: gliders and AUV's

New sensors, laser technology

Global Change and Sustainability Science

Integrated Coastal Zone Management

2. Objectives and strategy design

2.1. General qualitative goals

The general objective of this research line is the study of the physical mechanisms involved in coastal dynamics and its interactions with the near-shore and the open ocean, in a global change context. The variability of scales involved, from meters to thousands of kilometers and from seconds to years as well as their nonlinear interactions, makes the understanding of theses mechanisms a real challenge.

We will address this challenge combining theoretical, observational (in situ and remote) and numerical modelling approaches. On the shelf and open ocean area, we will focus on the understanding of the mesoscale, submesoscale and mean field contributions to natural and anthropogenic oceanic variability, also addressing bio-physical coupling and multidisciplinary biogeochemical effects. In the near-shore, we will focus on the study between coastal dynamics and coastal morphodynamics, specifically considering the interactions between currents and waves, bottom topography and sediment transport. We will continue developing and implementing new marine technologies. Combination of knowledge and technology will contribute to improve forecasting and nowcasting environmental conditions. With respect to transfer of knowledge, we will work to guarantee that more science based procedures are introduced in coastal management, always following sustainability principles (see for example Ocean Commission, 2004).

2.2. Specific qualitative goals

Scientific goals

High quality coastal ocean studies and development of needed technologies are the specific scientific qualitative goals of our research line. These activities are specifically focused towards ❶ a better understanding of global change in the coastal zone therefore specifically including the modifications in climate, oceans, coasts and ecosystems, ❷ the development of operational oceanography and related strategic services to society and ❸ the development of new technological tools for coastal ocean studies.

Transfer of knowledge

This research line supports totally the transfer of knowledge to the public and private sectors as a socialization of quality research. This has been already done in the past years (as indicated in Section 2.4) and will be done in the future following the same strategy (technology transfer and know-how transfer to guarantee more science based management of the coastal ocean).

Training

Training is considered an essential component of this research line at undergraduate and graduate level as well as technician formation. The intrinsic character of this Research line where the technical and scientific developments are put constantly together makes this point a challenge for the members of this Department. We expect to graduate in the period 2010-2013, 6 PhD thesis, 3 MSc thesis and 3 Engineering projects.

Popularization goals

Outreach is considered a crucial element in which we will devote many efforts (participation in forums, radio, TV, science-fairs, etc.). Dissemination conferences for the general public will also carried out. We have already demonstrated also our interest and compromise with dissemination and believe science is and integral part of our societies culture. We will continue so, although we are very much concerned by overselling scientific practices that appear to be nowadays 'a la mode'. Science has to proceed step by step, maintaining strict control on the quality of what is presented to the media.

Internationalization goals

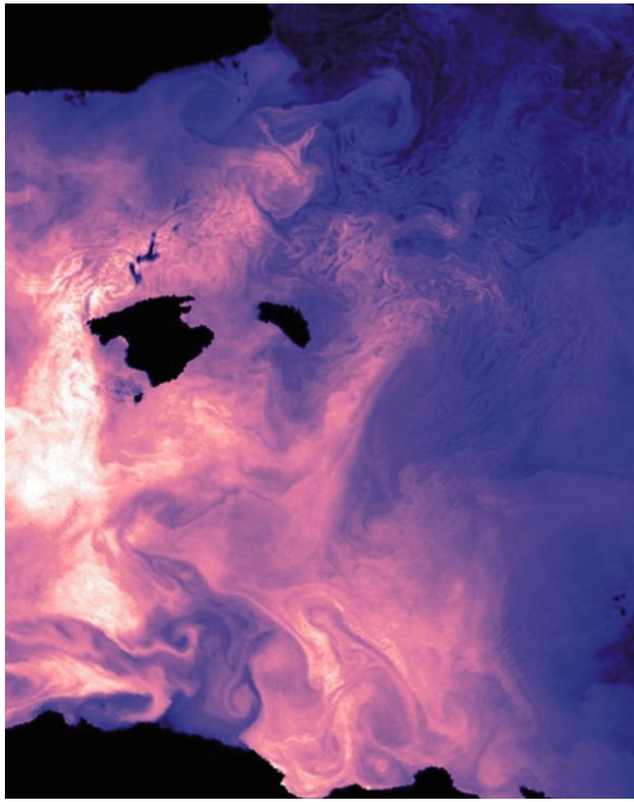
Relation with international research groups and universities will be continued and consolidated as a crucial point for the research objectives of this line. Cooperation will be in terms of EC projects (7 Framework Programme for example, but also LIFE, etc..), NSF projects, courses, space agencies, researchers exchange program between different international institutions, etc. We have and will be very active also on this aspect.

Gender equality programme

TMOOS members are convinced of the need to advance towards a higher representation of women in scientific activities. We strongly support gender equality.

Quality control programme

TMOOS members have established internal quality control procedures that guarantee for each one of the different ongoing processes, optimal results in due time. Examples can be found in the quality control established for real time data transfer and archive from buoys (in 2007) and from gliders (in 2008). Also relevant is the active participation of TMOOS members in the Programme lunched in 2008 by AENOR (National Agency for Quality Standards) for implementing Integrated Coastal Zone Management Procedures.



Sea surface temperature image (ENVISAT satellite)

2.3. General strategy

The strategy of this research line is carried out, as already indicated before, following 'tactics' that allow us systematic combination of actions following three axes: Observational, Numerical and Theoretical and a horizontal dimension of Transfer of Knowledge.

The Observational axis includes a combination of traditional techniques such as moored buoys (2 in real time transmission), moorings and/or drifting buoys (on project basis), ARGO floats (4 from TMOOS), and CTD profiles for Rapid Environmental Assessment-also on project basis) with the development and/or implementation of new technologies (both in situ and satellite platforms).

Special emphasis will be devoted to the recent technological advances which have allowed the development of autonomous underwater robots (gliders and AUV's) specifically designed to continuously monitor wide ocean areas. Gliders imply a major jump forward in sampling capacities by an order of magnitude (from 10 km to 1 km)[6]. A fleet of gliders monitoring the coastal ocean will lead to major advances in understanding processes and in operational capacities, and we progressively heading in this direction (4 gliders will be available in 2009 and new tools are being developed for quasi-real time sampling optimization, collision avoidance, etc).

Regarding the remote sensing component, satellite observations play a major role in operational oceanography since they provide global and periodic measurements of the sea surface topography (altimetry), the sea surface temperature (AVHRR), and ocean color. While surface temperature constitutes a key parameter in the climate change context, altimetry allows us to estimate surface currents, and ocean color can provide estimates of chlorophyll in the upper layers of the ocean. Newer remote sensing techniques are expected to expand the amount of information that can be remotely acquired in the near future (e.g. salinity and gravity). These techniques, however, face unexpected difficulties when applied to coastal areas due to technical a number of factors (including the low accuracy of the geophysical corrections that are applied to the data and erroneous editing criteria) that limit the accuracy of the measurements. For these reasons, one of the present challenges in operational oceanography is improving the accuracy of altimetry measurements in coastal areas.

The predictive axis includes the continuous development and application of different types of ocean prediction systems for forecasting and diagnosing the different physical processes at different scales of interest that will be all linked using nested models: basin, sub-basin and local scales in the Mediterranean (as an ideal small scale ocean) and Balearic seas.

We will study the contribution of mesoscale and sub-mesoscale interdisciplinary processes to 3-D upper ocean inter-annual variability specifically considering the relevance of eddy induced vertical motions and open ocean-coastal exchanges processes. We will also study global change scenarios in the Mediterranean and their impact on the inter-annual variability at sub-basin scale using high resolution observations and eddy resolving models. We will address biophysical coupling and biogeochemical fluxes (using 'simple' NPZD models to understand processes and also more complex models such as NEMURO for more realistic studies) analyzing major regime shifts in both the physical variability and step by step, on the ecosystems. We will progressively abandon the basin scale whish is now the focus of very well established organisms such as Mercator Océan, for example (with whom a strategic collaboration exists).

The specific processes in local areas are studied using high resolution models for hydrodynamics and wave propagation that are being coupled. The different coastal processes as well as the non linear interactions among them are linked to understand the complex variability in coastal and shelf areas such as the sediment dynamics, boundary layer dynamics and wave-current interactions. Theses models are all available at IMEDEA and can operate in a quasi-operational mode. Additionally, novel forecasting tools based on non linear prediction techniques like genetic algorithms have been developed.

Data management (for both observations and model output) is also becoming a key issue as an element of operational oceanography and as a way to have remote instantaneous access to data catalogues, visualization, download, etc.

Finally, numerical and observational tools provide the necessary background to formulate novel approaches to a better understanding of the physical system (third axis). In this sense, the goal is the design of optimal configuration networks and the definition of new assimilation strategies (from remote or in situ observations) for better understanding of both the ocean and near-shore variability, the study of physical processes related to environmental fluid dynamics such as energy transfer in viscous media or sediment transport in highly rotational flows. The ultimate goal is to achieve a deep understanding of the physical mechanisms that govern the coastal ocean system in a global change context by the use of all the techniques and tools developed in the Department.

These activities carried out in theses three axes are complemented by Horizontal Transfer of Knowledge activities in topics of interest to society. More specifically, we will continue to devote efforts towards establishing a sound transfer of knowledge to decision makers, policy makers and coastal managers in order to reach, on a global change environment, and under sustainability principles, a more science based management of the coastal ocean system. It is a difficult task, in between many times between science and governance many times, but we still believe that we have a certain responsibility (shared with many others of course) to try to advance along this path.

Summarizing, the main points of the general strategy of TMOOS research line build and are consistent with the already existing strategy:

THE BASIS:

- Disciplinary scientific and technological excellence with multidisciplinary interest. As a result,
- capacity to address, major internationally established scientific challenges and
- capacity to respond to society questions, trying to advance towards more science based ICZM.

[6] As shown by, for example, the very preliminary results obtained in the Alboran Sea in July 2008 in the frame of the SESAME project with significant small (order 2-4 kms) 3-D structures with clear bio-geochemical effects.

- Excellent human resources: always hire the best people possible in an international frame (the human dimension is the key to success!).

STRONG AND SOLID FOUNDATIONS:

- Consolidate knowledge firmly and systematically: essential for long-term achievements.
- Publish in leading peer reviewed international journals. This is a point of interest and concern in TMOOS due to the high variety of journals covered by our research activities: from coastal engineering and coastal zone management (relatively low SCI impact factors, i.e. below 1) to disciplines such as physics or physical oceanography or more multidisciplinary oceanography (Deep Sea Res, for example, with SCI above 2). Careful consideration by TMOOS to publish in leading journal of each field (that might or might not coincide with ISI categories).

NEW IDEAS, NEW CHALLENGES, NON-REPETITIVE ACTIONS:

- Initiate new research or technology initiatives that will complement already existing ones.
- Identify gaps of knowledge, potential major breakthroughs (i.e., gliders on top of altimeter tracks).

Deployment of an Acoustic Doppler Velocimeter (Vector, Nortek)

- Identify new marine technology needs (such as for example coastal ocean GSM drifting buoys).
- Implement new monitoring strategies (such as gliders for example).

TRANSFER KNOWLEDGE

- Free access to data (models and observations) in quasi real time establishing data discovery, downloading, access and viewing services, using for example Netcdf format, Thredds and Opendap technologies.
- Capacity to respond to society needs (beach erosion, extreme events, coastal zone management, innovation, etc.).

2.3.1. New experimental approaches

The major challenge for the next years is to establish a real capability for coastal ocean monitoring in quasi real time, or in other words, rapid environmental assessment. For this, the real challenge is the reception, pre-processing (quality control), visualization, archiving and download capability of the different type of data that we are considering:

- Satellite data, mostly SST, altimetry and progressively also ocean color
- Fixed moored coastal oceanographic buoys (2 will be in place during 2009)
- Drifting buoys (several depending upon experiments)
- ARGO floats (4 to be deployed early 2009)
- CTD, ADCP and ADV
- Gliders (3 to be ready during 2009)
- Optical fiber for coastal monitoring
- Laser techniques for ocean monitoring
- Laboratory and workshop

2.3.2. New methodologies

Different type of numerical models will be implemented depending on the type of processes, scales and problems to be addressed. In particular, in coastal ocean dynamics and Mediterranean circulation studies we will implement ROMS model for the hydrodynamics (changing therefore from the Harvard HOPS present environment to ROMS) and WAM and Boussinesq models for waves.

We will develop new merging methodologies for inferring the 3-D ocean state based on observations and empirical techniques (EOFs, CEOFs, genetic programmes, evolutionary computation, etc.).

With respect to coastal altimetry we will work to extend the utility of these valuable data to the coastal ocean. This is, nowadays a scientific and technological challenge since actually these measurements are not valid due its low accuracy.

Special effort will be made in developing new techniques for underwater autonomous vehicles, including path planning, data processing, quality control, interconnection of different platforms, etc. This point is also very relevant since these kind of instruments will be the essential components of any system working in the future in the coastal oceans.

2.3.3. Collaborations

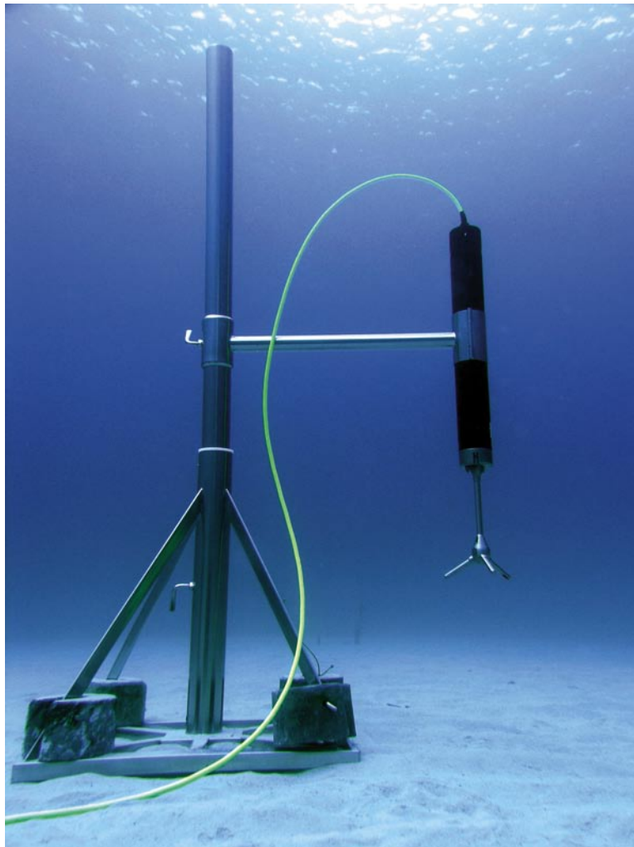
National and international collaborations will include (but not only) the leading groups in the fields of study of the research line,

- Instituto de Hidraulica Ambiental de Cantabria
- Grupo de Puertos y Costas de la Universidad de Granada
- Instituto de Ciencias del Mar (CSIC)
- Instituto de Ciencias del Mar de Andalucia (CSIC)
- School of Civil and Env Eng. Cornell University
- Coastal and Marine Sciences. Rutgers University
- Collecte Localisation Satellites (CLS)
- GKKS, Germany
- National Oceanographic Centre Southampton, (NOCS).
- University of Castilla la Mancha
- University of Gran Canaria
- SUNY Stony Brooks

2.3.4. Recruitment

The principle of the recruitment policy for engineers and support staff, graduate students or post docts, has been at TMOOS to always hire the best people with international open calls and always looking for disciplinary excellence and multidisciplinary real interest and cooperation capability.

For Ph. D. students, we first request solid physics and mathematics background and good learning capabilities. We will strongly recommend to our students to be involved during their Ph D., in both



Acoustic Doppler Velocimeter (Vector, Nortek)

experimental and numerical work, as a way to acquire a broad background during their Ph. D. We plan to have 4 PhD students during the period 2010-2013.

2.3.5. New human resources

Our research line is well focused but also covers at the same time a wide range of expertise's, all needed to study the coastal ocean. Since our strategy is not incremental along one axis, but is evolving along 3 or 4 axis, the establishment of a critical mass is a slow process where quality is the leading factor. Accordingly, we want to maintain our strategy of solid consolidation and step by step extension.

The quality of our research has been internationally recognized and accordingly we have been able to obtain high level instrumentation and have established new research facilities, mostly funded through peer reviewed research projects (this is true, except for some of the instrumentation that has been obtained during 2008 mostly associated with the new IMEDEA building). Theses instruments and facilities are operated by engineers and technician mostly under contracts in the frame of the same type of projects which is a major weakness of our Department.

We therefore need URGENTLY (2009) specialized personnel to maintain, use and make available the existing resources such as for example the gliders. We need a permanent position (at Titulado Superior CSIC level) for a well trained engineer that can take the responsibility for glider operations. Profile is for a Computer sciences engineer, with more than 3 years of experience in this area.

At a later stage, we will need one TS for Marine Technologies/ Electronics, likely during 2012.

On the scientific side, the relevance of Ocean monitoring with remote operated vehicles (gliders, etc) is a hot topic internationally where TMOOS is especially well positioned. We specifically request a highly specialized tenured scientist (CT level at CSIC). Note that these platforms are still under development and recruiting scientist in this field is presently complicated. However, as stated previously this will be a key element in coastal observing system in the near future and therefore this profile is requested for 2010, Also essential is to reinforce the numerical modeling capabilities of TMOOS and accordingly we request a PI for 2011.

Finally, the relevance of coastal oceanography and coastal morphodynamics is evident and we request a tenured scientists (CT level at CSIC) for 2013.

2.4. Structural changes

The structural changes in the near future, 2009, might be related to the potential inclusion in TMOOS on new personnel from UIB. Contacts have been made in different departments, mostly in Physics, Computer Sciences, Earth Sciences and Engineering School. We cannot expand on this since at present (October 2008), there is not yet any opening for this process.

Another potential structural change in the next years might be related to the beginning of the activity of a Coastal Ocean Observing and Forecasting System in the Balearic Islands, ICTS, OceanBIT. This system will definitively complement and extend present activities.

2.5. Analysis of the strategy

The strategy followed along the years has proved to be quite reasonable, taking into account that no baseline resources are provided by the institutions (CSIC or UIB) to maintain any strategy. The strategy is maintained by writing high quality, innovative (not repetitive) research proposals that get evaluated and funded at 90%.

We also accept some risk in our scientific strategy, always trying to keep a reasonable balance between new subjects of high risk and more traditional topics in which we are already 'well established'.

3. Indicators of present situation and evolution (2003-2008)

3.1. Personnel

3.1.1. Permanent staff

Dr. Alberto Álvarez (PhD in Physics, PhD in Electrical Engineering, MSc Ocean Engineering, Tenured Scientific Researcher CSIC – temporal leave since 01/2008 at NURC)

Prof. Salvador Balle (PhD in Physics, Tenured University Professor, UIB)

Dr. Ananda Pascual (PhD in Physics, Tenured Scientist, CSIC)

Dr. Alejandro Orfila (PhD in Physics, Tenured Scientist, CSIC)

Prof. Joaquín Tintoré (PhD in Physics, Tenured Research Professor, CSIC)

MSc. Guillermo Vizoso (MSc in Physics, Research Assistant, CSIC)[7]

MSc. Benjamin Casas (MSc in Marine Sciences, Research Technician, CSIC)

3.1.2. Non permanent staff

a) Post doctoral researchers

Dr. Simón Ruiz (PhD in Marine Sciences. Ramón y Cajal Researcher CSIC)

Dr. Lluís Gómez-Pujol (PhD in Geography. I3P Researcher CSIC)

Dr. Pau Balaguer (PhD in Geography. Contracted researcher)

Dr. Amy Diedrich (PhD in Marine Affairs and Policy. Contracted researcher)

Dr. Jordi Sole (PhD in Physics, Contracted researcher)

Dr. Jérôme Bouffard (PhD in Coastal Engineering, Contracted researcher)

Dr. Sonia Ponce de León (PhD in Coastal Engineering, Juan de la Cierva Researcher CSIC)

[7] Guillermo Vizoso is a Senior Technician responsible of the Operational Oceanography Service (Observations and Modelling) at IMEDEA since the Prestige Oil Spill, when he was requested to join IMEDEA by the former Secretary of State for Research. Benjamin Casas, is also Technician at IMEDEA, responsible for the maintenance and operation of the physical oceanography and coastal morphodynamics instrumentation from TMOOS. Both are formally from the General Services Unit of IMEDEA but carry out their daily activities in the frame of this research line.

b) Predoctoral researchers

MSc. Álvaro Galán (MSc in Civil Engineering)

MSc Amaya Álvarez (MSc and BSc Degree in Marine Sciences)

MSc. Enrique Vidal (MSc and BSc Degree in Marine Sciences)

MSc. Tomeu Cañellas (MSc and BSc Degree in Marine Sciences)

c) Engineers and technical staff

Dr. Lavinio Gualdesi (Engineer, PhD in Naval Engineering – Visiting Prof.[8], 12 months 2008-2009; UIB/TMOOS funded)

MSc. Bartolomé Garau (MSc in Computer Engineering)

MSc. Matías Bonet (MSc in Computer Engineering)

BSc. Miquel Martínez-Ledesma (BSc Telematics Engineering)

BSc. Marta Fuster (BSc Degree in Geography)

BSc. Carlos Castilla (BSc Degree in Marine Sciences)

BSc. Daniel Roig Broman (Manager, R+D Engineer)*

BSc. Gabriel Donaire Pascual (R+D Engineer)*

BSc. Saul Pitarch Garcia (Project Management)*

BSc. Alex Gasco Álvarez (Technician)*

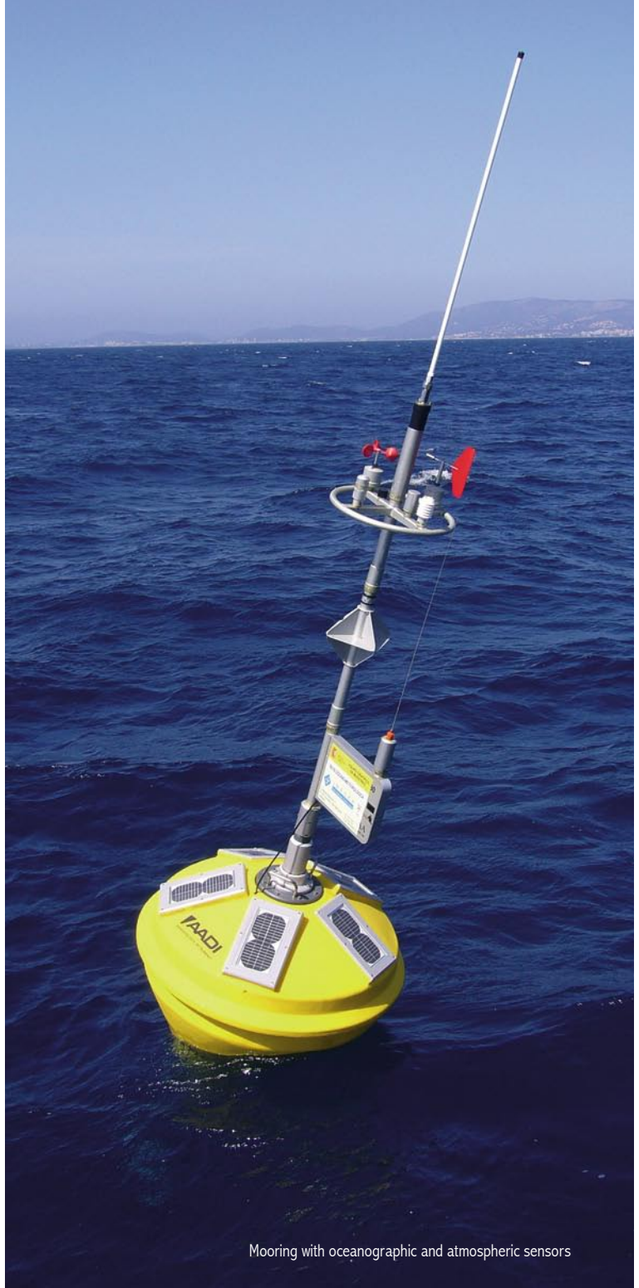
BSc. Francisco Vilaró Pueyo (Engineer)*

BSc. Gian Paolo Candini (R+D Engineer)*

BSc. Kristian Sebastian (BSc in Computer Engineering)*

[8] Every year, a number of well established Professors and Engineers (1 to 4) come to work with us for periods ranging from 1 to 12 months. As an example, during 2008, apart from Dr. Eng. Gualdessi, we had Prof. Dong-Ping Wang visiting us for 1 month in July, and Prof. Reiner Onken visiting us for 2 months.

* Formaly from Albatros Marine Technologies, spin off company created by agreement with CSIC and UIB from june 2008



Mooring with oceanographic and atmospheric sensors

3.2. Funding (projects and contracts)

3.2.1. Ongoing research projects

3.2.1.1. Financed by the European Commission

SESAME_IP. Southern European Seas: Assessing and Modelling Ecosystem changes Glogal change and environment. VI Framework Programme. European Union 036949-2. (10/2006 – 10/2010). PI IMEDEA: J. Tintoré. € 209.971.

ECOOP_IP: European Coastal-Shelf sea Operational observing and forecasting system'. Global/IP/0779. (2007 - 2010). PI IMEDEA: J. Tintoré. € 87.632.

MERSEA_IP: Marine Environment and Security for the European Area. European Union. SIP3-CT_2003-502885 (4/2004 hasta 4/2008). PI IMEDEA: J. Tintoré. € 194.403.

MYOCEAN: A project for the European Marine Core Service -Space Research Call 1. Proposal Number 218812. PI IMEDEA: J. Tintoré. (2009-20). € 426.900.

3.2.1.2. Financed by the Spanish National Plan for Research, Development and Innovation

COOL: Acoplamiento hidrodinámico oleaje corriente, tasas de dispersión e implicaciones interdisciplinarias en la zona costera. Plan Nacional de I+D, PN de Medio Ambiente, RRNN. CTM2006-12072/MAR (10/2006-07/2009). IP: J. Tintoré. € 330.088.

SESAME_IP/AC_CICYT: Southern European Seas Ecosystem Modelling. PN, CICYT (6/2007-12/2008). PI: J. Tintoré (PI CSIC Javier Ruiz, ICMAN). € 12.300.

AC Ayuda para la participación del IMEDEA en Proyectos Europeos: MOON, ECOOP y SESAME. PN, CICYT. CTM2006-27142E/MAR. (10/2006-09/2008). PI: J. Tintoré. € 3.600.

AC_ECOOP: Ayuda Complementaria al Proyecto Europeo European Coastal Shelf Sea Operational Observing and Forecasting System. CTM 2007-31006-E (10/2008-12/2010). IP: J. Tintoré. € 80.000.

Red Iberica CLIVAR. PCI2006-A5-0518. (/4/2008 hasta 12/2009). Investigador Principal IMEDEA: J. Tintoré. (I.P Fiz Fernández. IIM-CSIC).

Desarrollo de tecnicas de banda-ultra-ancha mediante pulsos generados por diodos laser: aplicaciones a las comunicaciones opticas inalambricas. TEC2006-13887- C05-03. (10/2006-09/2008). Investigador responsable IMEDEA: Salvador Balle (proyecto coordinado por la ETSIT de Madrid, con la Universidad de La Laguna, la Universidad de las Palmas de Gran Canaria y el Instituto de Física de Cantabria).

Red temática en ciencias marinas. IP: Enric Massutí, IEO. IP IMEDEA. J. Tintoré (27/11/2007-06/2009). Programa nacional de equipamiento e infraestructuras de investigación científica y tecnológica del Plan Nacional de i+D 2004-07.

3.2.1.3. Financed by the Balearic Government

UGIZC: Gestión Integrada de la Zona Zostera de las Islas Baleares. Convenio Govern Balear – CSIC (02/2005-12/2008). PI: J. Tintoré. € 1.500.000.

Grups competitius del Govern Balear. Direcció General d'R+D+I, Conselleria Innovació (10/2006-10/2009). PI: J. Tintoré. € 48.000.

Estudios y aplicaciones encaminadas a incrementar el conocimiento de las corrientes marinas y del oleaje para minimizar los riesgos sobre las personas, los bienes y el medio ambiente marino en las Islas Baleares. Conselleria de Interior, Dirección General de Emergencias, Govern Balear (08/2004-12/2007). PI: J. Tintoré. € 269.900.

Evaluación y monitorización de la calidad de las aguas costeras de las Islas Baleares. Conselleria de Medio Ambiente, Govern Balear (08/2004-08/2007). PI: J. Tintoré. € 230.000.

CAPALIMITROMETRO. Diseño y construcción de un medidor de capa límite oleajecorriente. Accions Especials. Govern Balear. (2007-2008). PI: A. Orfila. € 12.500.

SINOCOP: Hacia la implementación de un Sistema Integrado en Oceanografía Operacional: altimetría, gliders y boyas lagrangianas. Proyecto Intramural Especial CSIC. 2008-2009. € 30.000.

Ajudes per a la contractació de tècnics. Direcció General d'R+D+I, Conselleria Innovació (2008-2010). PI: A. Pascual. € 43.000.

3.2.1.4. Contracts with companies or public bodies

Unidad de Cultura Científica. Convenio FECYT-CSIC (10/2007-10/2008). PI: J. Tintoré. € 34.000. Cambio Global Cabrera: Convenio de colaboración entre el CSIC y la Fundación Parques Nacionales para la realización del proyecto de investigación 'Establecimiento de la red de seguimiento del cambio global en Parques Nacionales'. Cod. 2005030076. Fundación Parques Nacionales (10/2005-12/2008). PI: J. Tintoré. € 116.710.

Límites al crecimiento en el litoral de les Illes Balears. Cámara de Comercio, Industria y Navegación de Mallorca (11/2007-6/2009). PI: J. Tintoré. € 109.557.

COLCIENCIAS. Modulación experimental y simulación numérica de morfología costera. Cooperación. España-Colombia. CSIC Colciencias. (2007 - 2008). PI: A. Orfila. € 4.000.

PLAYEN. Estudio de la variabilidad de playas encajadas. FUEIB-UPV. 2006-2007. PI: A. Orfila. € 24.000.

MOON: Mediterranean Operacional Oceanography Network. Network. Memorandum and Agreement between different European institutions (2005-2015). PI IMEDEA: J. Tintoré.

MOON Data Exchange Agreement: Mediterranean Operacional Oceanography Network. Network. Agreement for model and data exchange between different European institutions (2008-2018). PI IMEDEA: J. Tintoré.

R/V Garcia del Cid (CSIC)

Physical and Ecosystem Variability in the Western Mediterranean Sea, observations and high resolution eddy resolving modelling in global change scenario: coupled mesoscale and sub-mesoscale bio-physical interactions and basin scale effects. BSC Mare Nostrum, ICTS - Tiempo de CPU. (6/2008-6/2009). PI IMEDEA: J. Tintoré.

Red IBERMAR (RED Iberoamericana de manejo costero integrado) (1/4/2008-1/4/2009). Financiación: CYTED. Investigador principal: Juan Ma. Barragán (Univ. de Cadiz). PI IMEDEA: J. Tintoré.

Estudio científico de la viabilidad operativa de un sistema de alerta frente a rissagues para el Puerte de Ciutadella. (1/3/2008-31/12/2008). IMEDEA (CSIC-UIB)/FUEIB – Univ. Cantabria. Financiación: SENER. PI: J. Tintoré.

Simulacion hidrodinamica de fluidos compresibles con transicion de fase. Proyecto Intramural Especial del CSIC. (06/2007-01/ 2008). PI: S. Balle.

VITRIOCEAN. Direcció General d'R+D+I, Conselleria Innovació (2008-2010). PI: A. Pascual. € 8.000.

SMOS: Combining SMOS surface salinity, SST and altimetry data to infer the 3-D structure of the ocean. ESA, European Spacial Agency, (2007-2010). PI: A. Pascual.

IVALCOREG: Improvement, validation and merging of altimeter products for coastal and regional applications. EUMETSAT/CNES. PI: A. Pascual.

3.2.2. Reasearch projects since 2003 (already finished)

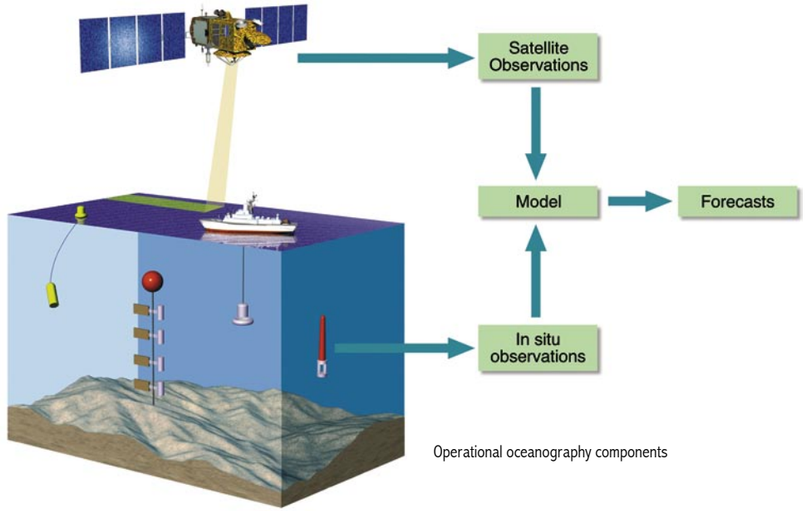
3.2.2.1. Financed by the European Commission

SOFT: Satellite-based Ocean ForecasTing Project. EVK3-CT-2000-00028. 01/01/2001- 01/12/2003. PI: J. Tintoré. € 382.234.

STRATEGY: New Strategy of monitoring and management of HABs in the Mediterranean Sea. EVK3-CT-2001-00046. 01/01/2001-31/12/2004. PI: Joaquín Tintoré. € 161.903.

MFSTEP: Mediterranean ocean forecasting system: toward environmental predictions. EVK3-2001-00174. 01/03/2003-01/01/2006. PI: Joaquín Tintoré. € 110.828.

MYTILOS: Développement d'un réseau interrégional de surveillance de la qualité des eaux côtières par des bio-intégrateurs pour la protection durable de la Méditerranée Occidentale. INTERREG (2004-2006). PI: Joaquín Tintoré. € 91.400.



Operational oceanography components

LIFE–POSIDONIA: Protección de Praderas de Posidonia en Baleares. Conselleria de Medi Ambient, European Commission, Life Programme (2002-2006). € 72.000.

3.2.2.2. Financed by the Spanish National Plan for Research, Development and Innovation

SOFT_AE: Satellite-Based Ocean Forecasting System. REN2001-3982-E/MAR. 30/09/2002- 01/01/2004. PI: J. Tintoré. € 48.081.

PRESTIGE: Acción conducente al mantenimiento y mejora del modelado y predicción de variables geofísicas y de trayectorias en las zonas afectadas por los vertidos del Prestige. 14/05/2003-31/12/2003. PI: Joaquín Tintoré. € 20.200.

CORMORAN: Desarrollo de una nueva plataforma de observación oceánica móvil y autónoma. REN2003-07787-C02-01/MAR. (2003-2006). PI: A. Álvarez. € 86.000.

CLIVAR: Red Temática CLIVAR: Climate Variability. 01/02/2004-01/01/2006. PI: Joaquín Tintoré. (IP Fiz Fernández IIM Vigo). € 6.000.

MFSTEP_AE: Mediterranean Ocean Forecasting System: Toward Environmental Predictions. REN2002-12249-E. 30/12/2003-01/03/2006. PI: Joaquín Tintoré. € 16.150.

ESEOO_OPSDAS: Establecimiento de un sistema español de oceanografía operacional. VEM2003-20577-C14-08. 19/12/2003-18/12/2006. PI: Joaquín Tintoré. € 94.450.

MERSEA_Acción complementaria CICYT. (2005-2006). PI: Joaquín Tintoré. € 45.000.

Láseres y amplificadores de cavidad vertical para comunicaciones ópticas y procesado óptico de señal. TIC2002-04255-C04-03. Plan Nacional de I+D, Govern Central (CICYT). 1/1/2003-31/12/2005. PI: Salvador Balle. € 35.000.

Láseres y amplificadores de cavidad vertical para comunicaciones ópticas y procesado óptico de señal. TIC2002-04255-C04-03. Plan Nacional. (2002-2005). PI: S. Balle. € 34.600.

Desarrollo de técnicas de banda-ultraancha mediante pulsos generados por diodos láser: aplicaciones a las comunicaciones ópticas inalámbricas. TEC2006-13887-C05-03. Pla Nacional (2006-2008). PI: S. Balle. € 35.000.

3.2.2.3. Financed by the Balearic Government

LIFE SANTA PONSA: Life Santa Ponça. MED-COASTS S-T LIFE 00 ENV/IT/000167. 01/01/2002- 01/09/2003. PI: Joaquín Tintoré. € 12.950.

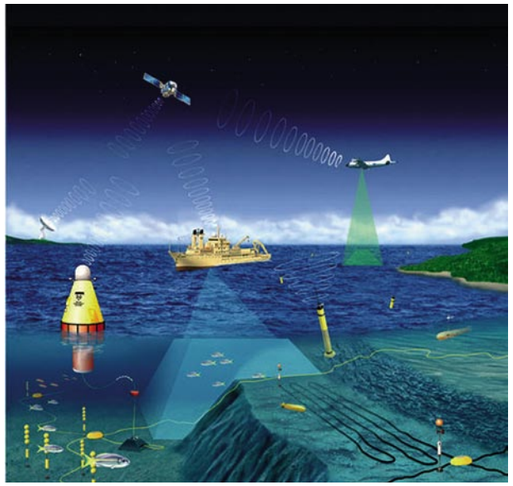
MEET_AE: Monitorització i Estudi dels efectes dels temporals sobre la platja de Ca'n Picafort-Muro. 01/01/2000- 01/01/2005. PI: Joaquín Tintoré. € 3.400.

Estudio interdisciplinario de la variabilidad de Cala San Vicente y Cala Millor (Mallorca). Conselleria de Medi Ambient, Govern Balear. 2004. PI: Joaquín Tintoré. € 60.000.

Grups excel.lencia del Govern Balear.Direcció General d'R+D+I, Conselleria Innovacio. Ref: PRDIB-2002GC1-02. (01/2003-01/2006). PI: Joaquín Tintoré. € 36.000.

Difusión y divulgación de nuevas tecnologías aplicadas a la monitorización de playas. (2003-2004). PI: Joaquín Tintoré. € 27.045.

INDICADORES: Indicadores cientificos para la gestion sostenible del litoral balear – ICGS. 12/2004-12/2006. PI: Joaquín Tintoré. € 39.000.



Virtual sketch of observing systems in the coastal ocean

ZONAS DE PRESTAMO: Estudio del tiempo de recuperación de las zonas de préstamo de sedimentos marinos en las Illes Balears. 09/12/2004-09/07/2006. PI: Joaquín Tintoré. € 60.000.

Micro-CTD: Adquisición de un microCTD y un sistema de navegación inercial. Govern Balear (09-2004/09-2005). PI: Alberto Álvarez. € 5.815.

PACO: AE Govern Balear. Paralelización Avanzada de Códigos Oceanográficos. (2005). PI: Alejandro Orfila. € 2.500.

DAMAGE: Conveni entre la Conselleria d'Interior i la Universitat de les Illes Balears (UIB) per a l'elaboració del diseny i implementació d'un sistema expert per a l'evaluació del dany produit per catàstrofes naturals en el marc del projecte europeu 2004-2006. PI: Joaquín Tintoré. € 150.000.

Desarrollo de un interferómetro de Hartmann-Shack para aberrometría ocular. Ajudes especials de recerca, desentvolupament tecnològic i innovació del Govern Balear, Govern Balear. (2003 - 2004). PI: S. Balle. € 30.000.

FLASH-1 i FLASH2. Projecte d'infrastructura per a equipament del laboratori de fotónica de l'IMEDEA. Govern Balear. PI: S. Balle. € 120.000.

Tomografía óptica de coherencia. Govern Balear. (2005-2007). PI: S. Balle. € 90.000.

3.2.2.4. Contracts with companies or public bodies

Innovación servicios: "Innovación en el sector turistico balear: análisis prospectivo de tecnologías". Fundación COTEC. PI: Joaquín Tintoré, Marta Jacob, Eugeni Aguiló. (2001-2002-2003). € 18.000.

INNOVATUR_COTEC: Oportunidades de innovación del sector turístico balear. 25/11/2003-25/12/2004. PI: Joaquín Tintoré. € 73.668.

COPAS. Codigos en paralelo y computación asistida. mec. fluidos computacional. Proyecto Intramural CSIC (2006 - 2007). PI: A.Orfila. € 24.000.

Desarrollo de un sensor de frente de onda de Hartmann-Shack en configuración abierta. Convenio Instituto Balear de Oftalmología. (2003-2004). PI: S. Balle. € 6.000.

SHIFT. Simulación hidrodinàmica de fluidos compresibles contransición de fase. Proyecto Intramural CSIC. (2007-2008). PI: S. Balle. € 16.000.

SLOCUM Glider (North of Mallorca)

3.3. Publications

It is important to note that the contributions from TMOOS personnel are numerous and always in top ranked peer reviewed journals. They are carried out in a wide variety of scientific areas and even disciplines (covered also by different categories of the Science Citation Index from the ISI journals). In theses scientific areas, we find very different scopes, methodologies, even tradition in publishing. This is especially true in fields such as coastal engineering and or marine technologies, new areas of research that we have found important to incorporate to our 'more classical' physical oceanography studies. In theses 'new' areas (for us) it is important to be aware that a presentation at an international conference and the subsequent Conference Proceedings (such as IEEE…) are considered of higher 'value' than a publication in many specialised journals. It is important to note that in each one of theses areas, the impact factor's are very different (from 0,5 in coastal and marine engineering to around 1 in coastal zone management or reaching 2 in physical oceanography, or even 3 en multidisciplinary ocean coupling studies).

3.3.1. 2008

Papers published in 2008 in international peer reviewed journal (ISI, SCI)

Álvarez, A., M. Palmer, J. Tomás, B. Morales-Nin. A two dimensional otolith growth inverse model. 2008. Journal of Fish Biology . 72, 3, 512-522.

Álvarez, A., V. Bertram, L. Gualdesi. Hull hydrodynamic optimization of autonomous underwater vehicles operating at snorkeling depth. Ocean Eng. (in press).

Álvarez, A., A. Caffaz, A. Caiti, G. Casalino, L. Gualdesi, A. Turetta, R. Viviani. Fòlaga: A low-cost autonomous underwater vehicle combining glider and AUV capabilities, Ocean Eng. (in press).

Álvarez, A., B. Garau, S. Ruiz, J. Tintoré. Rapid environmental assessment of marine coastal areas for naval operations using sequential space filling designs. J. Marine Systems. (in press).

Álvarez-Ellacuria, A., A. Orfila, M. Olabarrieta, G. Vizoso, R. Medina, J. Tintoré. A near-shore wave and currents forecasting system. Journal of Coastal research (in press).

Auladell, M., J.L. Pelegrí, A. García-Olivares, D.A. Kirwan, B.L. Lipphardt, J.M. Martín, A. Pascual, P. Sangrà, M. Zweng. Anticyclonic rings in the Gulf of Mexico. Journal of Marine Systems (accepted).

Balaguer P., R. Sardà, S. Ruiz, Diedrich, G. Vizoso, J. Tintoré. A proposal boundary delimitation for Integrated Coastal Zone Management initiatives. Ocean and Coastal Management. 2008 Vol. 51, 806-814.

Caballero, A., A. Pascual, G. Dibarboure, M. Espino. Sea Level and Eddy Kinetic Energy variability in the Bay of Biscay inferred from satellite altimeter data. 2008. Journal of Marine Systems, 72, 116-134.

Diedrich, A., E. García. Local Perceptions of Tourism as Indicators of Destination Decline. Tourism Management (in press).

Fäurst, S., A. Perez-Serrano, A. Scire, M. Sorel, S. Balle. Modal structure, directional and wavelength jumps of integrated semiconductor ring lasers: experiment and theory, Appl. Phys. Lett. 93, 251109.

Fornós, J.J., L. Clemmensen, L. Gómez-Pujol, A.D. Murray. Late Pleistocene carbonate aeolian deposits on Mallorca, Western Mediterranean: a preliminary luminescence chronology. 2008. Quaternary Science Reviews (accepted).

Gomis, D., S. Ruiz, M. García-Sotillo, E. Álvarez-Fanjul, J. Terradas. Low frequency sea level variability in the Mediterranean Sea: the contribution of atmospheric pressure and wind. Global and Planetary Change, 63, 215-229, doi: 10.1016/j.gloplacha. 2008.06.005.

González, M., R. Medina, A. Espejo, J. Tintoré, D. Martín, A. Orfila. Morphodynamic evolution of sand mining pits in the Balearic Islands. Marine Geology (submitted).

Infantes, E., J. Terrados, A. Orfila, B. Cañellas, A. Álvarez-Ellacuria. Wave energy and the upper depth limit distribution of Posidonia oceanica. Botanica Marina (in press).

Javaloyes, J., S. Balle. Emission directionality of Semiconductor Ring Lasers: a Travelling-Wave description. IEEE J. Quantum Electron (in press).

Jordi, A., J.M. Klinck, G. Basterretxea, A. Orfila, J. Tintoré. Estimation of shelf-slope exchanges induced by frontal instability near submarine canyons J. Geophys. Res. 2008 Vol. 13, 5016.

Onken, R., A. Álvarez, V. Fernández, G. Vizoso, J. Tintoré, Haley, P. E. Nacini. A forecast experiment in the Balearic Sea. 2008. J. of Marine Systems. Vol 71, 79-98.

Pascual, A., M. Marcos, D. Gomis. Comparing the sea level response to pressure and wind forcing of two barotropic models: validation with tide gauge and altimetry data. 2008. J. Geophys. Res., 113, C07011, doi:10.1029/2007JC004459.

Pascual, A., C. Boone, G. Larnicol, P.-Y. Le Traon. On the quality of real time altimeter gridded fields: comparison with in situ data. Journal of Atmospheric and Oceanic Technology (in press).

Ruiz, S., D. Gomis, M.G. Sotillo, S.A. Josey. Characterization of surface heat fluxes in the Mediterranean sea from 44-year high-resolution atmospheric data set. REF. Global and Planetary Change, 63, 258-274. doi:10.1016/j.gloplacha.2007.12.002. 2008.

Ruiz, S., A. Pascual, B. Garau, Y. Faugere, A. Álvarez, Tintoré J. Mesoscale dynamics of the Balearic front integrating glider and satellite data. Journal of Marine Systems (in press).

Simarro, G., A. Orfila, P.L.F. Liu. Bed shear stress under turbulent wave-current boundary layers. 2008. Journal of Hydraulic engineering, ASCE 134(2), 225-230.

Sánchez-Naves, J., L. Furfaro, O. Piro, S. Balle. Impact and permanence of LASIK induced structural changes in the cornea on pneumotonometric measurements: contributions of flap cutting and stromal ablation, J. of Glaucoma. 19, 611-618.

Sangrà, P., A. Pascual, A. Rodríguez-Santana, F. Machín, E. Mason, J.C. McWilliams, J.L. Pelegrí, C. Dong, A. Rubio, J. Arístegui, A. Marrero-Díaz, A. Hernández-Guerra, A. Martínez-Marrero, M. Auladell. The Canary Eddy Corridor: a major pathway for longlived eddies in the subtropical North Atlantic. Nature Geosciences (submitted).

Simarro, G., A. Orfila. Boundary layer effects on the propagation of weakly nonlinear waves. In Advances in Ocean and Coastal Engineering, World Scientific (in press).

Simarro, G., A. Orfila, Liu, P. L. 2007. Wave current turbulent boundary layer. Journal of Hydraulic Engineering (in press).

Tsimplis, M.N., M. Marcos, S. Somot, A. Pascual. On the causation of sea level rise in the Eastern Mediterranean during the 1990s. Journal of Marine Systems. (in revision).

Papers published in journals not present in ISI SCI, proceedings and/or book chapters during 2008

Alonso del Rosario, J.J., A. Pascual, J. Gómez-Enri, A. Tejera, P. Villares, M. Arias Balle. Altimetría. Oceanografía por Satélite: Fundamentos y aplicaciones. Editorial Tébar (in press).

Balaguer, P., J.J. Fornós, L. Gómez-Pujol. Determinación del retroceso de los acantilados en las bahías de Alcúdia y Pollença por georreferenciación lineal.

Trabajos de Geomorfología en España, 2006-2008. Ed. Gracia, F.J. et al., Sociedad Española de Geomorfología, 331-334.

Bouffard, J., L. Roblou, F. Birol, A. Pascual, L. Fenoglio-Marc, M. Cancet, R. Morrow, Y. Ménard. Assessment of improved coastal altimetry strategies over the NMW Sea. Costal altimetry. S. Vignudelli, A. Kostianoy, P. Cipollini and J. Benveniste Eds. Springer-Verlag (submitted).

Diedrich, A, J. Tintoré, F. Navinés, V. Tur and E. Tortosa. Sistema de Indicadores para la Gestión Integrada de la Zona Costera (GIZC) de las Illes Balears. 2008. Dictamen 5/2007 del Consell Econòmic i Social de les Illes Balears. Consell Econòmic i Social de les Illes Balears, Palma de Mallorca. ISBN 978-84-612-8329-3.

Diedrich, A. The Impacts of Tourism in Belize: An Assessment of the Impacts of Tourism Development in Six Coastal Communities in Belize, Central America. VDM Verlag. 2008. ISBN 9780542944185.

Fornos, J.J., L. Gómez-Pujol, V.M. Rosselló, F. Segura, J.E. Pardo, M. Van Strydonck. El mantell eòlic de ses Arenes (Ciutadella de Menorca): dades preliminars i primeres datacions. 2008. Boll. Soc. Hist. Nat. Balears, 50, 237-248.

Gómez-Pujol, L., J.J. Fornós, R.J. Pope, L. Clemmensen. Los abanicos aluviales litorales del NE de Mallorca: morfometría y arquitectura de facies. Trabajos de Geomorfología en España, 2006-2008. Ed. Gracia, F.J. et al., Sociedad Española de Geomorfología, 343-346.

Gonzalez Calleja, M., M. Fuster, Ll. Gómez-Pujol, M. Ruiz, J. Vallespir, M. Nadal, P. Balaguer. Construcción de un nodo científico IDE litoral para dar "Las nuevas técnicas de información geográfica al servicio de la gestión de zonas costeras: Análisis de la evolución de playas y dunas", Universidad Politécnica de Valencia, ISBN 978-84-8363-336-6.

Sánchez-Naves, J., S. Balle. Tomograía Optica de Coherencia, to appear in Revista de los Laboratorios Thea, issue 12. 2008.

Tsimplis, M.N., A.G.P.S. Shaw, Pascual A., M. Marcos, M. Pasaric, Fenoglio-Marc, L. Can we reconstruct the 20th century sea level variability

in the Mediterranean Sea on the basis of recent altimetric measurements? Remote Sensing of European Seas. Barale, Vittorio; Gade, Martin (Eds.). XXII, 514p. 2008. ISBN 978-1-4020-6771-6. Springer.

3.3.2. 2007

Papers published in international peer reviewed journal (ISI, SCI)

Álvarez, A., A. Orfila, G. Basterretxea, J. Tintoré, G. Vizoso and A. Fornes. Forecasting front displacements with a satellite based ocean forecasting (SOFT) system. 2007. Journal of Marine Systems, Volume 65, Issues 1-4, 299-313.

Álvarez, A., R. Pennel, B. Garau, J. Tintoré. A fourier transform path integral formalism to compute dispersion probability distributions in variable ocean. Geophys. Res. Lett., 34 L17605, 2007.

Basterretxea, G., A. Orfila, A. Jordi, J. Fornós, J. Tintoré. Evaluation of a small volume renourishment strategy in a narrow Mediterranean beach. 2007. Geomorphology. Vol. 88, 139-151.

Cañellas, B., A. Orfila, F. Méndez, M. Menéndez, J. Tintoré. Application of POT model to estimate the extreme significant wave height levels around the Balearic Sea (NW Mediterranean). 2007. Journal of Coastal Research, SI 50 329 - 333. ISBN 0749.0208.

Deudero, S., A. Box, D. March, J.M. Valencia, A.M. Grau, J. Tintoré, M. Calvo, J. Caixach. Organic compounds temporal trends at some invertebrate species from the Balearics, Western Mediterranean. 2007. Chemosphere, 68 (9), 1650-1659.

Deudero, S., A. Box, J.M. Valencia, A. Grau, J. Tintoré, Benedicto, J. Temporal trends of metals in benthic invertebrate species from the Balearic Islands, Western Mediterranean. 2007. Marine Pollution Bull. Vol. 54, N. 9,1545-1558.

Emelianov, M., J. Font, A. Turiel, C. Millot, J. Sole, P. Poulain, A. Julia, M. Vitria. 2006. Transformation of Levantine Intermediate Water tracked by MEDARGO oats in the Western Mediterranean. Ocean Science, 2, 291-304. EGU publications.

Gómez-Pujol, L., A. Orfila, B. Cañellas, A. Álvarez-Ellacuria, F.J. Méndez, R. Medina, J. Tintoré. 2007. Morphodynamic classification of sandy beaches in low energetic marine environment. Marine Geology Vol. 242, 4, 17, 235-246.

Gómez-Pujol, L., W.J. Stephenson, J.J Fornós. Two-hourly surface change on supra-tidal rock (Marengo, Victoria, Australia). Earth Surface Processes and Landforms, Vol. 32, Issue: 1, 1-12.

Javaloyes, J., S. Balle. Influence of thermal effects on Cross Gain modulation characteristics in VCSOA IEEE J. Quantum Electron, 43, 65-71 (2007).

Marino, F., F. Marín, S. Balle, and O. Piro. Chaotically spiking canards in an excitable system with 2D inertial fast manifolds. 2007. Phys. Rev. Lett. 98, 074104.

Martínez-Ribes, L., G. Basterretxea, M. Palmer, J. Tintoré. Origin and abundance of beach debris in the Balearic Islands. 2007. Scientia Marina. 71, 305-314.

Mulet, J., J. Javaloyes and S. Balle. Mode-locking of VECSELs by Crossed-Polarization Gain Modulation. 2007. IEEE J. Quantum Electron. 43, 786.

Mulet, J., M. Giudici, J. Javaloyes, and S. Balle. Square-wave switching by crossed-polarization gain modulation in vertical-cavity semiconductor lasers. 2007. Phys. Rev. A 76, 043801.

Nieves, V., C. Llebot, A. Turiel, J. Sole, E. García-Ladona, M. Estrada, D. Blasco. 2007. Common turbulent signature in sea surface temperature and chlorophyll maps. Geophysical Research Letters, VOL. 34, L23602, doi: 10.1029/2007GL030823, 2007.

Orfila, A., G. Simarro, P.L.F. Liu. 2007. Bottom friction and its effects on periodic long wave propagation. Coastal Engineering, Vol. 54, 11, 856- 864.

Pascual, A., M-I. Pujol, G. Larnicol, P-Y. Le Traon, M-H. Rio. Mesoscale Mapping Capabilities of Multisatellite Altimeter Missions: First Results with Real Data in the Mediterranean Sea. 2007. Journal of Marine Systems. Vol. 65,190-211.

Rio, M-H., P-M. Poulain, A. Pascual, Mauri, E.G. Larnicol. A mean dynamic topography of the Mediterranean Sea computed from altimetric data and in-situ measurements. 2007. Journal of Marine Systems, 65, 484–508, doi: 10.1016/j.jmarsys. 2005.02.006.

Ruiz, S., D. Gomis, J. Font. Recovery of North-East Atlantic Temperatures fields from profiling floats: determination of the optimal float number from sampling and instrumental error analysis. 2007. Journal of Marine Systems. Vol. 65, 212- 223.

Simarro, G., A. Orfila. Boundary layer effects on the propagation of weakly nonlinear waves. In Nonlinear Wave Dynamics, World Scientific. ISBN 978-981-270-903-5.

Sole, J., A. Turiel, J.E Llebot. 2007. Classication of Dansgaard-Oescher climatic cycles by the application of similitude signal processing. Physics Letters A, 366, Issue 3, 177-282.

Sole, J., A. Turiel, J.E. Llebot. 2007. Using Empirical Mode Decomposition to correlate paleoclimatic time-series. Natural Hazards and Earth System Sciences, Issue 7, 299-307.

Sotillo M. G., E. Álvarez-Fanjul, A. Jordi, M. I. Ferrer, J. Tintoré and J. Conde. The ESEOO Regional Ocean Forecast System: A new Spanish operational oceanographic tool. 2007. Geophysical Research Abstracts, Vol. 9, 07043.

Sotillo, M. G., A. Jordi, M.I. Ferrer, et al. The ESEOO regional ocean forecasting system. 2007. In Proceedings of the 17th International Offshore and polar engineering conference, Vol 1- 4, 1716-1722.

Papers published in journals not present in ISI SCI, proceedings and/or book chapters during 2007

Álvarez, A. Tecnologías marinas para la exploración del océano. 2007. Conferencias de la XXV semana de estudios del mar en Palma de Mallorca. ASESMAR. DL: M-40138-2007.

Álvarez A., B. Garau, A. Caiti. 2007. Combining networks of drifting profiling floats and gliders for adaptive sampling of the Ocean. IEEE Conference on Robotics and Automation. 157-162.

Álvarez, A. 2007. Tecnologías marinas para la exploración del océano. XXV Semana de estudios del mar. ASESMAR. Del 25/7 al 28/9. Palma de Mallorca.

Álvarez-Fanjul, E., I. Losada, J. Tintoré et al. The ESEOO project: Developments and perspectives for operational oceanography at Spain. In Proceedings of the 17th International Offshore and polar engineering conference, Vol 1- 4, 2007. 1708-1715.

Gómez-Pujol, L., A. Riera, A. Bujosa. Unravelling resident forest outdoor recreation patterns in Mallorca forests. Documents de Treball del CRE. Vol. 6, 1-9.

Martínez Ledesma, M., B. Garau Pujol, D. Roig Broman, A. Álvarez Díaz, J. Tintoré. Electronic design in a low-cost autonomous vehicle for coastal sea monitoring. MARTECH 2007, second international workshop on marine technology.

Martínez Ledesma, M., B. Garau Pujol, D. Roig Broman, A. Álvarez Diaz, J. Tintoré. Electronic design in a low-cost autonomous vehicle for coastal sea monitoring. MARTECH 2007, second international workshop on marine technology. ISSN 1697-2562.

Orfila, A. Interación océano-atmósfera. Estudios interdisciplinares en el Mediterráneo occidental. Conferencias de la XXV semana de estudios del mar en Palma de Mallorca. ASESMAR. DL: M-40138-2007.

Orfila, A. Los océanos: la última frontera. Conferencias de la XXV semana de estudios del mar en Palma de Mallorca. ASESMAR. Depósito Legal:M-40138-2007. Del 25/9 al 25/9. Palma de Mallorca.

Orfila, A. Los océanos: la última frontera. XXV Semana de estudios del mar, ASESMAR. Del 25/9 al 25/9. Palma de Mallorca.

Tintoré, J., A. Diedrich, G. Vizoso, S. Pitarch. Gestión Integrada de Zonas Costeras basada en el conocimiento: un elemento clave para garantizar el turismo sostenible. En: "Turismo 2020", Fernando Prats edt. Revista del Instituto de Estudios Turísticos, nº 172-173. 2008. 198-203.

Tintoré, J. Oceanografía Operacional y nuevas fronteras del conocimiento en ciencias marinas. Conferencias de la XXV semana de estudios del mar en Palma de Mallorca. ASESMAR. DL: M-40138-2007. Del 25/9 al 25/9. Palma de Mallorca.

Tintoré, J. Oceanografía Operacional y nuevas fronteras del conocimiento en ciencias marinas. XXV Semana de estudios del mar, ASESMAR. Del 25/7 al 28/9. Palma de Mallorca.

3.3.3. 2006

Papers published in 2006 in international peer reviewed journal (ISI, SCI)

Flexas, M.M., D. Gomis, S. Ruiz, A. Pascual, P. León. In situ and satellite observations of the eastward migration of the Western Alboran Sea gyre. 2006. Progress in Oceanography, 70, 486-509.

Fornes, A., G. Basterretxea, A. Orfila, A. Jordi, A. Álvarez, J. Tintoré. Mapping Posidonia oceanica from Ikonos. 2006. ISPRS: Journal of Photogrametry and Remote Sensing, Elsevieer, 60: 315-322.

Fornós, J.J., P. Balaguer, B. Gelaber, L. Gómez-Pujol. Pleistocene formation, evolution and retreat rates of a carbonate coastal cliff (Mallorca Island, Western Mediterranean). 2006. Journal of Coastal Research, 49, 15-21.

Fornós, J.J., G.X. Pons, L. Gómez-Pujol, P. Balaguer. The role of biological processes and rates of downwearing due to grazing organisms on Mallorcan carbonate coasts (Western Mediterranean). 2006. Zeitschrift für Geomorphologie N.F., Suppl. 144, 161-181.B. Garau;

A. Álvarez, Oliver, G. AUV navigation through turbulent ocean environments supported by onboard H-ADCP. 2006. Proceedings of the 2006 IEEE International Conference on Robotics and Automation, 3556-3562.

Gómez-Pujol, L., E.M. Cruslock, J.J. Fornós, J.O.H. Swantesson. Unravelling factors that control shore platforms and cliffs in microtidal coasts: the case of Mallorcan, Catalonian and Swedish coasts. 2006. Zeitschrift für Geomorphologie N.F., Suppl. 144, 117-135.

Gómez-Pujol, L., J.J. Fornós, J.O.H. Swantesson. Rock surface millimetre-scale roughness and weathering of supratidal Mallorcan carbonate coasts (Balearic Islands). Earth Surface Processes and Landforms, 31, 14, 1792-1801.

Javaloyes, J., J. Mulet, S. Balle. Passive mode-locking of lasers by crossed-polarization gain modulation. Phys. Rev. Lett. 97, 163902 (2006).

Jordi, A., M.I. Ferrer, G. Vizoso, A. Orfila, G. Basterretxea, Casas, B., A. Álvarez, Roig, D., B. Garau, Martínez, M., V. Fernández, Fornés, A., Ruiz, M., Fornós, J. J., Balaguer, P., Duarte, C. M., Rodríguez, I., Álvarez, E., Onken, R., Tintoré J. Scientific management of Mediterranean coastal zone: a hybrid ocean forecasting system for oil spill and search and rescue operations. Marine Pollution Bulletin. Vol.: 53, Issue: 5-7, 361-368.

Liu. P.L.-F., Simarro, G., Vandever, J., A. Orfila. Experimental and numerical investigation of viscous effects on solitary wave propagation in a wave tank. Coastal Engineering. Volume: 53, Issue: 2-3, 181-190.

Pascual, A., Y. Faugère, G. Larnicol, P-Y. Le Traon. Improved description of the ocean mesoscale variability by combining four satellite altimeters. 2006. Geophysical Research Letters, 33, L02611, doi: 10.1029.

Pedaci, F., S. Lepri, S. Balle, G. Giacomelli, M. Giudici, R. Jorge. Multiplicative noise in the longitudinal mode dynamics of a bulk semiconductor laser. Tredicce. Phys. Rev. E 73, 041101 (2006).

Van der Sande, G., M. Peters, I. Veretennicoff, J. Danckaert, G. Verschaffelt, S. Balle. The Effects of stress, temperature, and spin flips on polarization switching in vertical-cavity surface-emitting lasers. IEEE J. Quantum Electron. 42, 896 (2006).

Wang, X., A. Orfila, P.L.-F. Liu. Numerical simulation on tsunami run-up with a shallow water model. 2006. Advances in Coastal and Ocean Eng. Vol. 10, World Scientific, Singapore, 10.

Papers published in journals not present in ISI SCI, proceedings and/or book chapters during 2006

Caballero, A., A. Pascual, G. Larnicol. Variabilidad del nivel del mar en el Golfo de Vizcaya a partir de medidas altimétricas. Revista de teledetección. ISSN 1133-0953, Nº. 25, 35-39 (2006).

Jordi, A., G. Basterretxea, A. Orfila, J. Tintoré. Analysis of the circulation and shelf-slope exchanges in the continental margin of the northwestern Mediterranean. Ocean Science, 2, 173-181 (2006).

Martínez-Ribes, L., G. Basterretxea, L. Arqueros, A. Jordi, T. Estrany, J. M. Aguiló, J. Tintoré. Influence of wind on floating debris distribution in the Balearic Islands" In: Management of Natural Resources, Sustainable Development and Ecological Hazards. Brebbia C.A, Conti M.E., Tiezzi E. (eds) 99: 553-562 (2006).

Simarro, G., A. Orfila, Liu, P.L.-F. Near-shore sandbar migration. Proc. ICCE Conference. ASCE, World Scientific (2006).

3.3.4. 2005

Papers published in 2005 in international peer reviewed journal (ISI, SCI)

Barland, S., X. Hachair, M. Giudici, S. Balle, J.R. Tredicce, G. Tissoni L. Spinelli, L. Lugiato, M. Brambilla. Spatial decorrelation in broad-area edge-emitting semiconductor amplifiers. European Physical J. D 32, 75-82 (2005).

Basterretxea, G., E. Garcés, A. Jordi, M. Masó, J. Tintoré. Breeze conditions as a favouring mechanism of Alexandrium Taylori blooms at a Mediterranean beach. Estuarine Coastal and Shelf Science, 62, 1-12.

Fernández, V., D. Dietrich, R. Haney, J. Tintoré. Numerical simulations of the Mediterranean Sea using DIECAST ocean model: seasonal, interanual and natural variability. Progress in Oceanography, Elsevier 66, Nos 2-4, 321-340.

Furfaro, L., F. Pedaci, X. Hachair, M. Giudici, S. Balle, J. Tredicce. Modal switching in QW semiconductor lasers with weak optical feedback. IEEE J. Quantum Electron. 41, 609-618 (2005).

Gazeau, F., C. M. Duarte, J. P. Gatusso, C. Barrón, N. Navarro, S. Ruiz., Y.T. Prairie, M.Calleja, B. Delille, M. Frankignoulle, A.V. Broges. Whole-system metaboism and CO2 fluxes in a Mediterranean Bay dominated by seagrass beds (Palma Bay, NW Mediterranean). Biogeosciences, 2, 43-60.

Gomis, D., A. Pascual, M.A. Pedder. Errors in dynamical fields inferred from synoptic oceanographic cruise data. Part II: the impact of the lack of synopticity. J. Marine Systems, 56/3-4, 334-351.

Hachair, X., L. Furfaro, J. Javaloyes, M. Giudici, S. Balle, J.R. Tredicce, G. Tissoni, L. Lugiato, M. Brambilla, T. Maggipinto. Cavity-solitons switching in semiconductor microcavities. Phys. Rev. A 72, 013815 (2005).

Jordi, A., A. Orfila, G. Basterretxea, Tintoré J. Coastal trapped waves in the northwestern Mediterranean. Continental Shelf Research, 25 (2), 185-196.

Jordi, A., A. Orfila, G. Basterretxea, J. Tintoré. Shelf-slope exchanges by frontal variability in a steep submarine canyon. Progress in Oceanography, 66, (2-4), 120-141.

Liu, P.L.-F., A. Orfila. Corrigendum to viscous effects on transient long-wave propagation. Journal of Fluid Mechanics, 537.

Marino, F., S. Balle. Excitable waves in semiconductor micro-resonators. Phys. Rev. Lett. 94, 094101 (2005).

Marino, F., L. Furfaro, S. Balle. Cross-gain modulation in a broad-area vertical-cavity semiconductor optical amplifier. Appl. Phys. Lett. 86, 151116 (2005).

Mulet, J., S. Balle. Mode-locking dynamics in electrically-driven vertical-external-cavity surface-emitting lasers. IEEE J. Quantum Electron. 41, 1148-1156 (2005).

Orfila, A., A. Álvarez, J. Tintoré, A. Jordi, G. Basterretxea. Climate teleconnections at monthly time scales in the Ligurian sea inferred from satellite data. Progress in Oceanography, 66. Issues 2-4, 157-170.

Orfila, A., A. Jordi, G. Basterretxea, G. Vizoso, N. Marbà, C. Duarte, F.E. Werner, J. Tintoré. Residence Time and Posidonia oceanica in Cabrera National Park, Spain. Continental Shelf Research, 25 (11).

Palanques, A., E. García-Ladona, D. Gomis, J. Martín, M. Marcos, A. Pascual, P. Puig, J.M. Gili, M. Emelianov, S. Monserrat, J. Guillén, J. Tintoré, M. Segura, S. Ruiz, G. Basterretxea, J. Font, A. Jordi, D. Blasco, F. Pagès. A multidisciplinary program to study the dynamics and the ecology of a North-western Mediterranean submarine canyon: The Palamós Canyon. Progress in Oceanography, 66, 2-4, 89-119.

Tintoré, J., A. Álvarez, R. Onken. Mediterranean physical oceanography and biogeochemical fluxes: Mediterranean general circulation. Editors. Progress in Oceanography, 66, Nos 2-4, 87-89.

Van der Sande, G, J., Danckaert, I. Veretennicoff, K. Panajotov, S. Balle. Analytical approximation for the quantum well gain and refractive index spectra of vertical-cavity surface-emitting lasers including the effect of uniaxial planar stress. Phys. Rev. A 71, 063801 (2005).

Vélez-Belchí, P., J. Tintoré, M. Vargas, J.C. Gascard. Observation of a western alborán gyre migration event. Progress in Oceanography, 66, Nos 2-4, 190-210.

Papers published in journals not present in ISI SCI, proceedings and/or book chapters during 2005

Garau, B., A. Álvarez, G. Oliver. Path planning of autonomous underwater vehicles in current fields with complex spatial variability: an A* Approach. Proceedings of the 2005 IEEE International Conference on Robotics and Automation, 195-199.

Liu, P.L.-F., G. Simarro, A. Orfila. Onshore sandbar migration. Proceedings Asian and Pacific Coasts (APAC) conference (2005).

Orfila, A., G. Simarro, X. Wang and Liu, P.L.-F. Numerical simulations of wave propagation with viscous effects. Proceedings of the 2005 Waves Conference, ASCE.

Richter, A., M. Marcos, S. Monserrat, D. Gomis, S. Ruiz, G. Liebsch, R. Dietrich. Comparison and combination of coastal and off-shore tide gauge measurements. Journal of Marine Geodesy, 28, 271-289.

Sánchez-Naves, J., L. Furfaro, S. Balle. Astigmatismos irregulares. Revista de los Laboratorios Thea. 11 (2005).

Simarro, G., A. Orfila, Liu, P.L.-F. Viscous effects on the propagation of solitary wave in a wave tank: A Numerical Model. Proceedings of the 2005 Waves Conference, ASCE.

3.3.5. 2004

Papers published in 2004 in international peer reviewed journal (ISI, SCI)

Álvarez, A., A. Caiti, R Onken. Evolutionary path planning for autonomous underwater vehicles in a variable ocean. IEEE Journal of Oceanic Enginnering Volume: 29, 2, 418-429.

Álvarez, A., A. Orfila, J. Tintoré. Real-time forecasting at weekly time scales of the SST and SLA of the Ligurian Sea with a satellite based ocean forecasting (SOFT) system. Journal of Geophysical Research, AGU. 109, 1-11.

Basterretxea, G., E. Garces, T. Jordi, M. Masó, J. Tintoré. Breeze conditions as a favouring mechanism of Alexandrium Taylori blooms at a

Mediterranean beach. 2005. Estuarine Coastal and Shelf Science (A). 62, 1-12.

Basterretxea, G. A. Orfila, A. Jordi, B. Casas, P. Lynett, P.L.F. Liu, C.M. Duarte and J. Tintoré. Seasonal dynamics of a microtidal pocket beach with Posidonia oceanica seabeds (Mallorca, Spain). Journal of Coastal Research. 20 (4), 1155-1164.

Ciszak, M., F. Marino, R. Toral and S. Balle. Dynamical mechanism of anticipating synchronization in excitable systems. Phys. Rev. Lett. 93, 114102 (2004).

Dietricht, D., R. Haney, V. Fernández, S. Josey, J. Tintoré. Air-Sea fluxes based on observed annual cycle surface climatology and ocean model internal dynamics: a precise non damping zero phase lag approach applied to the Mediterranean Sea. 2004. J. Mar. Systems. 52, 145-165.

d'Ovidio, F., V. Fernández, E. Hernández-García, C. López. Mixing structures in the Mediterranean Sea from Finite-Size Lyapunov Exponents. Geophysical Research Letters, 31, L17203.

Furfaro, L., F. Pedaci, M. Giudici, X. Hachair, J.R. Tredicce, S. Balle. Mode-Switching in Semiconductor Lasers IEEE J. Quantum Electron. 40, 1365-1376 (2004).

González-Quirós, R., A. Pascual, D. Gomis, R. Anadón. Influence of mesoscale physical forcing on trophic pathways and fish larvae retention in the central Cantabrian Sea. Fisheries Oceanography, 13:5, 1-14.

Hachair, X., S. Barland, L. Furfaro, M. Giudici, S. Balle, J.R. Tredicce, Brambilla, M., Maggipinto, T., Ida, M., Perrini, Tissoni, G., Lugiato, L. A. Cavity solitons in broad-area vertical-cavity surface-emitting lasers below threshold. Phys. Rev. A 69, 043817(2004).

Jordi, A., A. Orfila, G. Basterretxea, J. Tintoré. Coastal Trapped Waves in the Northwestern mediterranean Sea. Continental Shelf Res. 25/2 185-196 (2004).

Liu, P.L.-F, A. Orfila. Viscous effects on transient long-wave propagation. J. Fluid Mech., 520, 83 – 92.

Marino, F., S. Balle. Experimental study of a broad area vertical-cavity semiconductor optical amplifier. Opt. Commun. 231, 325-330 (2004).

Marino, F., Catalán, G., Sánchez, P., Balle S., O. Piro. Thermo-optical "canard orbits" and excitable limit cycles. Phys. Rev. Lett. 92, 073901 (2004).

Pascual, A., D. Gomis, R.H. Haney, S. Ruiz. A quasi-geostrophic analysis of a meander in the Palamós Canyon: vertical velocity, geopotential tendency and a relocation technique. Journal of Physical Oceanography. 34, 2274-2287.

Sondermann, M., T. Ackemann, S. Balle, Mulet, J. Experimental and theoretical investigations on elliptically polarized dynamical transition states in the polarization switching of vertical-cavity surface-emitting lasers Panajotov. Optics Commun. 235, 421-434 (2004).

Yacomotti, A., L. Furfaro, Hachair, X., Pedaci, F., M. Giudici, Tredicce, J., Javaloyes, J., S. Balle, Viktorov, E.A., Mandel, P. Dynamics of multimode semiconductor lasers. Phys. Rev. A, 69, 053816 (2004).

Papers published in journals not present in ISI SCI, proceedings and/or book chapters during 2004

Álvarez, A., E. Hernández-García, J. Tintoré. On the topographic rectification of ocean fluctuations. Instabilities and Nonequilibrium Structures VII & VIII, edited by Orazio Descalzi, Javier Martínez, and Enrique Tirapegui, Kluwer academic publishers, Dordrecht, 133-139.

Fornés, A., G. Basterretxea, A. Jordi, G. Vizoso, B. Casas, M.I. Ferrer, J. Tintoré. L'ús dels Sistemes d'Informació Geogràfica en la recerca i gestió del medi ambient marí i costaner. IV Jornades de Medi Ambient de les Illes Balears, Societat d' Història Natural de les Balears, 219-221.

Jacob, M., J. Tintoré, R. Simonet, E. Aguiló. Pautas de innovación en el sector turístico balear. Estudios Cotec, Madrid, COTEC nº25.

Martínez, M., D. Roig, T. Garau, G. Vizoso, A. Álvarez, J. Tintoré, G. Oliver. CORMORAN: Un submarino autónomo para el estudio de las aguas litorales de Baleares. IV Jornades del Medi Ambient de les Illes Balears, Societat d' Història Natural de les Balears, 210-212.

Orfila, A., G. Vizoso, A. Álvarez, R. Onken, A. Jordi, G. Basterretxea, V. Fernández, B. Casas, A. Fornes, J. Tintoré. La respuesta científica ante el vertido del buque Prestige: oceanografía operacional en España y la experiencia del IMEDEA. Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales, 98 (1), 191-207.

3.3.6. 2003

Papers published in 2003 in international peer reviewed journal (ISI, SCI)

Álvarez, A. Performance of satellite based ocean forecasting (SOFT) systems: A study in the Adriatic Sea. Journal of Atmospheric and Oceanic Technology, 20 (5), 717-729.

Barland, S., M. Giudici, J.R. Tredicce, S. Balle. Procesado óptico de información. Solitones de cavidad. Investigación y Ciencia, 38-40 (2003).

Barland, S., F. Marino, M. Giudici, J.R. Tredicce, S. Balle. In-situ measurement of the cavity resonance gradient in a single broad-area. VCSEL Appl. Phys. Lett. 83 2303-2305 (2003).

Cara, M., L. Occhi, S. Balle. Modelling and measurement of the wavelength dependent output properties of quantum-well optical amplifiers. IEEE J. Sel. Topics in Quantum Electron. 9,783-787 (2003).

Jacob, M., J. Tintoré, E. Aguiló, A. Bravo, J Mulet. Innovation in the Tourist sector: results from a pilot study in the Balearic Islands. Tourism Economics, 9 (3), 279-295.

Marino, F., S. Barland, S. Balle. Photon. Single-mode operation and transverse mode control in VCSELs induced by frequency selective feedback 2003. Technol. Lett. 15, 789-791.

Pascual, A., D. Gomis: Use of surface data to estimate geostrophic transport. J. Atmos. Ocean. Tech., 20, 912-926 (2003).

Sellschopp, J. A. Álvarez. Dense low-salinity outflow from the Adriatic Sea under mild (2001) and strong (1999) winter conditions. Journal of Geophysical Research-Oceans. 108, C9, Article Number 8104.

Sondermann, M., M. Weinkath, T. Ackemann, J. Mulet, S. Balle. Two-frequency emission and polarization dynamics at lasing threshold in vertical-cavity surface-emitting lasers. Phys. Rev. A 68, 033822(11) (2003).

Stephane, B., P. Oreste, G. Massimo, R, Tredicce, S. Balle. Experimental evidence of van der Pol-Fitzhugh-Nagumo dynamics in semiconductor optical amplifiers. Phys. Rev. E 68 036209(6) (2003).

Papers published in journals not present in ISI SCI, proceedings and/or book chapters during 2003

Aguiló, E., M. Jacob, J. Mulet, R. Simonet, J. Tintoré, E. Tortosa. La innovación medioambiental como un factor de competitividad de las empresas turísticas de Baleares. En Serie de Estudios Regionales, Islas Baleares. BBVA Edt., BBVA. ISSN 02143-2273 (2003).

Álvarez, A., A. Orfila, J. Sellschopp. Satellite based forecasting of sea surface temperature in the Tuscan Archipelago. International Journal of Remote Sensing, 11, 2237-2251.

Fornés, A., A. Orfila, G. Basterretxea, A. Jordi, F. Moral, A. Álvarez, G. Vizoso, B. Casas, C. Duarte, J. Tintoré. The IMEDEA M&CGIS: A GIS based interdisciplinary tool for scientific management of the coastal zone. Proceedings of CoastGIS'03. Fifth International Symposium on GIS and Computer Cartography for Coastal Zone Management.

Jacob, M., J. Tintoré, R. Simonet. Turismo e innovación. El papel social de la ciencia en Baleares: un homenaje a Javier Benedí. C. M. Duarte y F. Grases edt, UIB, 224-226. ISBN 84-7632-845-1.

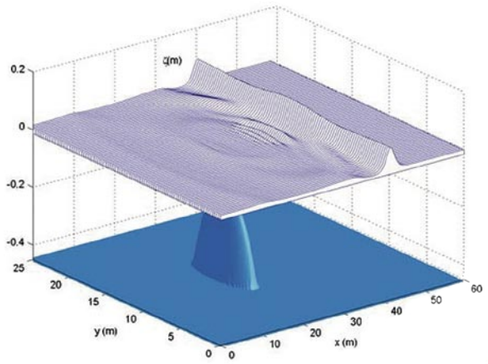
Jacob, M., E. Aguiló, J. Tintoré, J. Alegre, A. Costa, J. Lozano, LL. Pou, A. Riera, J. Rosselló, M. Tugores, R. Simonet. El papel social de la ciencia en Baleares: Un homenaje a Javier Benedí, Carlos M. Duarte y Félix Grases edts, UIB, 215-234. ISBN 84-7632-845-1.

Pascual Ascaso, A. Different approaches to the circulation in the Balearic Sea: from satellite data to QG dynamics. PhD thesis. Dir. Damià Gomis Bosch, UIB.

Ruiz, S., D. Gomis, J. Font. 3-D EOF-based spatial analysis of Gyroscope observations in the North Atlantic Ocean. Building the European Capacity in Operational Oceanography - Proceedings of the Third Internacional Conference on EuroGOOS. Ed. by Elsevier. 69, 513-515.

Tintoré, J. Ciencia y Medio Ambiente en el siglo XXI: el reto del desarrollo sostenible. El papel social de la ciencia en Baleares: un homenaje a Javier Benedí. C. M. Duarte y F. Grases edt., UIB, 45-49. ISBN 84-7632-845-1.

Tintoré, J., M. Jacob, C. Duarte. Medi ambient i Sostenibilitat a les Illes Balears: Un Repte pel Segle 21. En Informe Econòmic i Social de les Illes Balears 2002. A. Riera Edt., Caixa de Balears, Sa Nostra , 594-600. ISBN 84-96031-21-7.



Numerical simulation of nonlinear waves propagation over a submerged shoal

3.4. Awards

- Jacob, M., J.L. Groizard: II Premio a la investigación Fundación Cátedra Iberoamericana – UIB. Título: Innovación, transferencia de tecnología y desarrollo. Estudio de las contribuciones de las empresas hoteleras de origen balear en las economías latinoamericanas. Enero 2003.
- Tintoré, Joaquín: Premio Nacional Alejandro Malaspina en Ciencias y Tecnologías de los Recursos Naturales. 3-noviembre de 2003.
- ASESMAR mejor ponencia Palma 2007, Dr. Alberto Álvarez.

3.5. Patents

- DARWIN: Modelización de procesos caóticos mediante algoritmos genéticos. Número de solicitud: EVBPM28330. País de prioridad: U.E. 2002. Álvarez, A.; Orfila, A.; Tintoré, J.
- Patente nº P200601134, Oficina Española de Patentes y Marcas. Título: Método y dispositivo para la producción de pulsos láser ultracortos, depositada en Mayo 2006.
- Patente española solicitada nº P200702282. Título: Robot submarino operado por control remoto. Titular: CSIC y UIB. 14/08/2007.
- Solicitud de la PCT. Número de presentación: 300001270. Solicitud Número PCT: PCT/ES2008/070162 . Título: Robot submarino operdo por control remoto. Titular: CSIC y UIB. Fecha de recepción: 12 agosto 2008. Oficina Receptora: Oficina Española de Patentes y Marcas, Madrid.

3.6. Conferences

We present here the invited presentations of 2007 and 2008. More details on other presentations (oral and posters) can be found at http://www.imedea.uib-csic.es/tmoos.

2008

Bouffard, J., A. Pascual. Coastal altimetry applications in Europe. Second coastal altimetry workshop. Pisa, Italy, 2008.

Diedrich, A., J. Tintoré, G. Vizoso. Balancing Science and Societal Needs through Establishing Locally Relevant Indicators for Sustainability in the Coastal Zone of the Balearic Islands. Invited Participant of the ENCORA Workshop on Public Participation and Implementation of ICZM. Littoral 2008. A Changing Coast: Challenge for the Environmental Policies. Venice, Italy. 2008.

Onken, R., J. Tintoré, G. Vizoso, A. Álvarez. Presence and future of a coastal forecasting system in the Balearic sea. EGU-2008, Vienna, Austria. 2008.

Pascual, A. Outreach activities on satellite altimetry in the Balearic Islands. Ocean Surface Topography (OSTST) Meeting. Nice. 2008

Tintoré, J. La GIZC: Un proceso de mejora continua de la gestión del litoral basado en los principios de sostenibilidad, los avances científicos y los nuevos sistemas de observación y predicción costeros.1er Congreso Mediterráneo de Gestión del Litoral. Ibiza, España. 2008.

Tintoré, J. Science based integrated coastal zone management: the Balearic Islands case Congress: Patrimoni de la Humanitat, turisme I Canvi Climàtic. Ajuntament d' Eivissa. 2008.

Tintoré, J. El sistema d'observació i predicció costaner del litoral de les Illes Balears. I Jornades de Transport Marítim, Palma. 2008.

2007

Tintoré, J., A. Diedrich. Science-Based Integrated Coastal Zone Management (ICZM) in the Balearic Islands. International Symposium on Integrated Coastal Zone Management. Arendal, Norway. 2007.

Orfila, A. Los océanos: la última frontera. XXV Semana de estudios del mar, ASESMAR. 2007.

Pascual, A., A. Álvarez, A. Orfila, G. Vizoso, B. Casas, T. Garau, M. Martínez-Ledesma, G. Basterretxea, S. Ruiz, J. Solé, T. Jordi, J. Tintoré. An International coastal ocean technological observatory in the Balearic Islands: The relevance of improved satellite altimeter products for regional applications. 2007 GODAE Coastal Workshop "Assessing the value of GODAE products in coastal and shelf seas". 2007.

Tintoré, J. Oceanografía Operacional Y Nuevas Fronteras Del Conocimiento En Ciencias Marinas. XXV Semana de estudios del mar, ASESMAR. 2007.

Álvarez, A. Tecnologías Marinas. En Ciencias Marinas. XXV Semana de estudios del mar, ASESMAR. 2007.

Deployment of a glider in the Mediterranean Sea

3.7. Fieldwork

2008

S. Ruiz. Campaña Canoa 08. Jefe de Campaña: J.L. Pelegrí, B/O Sarmiento de Gamboa, (zona de estudio: Sección Cadiz-Canarias-Cabo Verde), 28 días. From 02/11 to 29/11. 2008.

Gómez-Pujol, Ll. Dataciones de dunas norte de Menorca. From 02/12 to 07/12. 2008.

S. Ruiz, J. Tintoré. Participantes del IMEDEA: M. Martínez, B. Casas, B. Garau, M. Bonet. Embarcaciones FAM-Cartagena. Zona de estudio: Alborán Oriental. From 04/07 to 21/07. 2008.

Orfila, A. ESSASI. From 01/01 to 25/01. 2008.

Garau, B., Martínez, M., Casas, B., Bonet, M., A. Pascual, Vidal-Vijande, E., Tinturé, J. Coordinador programa: Ruiz, S. Programa observacional de gliders (muestreo bimensual), embarcación IMEDEA. Zona de estudio: Frente Balear. From 05/02 to 27/08. 2008.

2007

Álvarez, A., T. Cañellas, B Casas. Campaña morfodinamica Cala Millor. Transectos y linea de costa (periodicidad trimestral). From 14/3 to 14/3. 2007.

Álvarez, A., B. Casas, C. Castilla, P. Balaguer, G. Zarruk, A. Orfila, E Vidal. Campaña Cala Millor. Toma de datos batimetricos, y colocación de correntimetros y adcps en cala millor. From 17/9 to 20/9. 2007.

Álvarez, A., B. Cañellas. Campaña linea costa Cala Millor. Del 23/3 al 23/3. 2007.

Gomis, D., M.M. Flexas, A. Orfila, B. Jordà, M. Marcos, B. Casas. ESASSI. From 28/12 to 23/1. 2007.

Jordà, G., D. Gomis. Description of the SMOS L3 algorithm for Sea Surface Salinity. SMOS Observing Land Moisture and Salt in the Ocean - CAL VAL Workshop. From 19/11 to 23/11. 2007.

Ruiz, S., B. Garau, M. Martínez, A. Pascual, B. Casas, G. Vizoso, A. Álvarez, J. Tintoré, E. Vidal-Vijande. Mesescala del frente Balear- Calibración Envisat. Programa observacional frente Balear con glider costero. From 1/6 to 31/12. 2007.

Ruiz, S., B. Garau, M. Emelianov, M. Martínez, G. Zarruk, G. Vizoso, Y. Faugere, T. Cañellas, E. Vidal, A. Arias, R. Samacoits, A. Pascual, J. Tintoré. South Mallorca 2007 Coastal Ocean Study. Campaña oceanográfica B/O García del Cid y planeador submarino costero. From 6/6 to 12/6. 2007.

3.8. Transfer of knowledge

There are two important contributions in this section. The first one is related to the more technologically oriented transfer, technologies and innovation related to products that can later appear in the market. The second one is related to services and "know how", more related to innovation in services (services sector, tourism, etc. for example) which is transferred for example to administrations and/or policy makers.

3.8.1. Technology transfer

The TMOOS team develops new technologies such as for example (AUV's, coastal ROVs, buoys, remote sensing beach monitoring system, etc) which are transferred to end user's through the spin off company (participated by CSIC and UIB), Albatros Marine Technologies (AMT).

At present, following guidance from CSIC Technology Transfer (Dr. Juan Castro, Dr. Jose Luis de Miguel), we are in the process finalizing two specific agreements:

1st) Licensing Agreement between IMEDEA and AMT S.L. in order to transfer knowledge related to the exploitation of a ROV (Remote Operated Vehicle).

2nd) Licensing Agreement between IMEDEA and AMT S.L. in order to transfer knowledge related to the exploitation of lagrangian buoys (being negotiated).

3.8.2. Know how transfer, innovation:

In the period 2003-2007, we have been quite active also in transferring know how to society, in particular:

- Beach safety: development of a Hazard Alert System (HAS) in the Balearic Islands. Transferred to the Balearic Government (Emergencies Dept., specific agreement signed with CSIC) in early 2008 and in use since then.
- Rip Current forecasting system. Transferred to the Balearic Government (Emergencies Dept., specific agreement signed with CSIC) in 2007 and in use since then.
- Oil Spill Operational modelling. Alert and Risk mitigation. Transferred to the Balearic Government (Emergencies Dept., specific agreement signed with CSIC) in 2007 and in use since then.
- Coastal Zone characterization and Environmental Sensitivity Index for Oil spill. Transferred to the Balearic Government (Emergencies Dept., specific agreement signed with CSIC) in 2007 and in use since then.
- Innovation in Services studies carried out during 2003 and 2004 under request from COTEC Foundation (one of the leading and more respected Foundations in Spain and Europe in the area of Innovation). Specific agreement signed with CSIC.

Jason-1 satellite altimeter

More recently, during 2007 and 2008, we have established:

- Collaboration with the Consell Econòmic i Social (Council where Government, Chambers of Commerce, Unions, etc. are represented), that, after one year of joint work at different Commissions from CES level, has lead to the publication of the "Dictamen del CES" ("dictum") number 5/2007, related to a Indicators Panel System for the ICZM in the Balearic Islands.
- Collaboration with the Cámara de Comercio, Indústria y Navegación de Mallorca (11/2007-6/2009), to carry a research project to establish the potential limit to growth in the Balearic Islands.
- We are also members of the Spanish Working Group for the Implementation of Integrated Coastal Zone Management, AENOR, 2008. Coordinated by AENOR and Autoridad Portuaria de Gijón (Juan Luis Domenech). Participants IMEDEA; J. Tintoré, A. Diedrich.

3.9. Training

Training is an essential component of TMOOS research activities.

Accordingly, we are supervising different PhD thesis (6 ongoing), and participate in an international exchange Programme with French Engineering Schools (3 months at IMEDEA, after 4 years of studies), since 1998.

More recently, since 2005, we have been establishing close contacts with the UIB Engineering School, and have already now a PhD student that will be defending his thesis during the end of 2008. The TMOOS Department also hosts continuously students completing their MSc thesis in the frame of the research line projects.

We maintain close collaborations with former personnel of the Department which are presently in other (national or international) organizations. The permanent members of TMOOS also actively participate in different Master and PhD programmes and are frequently members of Thesis Committees.

3.9.1. Master thesis 2003-2008

Title: Internal variability in the Mediterranean Sea using DIECAST ocean model
Master student: Vicente Fernández
University: UIB (Physics Dept.)
Year: 2003
Director: J. Tintoré

Title: Coastal trapped waves in the northwestern Mediterranean Sea
Master student: Antoni Jordi
University: UIB (Physics Dept.)
Year: 2005
Director: J. Tintoré

Title: Beach and surf zone hydrodynamics: numerical and experimental analysis
Master student: Amaya Álvarez
University: UIB (Physics Dept.)
Year: 2008
Director: A. Orfila

Title: Wave climate characterization in the Balearic sea: hazardous extreme events
Master student: Tomeu Cañellas
University: UIB (Physics Dept.)
Year: 2008
Director: A. Orfila

3.9.2. PhD thesis 2003-2008

Title: Nonlinear modelling of natural processes with genetic algorithms
PhD student: Alejandro Orfila
University: UIB (Physics Dept.)
Year: 2003
Director: J. Tintoré and Dr. Alberto Álvarez

Title: Circulación de gran escala en el Mediterráneo y su relación con forzamientos anómalos
PhD student: Vicente Fernández
University: UIB (Physics Dept.)
Year: 2004
Director: J. Tintoré

Title: Circulación ageostrófica en frentes oceánicos
PhD student: Pedro Vélez
University: UIB (Physics Dept.)
Year: 2006
Director: J. Tintoré

Title: Shelf-slope exchanges through submarine canyons and implication on bio-geochemical fluxes
PhD Student: Antoni Jordi Ballester
University: UIB (Physics Dept.)
Year: 2006
Director: J. Tintoré

3.9.3. Ongoing PhD thesis:

Title: Beach and surf zone hydrodynamics: numerical and experimental analysis
PhD student: Amaya Álvarez-Eyacuria
University: UIB (Physics Dept.)
Director: A. Orfila

Title: Wave climate characterization in the Balearic sea: hazardous extreme events
PhD student: Tomeu Cañellas Moragues
University: UIB (Physics Dept.)
Director: A. Orfila

Title: A new type of highly non linear Boussinesq models for water wave from deep to shallow water
PhD student: Álvaro Galán Alguacil
University: Castilla la Mancha
Director: A. Orfila and G. Simarro (University of Castilla la Mancha)

Title: Hydrodynamic energy and distribution of sea grass species
PhD student: Eduardo Infantes Oanes
University: UIB (Biology Dept.)
Director: J. Terrados and A. Orfila

Title: Analysis of a 44 year hind cast for the Mediterranean sea: comparison with altimetry and in situ data
PhD student: Enrique Vidal Vijalde
University: Gran Canaria
Director: A. Pascual

Title: New techniques for path planning autonomous vehicles
PhD student: Bartolomé Garau Pujol
University: UIB (Computer Engineering Dept.)
Director: A. Álvarez

3.10. Popularization

Dissemination of science is one of the elements in which we have also been especially active. Some examples of these activities are:

- IMEDEA, Stand in the II Fira de la Ciència (Science Fair). Palma de Mallorca, 2003. Active participation in situ of TMOOS members.
- IMEDEA, Stand in the III Fira de la Ciència. Palma de Mallorca, 2004. Active participation in situ of TMOOS members.
- IMEDEA, Stand in the IV Fira de la Ciència. Palma de Mallorca, 2005. Active participation in situ of TMOOS members.
- IMEDEA, Stand in the V Fira de la Ciència. Palma de Mallorca, 2006. Active participation in situ of TMOOS members.
- IMEDEA, Stand in the VI Fira de la Ciència. Palma de Mallorca, 2007. Active participation in situ of TMOOS members.
- Convenio para el desarrollo de un programa de prácticas de estudios de formación de postgrado de la cátedra UNESCO en gestión empresarial y medio ambiente, entre el IMEDEA y el estudiante Pablo Homar Regnault de Maulmin. 2003.
- Organización de una exposición divulgativa itinerante: "Observacions des del satèl.lit ENVISAT: El nivell de la mar a les Illes Balears". Menorca, Mallorca, Ibiza. 2002.

More details on press releases, magazines, radio programmes, TV, and seminars can be found at www.imedea.uib-csic.es/tmoos

3.11. Internationalization

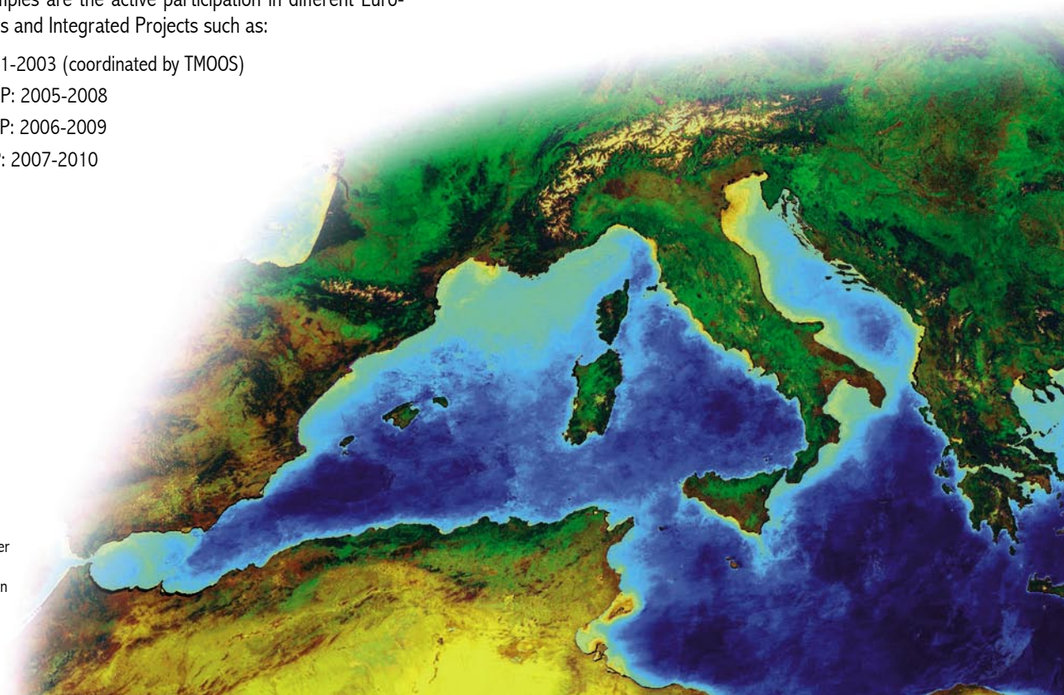
Internationalization is an essential component for TMOOS consolidation and opening new complementary research actions.

Specific examples are the active participation in different European Projects and Integrated Projects such as:

- SOFT, 2001-2003 (coordinated by TMOOS)
- MERSEA_IP: 2005-2008
- SESAME_IP: 2006-2009
- ECOOP_IP: 2007-2010

Also important is the structural relation with Prof. Dong-Ping Wang (SUNY, Stony Brook); Prof. Phil Liu and Prof. Edwin A. Cowen (Univ. of Cornell) in the area of near-shore studies; Prof. John Wilkin and Prof. Cisco E. Werner (Rutgers University) both on physical oceanography and numerical modelling; Dr. Reiner Onken (GKSS, Germany) in the field of operational oceanography; Prof. Pierre de Mey (LEGOS), Dr. Gilles Larnicol (CLS) and Dr. Pierre Yves Le Traon (IFREMER) in satellite and coastal oceanography; Dr. Lavinio Gualdessi (NURC, Italy) in engineering and new developments of marine technologies, Dr. Pierre Testor (LODYC) and Dr. Uwe Send (Scripps) in gliders implementation, among others.

At the same time, we participate actively in the MOON (Mediterranean Operational Oceanography Network) since 2005 when it was signed by all European Partners (CSIC, IFREMER, CNRS, CNR, HCMR, Mercator Océan, etc.). Joaquín Tintoré is Chairman



AVHRR vegetation index over land and CZCS ocean color phytoplankton concentration over sea in the Western Mediterranean

Glider missions performed by TMOOS team between July 2007 and August 2008

of the Scientific Steering Committee from MOON[9]. During 2007, a Data Exchange Agreement was signed and in 2008 a specific collaboration agreement between MOON Partners and REMPEC (UN Mediterranean) has been also signed. A. Pascual is member of the OST (Ocean Surface Topography Team). A. Orfila collaborates with the Universidad Javeriana in Bogotá through several projects as well as with the Naval Postgraduate School in Cartagena. A. Diedrich is member of the ICES Working Group on ICZM.

TMOOS has also organised several international meetings, workshops and courses, among others:

- First European Glider School, TMOOS-IMEDEA, Calanova, October 2007. 1 week.
- Advanced European Oil Spill Modelling Course. TMOOS-IMEDEA and NOAA-HAZMAT, June 2006

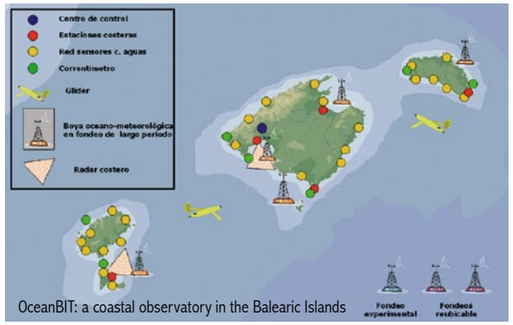
For the near future, we foresee a strengthening of the collaboration with French scientific institutions (MOOSE initiative) and space agencies (ESA and CNES). Members of the Department are referees of the main international peer review journals (Geophysical Research Letters, Journal of Geophysical Research, Journal of Marine Systems, Deep Sea Research, Journal of Climate, Global and Climate Change, Continental Shelf Research, etc.) as well as in international PhD committees.

[9] http://www.moon-oceanforecasting.eu/

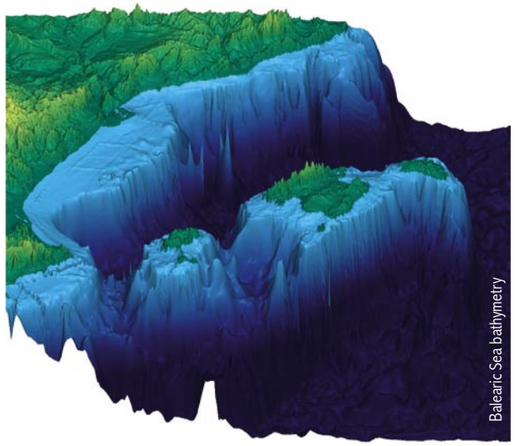
3.12. Relation to ICTS (large scale scientific and technological spanish facilities)

OceanBIT: an international coastal ocean observing and forecasting system based in the Balearic Islands

OceanBIT is a multi-platform distributed and integrated technological facility that will provide streams of oceanographic data and modelling services in support to operational oceanography in the Balearic Islands in a European and international frame, therefore also contributing to the needs of marine and coastal research in a global change context. Operational Oceanography is here understood in a wide sense, including both the systematic, long-term routine 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 priorities. OceanBIT activities will be mostly (but not only) centred in the western Mediterranean, with focus in the Balearic Islands and adjacent sub-basins (specifically Algerian and Alboran) and covering from the near-shore to the open ocean.



OceanBIT: a coastal observatory in the Balearic Islands



Balearic Sea bathymetry

Coastal ocean research and technology development in the Balearic Islands in the last 20 years have significantly contributed to understand different oceanographic problems of worldwide interest[10]. Therefore, the 'know how' capability exists. Also important are both the strategic position of the Balearic Islands in the Western Mediterranean Sea and the nature of this semi-enclosed sea, an ideal reduced scale ocean laboratory, where processes (thermohaline circulation, deep convection, shelf-slope exchanges, mesoscale and submesoscale dynamics, coastal interactions, etc.) can be studied at smaller scales than in other oceanic regions (Internal Rossby Radius of order 10 km). Physical mechanisms are thus better monitored and understood in this 'ocean basin', contributing then to the advancement of knowledge of physical interactions and biogeochemical coupling at near-shore, local, sub-basin and global scales.

OceanBIT basic principles are: scientific and technological excellence through peer review; science, technology and society driven objectives; support to R&D activities in the Balearic Islands (existing and new ones); integration, coordinated multiplatform, multidisciplinary and sustained (systematic, long term and different scales) monitoring, partnership between institutions; free, open and quality controlled data streams; baseline data in adherence to community standards;. More specifically, OceanBIT objectives are driven by state of the art international scientific and technological priorities but also, by specific interests from the Spanish and Balearic Islands society. The general objective is twofold: ❶ to address and respond to international scientific, technological and strategic challenges for operational oceanography in the coastal ocean and ❷ to vertebrate the coastal ocean operational oceanography research being carried out in the Balearic Islands, contributing to the consolidation of a well structured centre of excellence. Five specific objectives have been also identified and are further described in OceanBIT Programme: Scientific, Technological, Strategic (response to society needs), Transfer of Knowledge (including Outreach and Education) and Training and Mobility.

[10] Major Scientific Topics underlying OceanBIT initiative: specific peer reviewed contributions to understand different oceanographic problems of worldwide interest can be found in topics related to mesoscale and submesoscale dynamics, fronts, eddies and filaments induced vertical motions and biological effects, shelf-slope exchanges through canyons, interactions between basin and sub-basin scale circulation, mesoscale eddies blocking effects, satellite altimetry studies of interactions with large basin scale flows, inter-annual oceanic variability, influence on mesoscale circulation and relation with ocean climate variability at decadal scale, biogeochemical effects, internal-near inertial waves propagation in the coastal ocean, new forecasting systems successfully applied to different oceanic areas, coastal morphodynamics, wave-current interactions, beach erosion and sediment transport, seiches oscillations in harbours and relation to long trapped or edge atmospherically generated waves, and also technology implementation and development (including gliders, new coastal AUV's, ROV's, and buoys) or new ICZM initiatives in the frame of international based sustainability science. Results from this research, carried out in the frame of competitive projects mostly funded by EU, Spanish National R&D Plan and also Balearic Islands R&D Plan, were published in more than 100 publications in international journals. Under this research frame a Pilot Forecasting and Observing System in the Balearic Islands, first step towards OceanBIT, was established and is operational at IMEDEA since 2006.

On a long term, our vision is to advance on the understanding of physical and multidisciplinary processes and their non linear interactions, to detect and quantify changes in coastal systems, to understand the mechanism that regulate them and to forecast their evolution and or adaptation under, for example, different IPCC scenarios. OceanBIT will specifically address the preservation and restoration of the coastal zone and its biodiversity, the analysis of its vulnerability under global change and consider new approaches, such as connectivity studies and Marine Protected Areas optimal design to advance and progressively establish a more science based and sustainable management of the coastal area (ICZM).

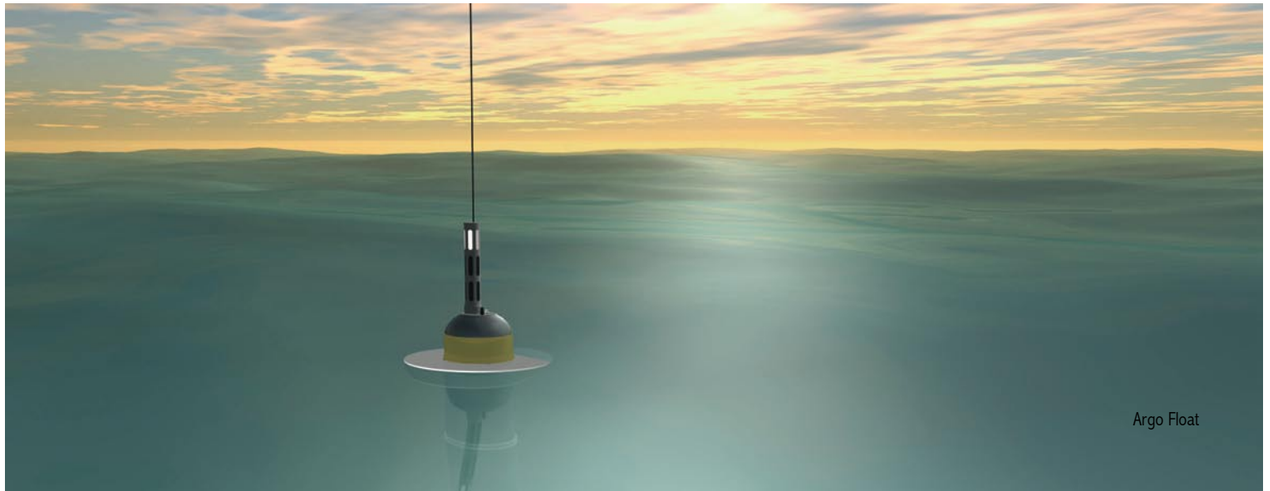
OceanBIT components will be therefore constituted by a sustained, spatially distributed, heterogeneous, potentially relocatable and dynamically adaptive observing network that will be integrated through data management and numerical methodologies to exploit the synergies between both the observational network (moorings network, surface velocity drifters, ARGO profilers, HF radar, gliders, AUV's, R/V's, VOS, etc.) per se and between the observational network and the numerical models (physical-waves and currents at different scales- and biogeochemical coupling) and assimilation tools, with the aim to provide a complete and integrated description of the physical and biogeochemical properties of the marine environment.

OceanBIT will be composed of three major subsystems: ❶ an observing sub-system, ❷ a forecasting and data assimilation sub-system and ❸ a data management, visualization and dissemination sub-system. It will allow real time monitoring and forecasting of the space-time variability of the coastal area. The development of new technology that can contribute to science-based sustainable management of the coastal region will also be considered as part of this initiative. OceanBIT, in close partnership with institutions, will **(a)** Operate and provide access to the Balearic Islands Observing and Forecasting System. **(b)** Offer open access to data to the national and international marine and coastal research communities. **(c)** Establish, operate and/or provide merit-based access to the research infrastructures of OceanBIT.

OceanBIT structure is original in that apart from the science driven objectives, it will also address technology and society driven objectives. Also original is that OceanBIT will have both static and relocatable facilities (the facilities make the observations that are specified by the nodes that provide the objectives[11]). The first ones will be mostly sustained in permanent locations (in response to operational and scientific needs) and will be open and internationally access free such as Thredds and openDap type web servers. The second, relocatable dynamic facilities will have adaptive capability in space and time to respond to specific scientific requests that will be allocated after an international peer reviewed process in response to open annual international calls. OceanBIT is part of the Spanish Large Scale Infrastructure Facilities (ICTS). An international scientific advisory committee will be responsible for the implementation of a peer review evaluation process following the highest quality standards.

Formal agreement between the Spanish Government (Ministry of Science and Innovation) and the Balearic Islands Regional Government (Ministry of Economy, Finance and Innovation) was reached in 2008 to establish, in the Balearic Islands, an international Coastal Ocean Observing and Forecasting System, OceanBIT (BIT for Balearic Islands Technologies), a new Consortium with legal entity, following a proposal submitted in 2006. Funding, up to € 36 million has been approved, including € 14 million for scientific equipment and facilities, and € 2 million/year for running costs during 11 years (2011-2021). Activities planned for 2009 specifically include preparation of the implementation plan and the formal participation in the Consortium of key partners in the Balearic Islands, such as CSIC, IEO and UIB[12]. Strong and active involvement and partnership between all key players is essential for the success of this initiative. Cooperative agreements with other international institutions are also foreseen in the very near future.

OceanBIT is a new way to fund R&D activities and represents a very significant change in marine and coastal observing in the Balearic Islands (and also at European level), moving to an oriented, strategic regional approach with a view to establishing a sustained marine and coastal system. It is a pilot initiative at regional level that will be later extended at national and/or European level. OceanBIT is a specific contribution to MOON[13] and is also in line with IMOS[14] in Australia (with which many similarities exists), OOI and IOOS initiatives in USA[15] and several other observational and forecasting systems existing or being designed at present (Liverpool Bay Coastal Observatory[16], COSYNA[17] in Germany, MOOSE-Mediterranean Ocean Observation on Environment in France-with which active coordination is envisioned in particular in the northern sub-basins) and will be also linked to ongoing European operational initiatives such as the MyOcean, the Marine Core Service in the Mediterranean and other GMES actions.



Argo Float

The importance of this new challenge is of the highest importance and a number of issues still need to be adequately analyzed and resolved.

The following basic underlying principles will be followed if TMOOS personnel is to be involved in this new challenge:

- ICTS will complement TMOOS and more generally, IMEDEA.
- ICTS will help to consolidate both TMOOS activities and related activities at IMEDEA.
- ICTS might undertake routine monitoring that can be found of potential interest to IMEDEA research activities.
- ICTS will collaborate in establishing a Spanish Ocean Monitoring initiative to address global change in the Western Mediterranean (e.g., collaboration with MOOSE – France).
- ICTS will establish a data management division that will help archiving, accessing and download of operational oceanography products and that might also be of help to retrieve historical data.

[11] In line with IMOS, Australia. http://doga.ogs.trieste.it/sire/medsvp

[12] CSIC, Spanish National Research Council. IEO, Spanish Institute of Oceanography., UIB.

[13] http://www.moon-oceanforecasting.eu/

[14] http://www.imos.org.au/

[15] http://www.oceanleadership.org/ocean_observing/initiative http://ioos.noaa.gov/

[16] http://cobs.pol.ac.uk/

[17] http://www.gkss.de/institute/coastal_research/structure/operational_systems/KOK/projects/ICON

4. Critical analysis

4.1. SWOT analysis

4.1.1. Weaknesses

◆ Lack of technicians for laboratory and fieldwork tasks

During the last five years, TMOOS members have established important facilities and infrastructures for scientific support. All these infrastructures require the existence of high qualified technicians for their correct functioning and implementation. These technicians must cover the whole range of requirements addressed by the scientific personal. These requirements range from building specific tools or sampling platforms up to the implementation of field experiments. Unfortunately, the present number of technicians in the group is not sufficient to adequately run the technical infrastructures.

◆ Lack of a well defined promotion career for technicians

Unfortunately, there is not a well defined track for promotion of well trained and motivated technicians and as a result, motivation can decrease along the years. This is a crucial point to guarantee the success and consolidation of the research activities of TMOOS.

◆ Difficulties to attract talented PhD students and qualified temporal workers

Recently, the difficulties to get talented PhD students have increased. Two main factors contribute to this deficiency. The competence with non-academic activities is very strong due to the lack of long term perspectives for the PhD students in the academic sector. This is more notorious in technological oriented activities. Second, the link between research groups from CSIC and universities is not strong enough to allow a transfer of students from the later to the former. The inability to form new researchers could have a strong impact on the survival of the group in the long term.

◆ Lack of permanent structural funding in the Spanish Research System for instrumentation and laboratory maintenance

TMOOS activities have a strong dependence on external projects based funding for the maintenance of long term routine observations, operational systems, and running workshops and laboratories.

◆ Reduced number of TMOOS tenured researchers

To maintain the high degree of specialization and the intense activity of TMOOS department (based on disciplinary excellence in a multidisciplinary environment) and to reach a critical mass, new tenured positions are needed. This has to be accomplished step by step and only considering applications from researchers of outstanding international quality.

4.1.2. Threats

◆ Non competitive salaries for well trained technicians

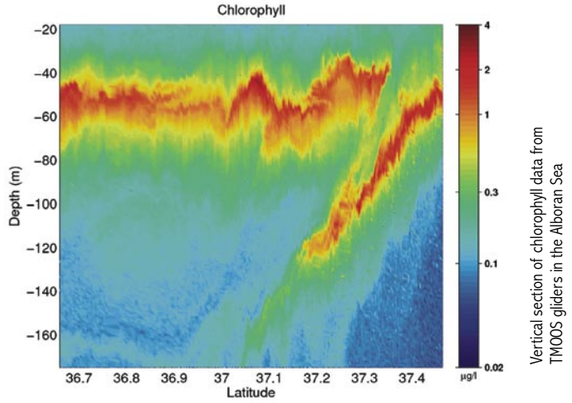
Private companies and international research centres offer higher salaries and longer term careers, than present possibilities at CSIC.

◆ New services unit from IMEDEA

TMOOS members have always endorsed the establishment of a new Services Unit at IMEDEA. It is important that this Unit should be established step by step and with an implementation linked to new resources (mostly -but not only- human) in order to guarantee that it is really a Strength for TMOOS and for IMEDEA and not a Thread.

◆ Political changes and sustainability science

There is a growing risk (given the difficult economic worldwide situation, in October 2008) that the endorsement of sustainability science, and preservation and restoration principles on which we have based the transfer of knowledge to society on ICZM issues might change in favour of more economical approaches.



Vertical section of chlorophyll data from TMOOS gliders in the Alboran Sea

4.1.3. Strengths

◆ Interdisciplinary and recognized team of researchers

TMOOS is formed by a highly qualified team of researches covering different aspects related to the research of the marine environment. There is a strong connection between modelling and observation. The team is constituted by marine scientists, physicists, geologists and engineers with wide research experience and capabilities, strongly motivated and with international recognition.

◆ Well trained technical support team

A team constituted by 3 engineers and two technicians (on-sea and operational activities) supports the scientific activities of TMOOS. They run the infrastructures, do the maintenance and develop new and innovative technological products to be used at sea. The technical team is young, very well trained, combining the area of expertise with a strong knowledge of the marine environment and its technological challengers.

◆ Unique infrastructure capabilities and equipments

TMOOS owns unique infrastructures and equipments. Among them, the department has mechanical and electronic workshops equipment with the most advanced technology like numerically controlled machining centre, pressure chamber, SMOS welding centre, precision lathe and milling machines. Observational equipments are formed by CTDs, ADV, ADCP, ACTV, RTK and video platforms. Finally, special equipment is constituted by a fleet of four gliders and a permanent coastal mooring off shore the coast of Mallorca. Besides, the TMOOS department manages different transport facilities (cars, coastal boat) as well as a computer cluster facility (with 128 processors). The value of the infrastructure is closer to € 3 million.

◆ Calanova IMEDEA coastal marine station

The very reduced and manageable facilities existing at Calanova Harbour are of very much interest and relevance for TMOOS activities. They hosted an international glider course in 2007 and are used frequently by French teams (Dr. Testor, Dr. Lherminier), German (Dr. Karsten, Dr. Uwe Send – now at Scripps, USA) or UK teams (Dr. Griffith, Dr. Smeed) to test gliders, etc.

◆ International leadership in using glider

In the frame of EU funded project MERSEA and more recently under ECOOP and SESAME, TMOOS has gained recognition as one of the leading teams in the use of new sampling autonomous devices such as gliders. The experience gained since 2005 (25 missions, more than 3.000 CTD profiles), the well trained personnel, the facilities established (mechanical and electronics labs, pool and ballasting facility, etc), the accessible coastal boat (Rodman 1120 from IMEDEA), the glider tools developed (wiki, data management, www, etc.) have made TMOOS/IMEDEA an attractive environment to international researchers.

◆ Knowledge and experience in answering to social and environmental regional issues (e.g. coastal conservation, oil spills, beach erosion, etc.)

TMOOS keeps close contact with social and political decision makers at regional and national level. As an example, the department has provided support in the past to local and national authorities during oil spills (Prestige in 2002-2003; Don Pedro in 2007), severe storms damage to coastal structures and beaches (November 2001), and in frequent search and rescue operations. TMOOS-IMEDEA is now seen as a guarantee for reliable and independent scientific information, useful for decision making.

◆ Good reputation and good results in applying for projects and funds at local, national and international level

TMOOS-IMEDEA activities and scientific contributions are well recognized by the scientific community. As a result, we have frequent requests for collaboration with other international and national groups.

◆ Excellent relation with industrial partners

TMOOS has been the origin of the spin off Albatros Marine Technology. The firm is specialised on the development of new technologies for coastal environments. This industrial partner facilitates the development of new innovative products to monitor the coastal sea and is also a bridge for connection with society.

4.1.4. Opportunities

◆ Identification of coastal and near-shore environments as a key issues by the 7th EU Framework Programme. This aspect reflects the increasing interest of the EU on coastal regions.

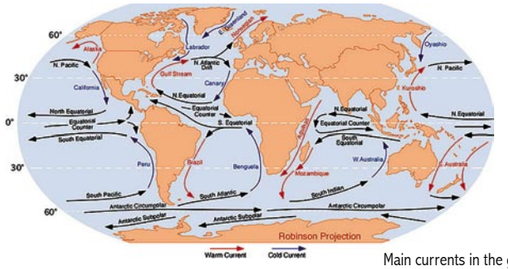
◆ Request of new technologies for coastal monitoring. The above mentioned social interest on coastal regions, directly linked to global change, brings the demand of developing new technologies for continuous coastal monitoring to support operational activities or administrations. They are low cost, simple and robust. TMOOS has the knowledge, innovation and infrastructure to play an important role in this aspect.

◆ Regional social and political concern on coastal and near-shore issues related to tourism and sustainable development. Tourism is an important economic activity in Spain and other countries. Environmental quality is becoming a benefit to the touristic offers increasing their competitiveness. Conversely, uncontrolled tourism can generate serious damage to the environmental health. These two aspects have brought the attention of policy makers towards the research of the process and variability in the coastal environment. This knowledge would be employed to assess the environment and mitigate the impact of human activities, specially the touristic one.

◆ The new Scientific and Technological Infrastructure (ICTS in Spanish) –Coastal Observing and Forecasting System- approved for the Balearic Islands will hopefully provide a unique opportunity for the development of the activities of TMOOS Department.

◆ Similarly, this ICTS will also hopefully bring a unique opportunity to establish a Monitoring Strategy also of interest to IMEDEA.

◆ The fact that Dr. Alberto Álvarez a key element of TMOOS personnel is presently at NURC, is a very interesting opportunity since NURC is one of the leading international research centers for marine technologies and operational oceanography. It is therefore an excellent opportunity to increase collaboration and exchanges between TMOOS and NURC. At present, there is an European glider meeting and Glider school scheduled at NURC in October 2008 where TMOOS activities will be very well represented (2 talks) and one of TMOOS technicians will be acting as invited teacher (for the second time) at the Glider School. Also important is that a major joint programme is being prepared at present for intense monitoring of Atlantic/Mediterranean adjustments East of the Alboran Sea in 2010.



Main currents in the global ocean

4.2. Relational analysis

In this section we present for each on of the research activities from the research line, the collaborators, competitors and reference centres. It is important to be aware thought that in some cases this distinction might be arbitrary, since in some cases, collaborators can actually become competitors for resources for example, in the frame of an international call for proposals.

4.2.1. Collaborators

Institute/Department: Environmental Fluid Dynamics Group
Group Leader: Phillip L.F. Liu
E-mail: PLL3@cornell.edu
Center: School of Civil and Environmental Engineering
Institution: Cornell University
Address: Hollister Hall, 14853 Ithaca NY, USA
www: http://www.cee.cornell.edu/index.php/research/

Liu, P. L.-F. and Orfila, A. (2004) Viscous effects on transient long wave propagation. J. Fluid Mech. 520: 83-92.

Liu, P. L.-F. (2006) Turbulent boundary layer effects on transient wave propagation in shallow water. Proc. Roy. Soc. London. 462 (2075): 3481-3491.

Liu, P. L.-F., Simarro, G., VanDever, J., and Orfila, A. (2006) Experimental and numerical investigation of viscous effects on solitary wave propagation in a wave tank. Coastal Engrg. 53 (2/3): 181-190.

Orfila, A., Simarro, G. and Liu P. L.-F. (2007) Bottom friction and its effects on periodic long wave propagation, Coastal Engrg. 54: 856-864.

Simarro, G., Orfila, A. and Liu, P. L.-F. (2008) Turbulent wave-current boundary layer. J. Hydraulic Engrg., DOI:10.1061(ASCE)0733-9429 (2008) 134: 2(225).

Institute/Department: Rutgers Ocean Modelling Group
Group Leader: John Wilkin
E-mail: wilkin@marine.rutgers.edu
Center: Institute of Marine and Coastal Sciences
Institution: Rutgers University
Address: 71 Dudley Road, New Brunswick, NJ 08901, USA
www: http://marine.rutgers.edu/~wilkin/

Cahill, B., O. Schofield, R. Chant, J. Wilkin, E. Hunter, S. Glenn, and P. Bissett (2008), Dynamics of turbid buoyant plumes and the feedbacks on near-shore biogeochemistry and physics, Geophys Res. Lett., 35, L10605, doi: 10.1029/2008GL033595.

Hofmann, E. E., J.-N. Druon, K. Fennel, M. Friedrichs, D. Haidvogel, C. Lee, A. Mannino, C. McClain, R. Najjar, J. Siewert, J. O'Reilly, D. Pollard, M. Previdi, S. Seitzinger, S. Signorini, J. Wilkin, (2008), Eastern U.S. Continental Shelf Carbon Budget: Integrating Models, Data Assimilation, and Analysis, Oceanography. 21: 86-104.

Haidvogel, D. B., H. Arango, W. P. Budgell, B. D. Cornuelle, E. Curchitser, E. Di Lorenzo, K. Fennel, W. R. Geyer, A. J. Hermann, L. Lanerolle, J. Levin, J. C. McWilliams, A. J. Miller, A. M. Moore, T. M. Powell, A. F. Shchepetkin, C. R. Sherwood, R. P. Signell, J. C. Warner and J. Wilkin, (2008), Ocean forecasting in terrain-following coordinates: Formulation and skill assessment of the Regional Ocean Modeling System, Journal of Computational Physics. 227: 3595-3624.

Castelao, R., S. Glenn, O. Schofield, R. Chant, J. Wilkin and J. Kohut, (2008): Seasonal evolution of hydrographic fields in the central Middle Atlantic Bight from glider observations, Geophys. Res. Lett. 35, L03617, doi: 10.1029/2007GL032335.

Choi, B.-J. and J. L. Wilkin, (2007): The effect of wind on the dispersal of the Hudson River plume. Journal of Physical Oceanography. 37: 1878-1897.

Institute/Department: Space Oceanography Division
Group Leader: Gilles Larnicol
E-mail: Gilles.Larnicol@cls.fr
Center: Collecte Localisation Satellites
Address: 8-10 Rue Hermès. Parc Technologique du Canal, 31526 Ramonville Saint-Agne, France
www: http://www.cls.fr/html/oceano/welcome_fr.html

Volkov, DL; Larnicol, G; Dorandeu, J, Improving the quality of satellite altimetry data over continental shelves, JOURNAL OF GEOPHYSICAL RESEARCH-OCEANS. 112, C6: C06020 JUN 23 2007.

Pascual, A; Faugere, Y; Larnicol, G, et al., Improved description of the ocean mesoscale variability by combining four satellite altimeters, GEOPHYSICAL RESEARCH LETTERS. 33, 2: L02611 2006.

Pascual, A; Nardelli, BB; Larnicol, G, et al, A case of an intense anticyclonic eddy in the Balearic Sea (western Mediterranean). JOURNAL OF GEOPHYSICAL RESEARCH-OCEANS. 107, C11: 3183, NOV 2002.

Larnicol, G; Ayoub, N; Le Traon, PY, Major changes in Mediterranean Sea level variability from 7 years of TOPEX/Poseidon and ERS-1/2 data. JOURNAL OF MARINE SYSTEMS. 33: 63-89 JUN 1 2002. Article Number: PII S0924-7963(02)00053-2.

Larnicol, G; LeTraon, PY; Ayoub, N, et al., Mean sea level and surface circulation variability of the Mediterranean Sea from 2 years of TOPEX/POSEIDON altimetry JOURNAL OF GEOPHYSICAL RESEARCH-OCEANS. 100, C12: 25163-25177, DEC 15 1995.

Institute/Department: Physical Oceanography
Group Leader: José Luis Pelegrí
E-mail: pelegri@icm.csic.es
Center: Instituto de Ciencias del Mar
Institution: CSIC
Address: Passeig Marítim de la Barceloneta, 37-49. E-08003 Barcelona, Spain
www: http://www.icm.csic.es/oce/index.php?lang=ingles

Pastor, MV; Pelegrí, JL; Hernández-Guerra, A, et al., Water and nutrient fluxes off Northwest Africa. CONTINENTAL SHELF RESEARCH. 28, 7: 915-936, 2008.

Machin, F; Pelegrí, JL; Marrero-Diaz, A, et al., Near-surface circulation in the southern Gulf of Cadiz. DEEP-SEA RESEARCH PART II-TOPICAL STUDIES IN OCEANOGRAPHY. 53, 11-13: 1161-1181, 2006

Martins, AM; Pelegrí, JL, CZCS chlorophyll patterns in the South Atlantic Bight during low vertical stratification conditions. CONTINENTAL SHELF RESEARCH. 26, 4: 429-457, MAR 2006.

Machin, F; Pelegrí, JL, Effect of the Canary Islands in the blockage and mixing of the North Atlantic eastern water masses. GEOPHYSICAL RESEARCH LETTERS. 33, 4. Article Number: L04605, FEB 18 2006.

Pelegrí, JL; Aristegui, J; Cana, L, et al. Coupling between the open ocean and the coastal upwelling region off northwest Africa: water recirculation and offshore pumping of organic matter. JOURNAL OF MARINE SYSTEMS. 54, 1-4: 3-37, 2005.

Institute/Department: Proudman Oceanographic Laboratory
Group Leader: Roger Proctor
E-mail: rp@pol.ac.uk
Institution: NERC
Address: Joseph Proudman Building 6 Brownlow Street Liverpool L3 5DA, UK
www: http://www.pol.ac.uk/home/staff/?user=ProcRoge

Holt, J; Proctor, R, The seasonal circulation and volume transport on the northwest European continental shelf: A fine-resolution model study, JOURNAL OF GEOPHYSICAL RESEARCH-OCEANS. 113, C6 Article Number: C06021, 2008.

Allen, JI; Holt, JT; Blackford, J, et al., Error quantification of a high-resolution coupled hydrodynamic-ecosystem coastal-ocean model: Part 2. Chlorophyll-a, nutrients and SPM, JOURNAL OF MARINE SYSTEMS. 68: 381-404, 2007.

Andreu-Burillo, I; Holt, J; Proctor, R, et al., Assimilation of sea surface temperature in the POL Coastal Ocean Modelling System. JOURNAL OF MARINE SYSTEMS Volume: 65 Issue: 1-4 Pages: 27-40, 2007.

Howarth, MJ; Proctor, R; Knight, PJ, et al., The Liverpool bay coastal observatory towards the goals. Conference Information: Oceans 2006 Conference, Date: SEP 18-22, 2006 Boston MA, OCEANS 2006. 1-4: 381-386.

Howarth, MJ; Proctor, R; Smithson, MJ, et al:. The Liverpool Bay Coastal Observatory. PROCEEDINGS OF THE IEEE/OES EIGHTH WORKING CONFERENCE ON CURRENT MEASUREMENT TECHNOLOGY - PROCEEDINGS: 132-136, 2005.

4.2.2. Competitors

None really. TMOOS is among the very few teams or institutes worldwide that have been working for 10 years doing Research, Technology Development and also Transfer of Knowledge/Innovation, with significant results that are always published always in peer reviewed journals.

In other words, TMOOS has been combining: ❶ Fundamental physical process studies, ❷ Observational activity, including worldwide and European leadership such as recently with gliders, ❸ Numerical modelling at a variety of scales (from waves near-shore to basin scale modelling) and ❹ Technology development to respond to scientific needs together with recent involvement in ❺ Transfer of knowledge to society to guarantee a sound based Integrated Coastal Zone Management.

It is true that we all compete for funds, but at TMOOS we strongly believe that today's advancement of science and technology transfer are carried out through COOPERATION RATHER THAN COMPETITION. Accordingly, we prefer to consider our colleagues Referents and Collaborators, rather than competitors (if formally needed, any collaborator or referent can be considered at times as a competitor!).

4.2.3. Referents

Institute/Department: Environmental Fluid Dynamics Group
Group Leader: Phillip L.F. Liu
E-mail: PLL3@cornell.edu
Center: School of Civil and Environmental Engineering
Institution: Cornell University
Address: Hollister Hall, 14853 Ithaca NY, USA
www: http://www.cee.cornell.edu/index.php/research/

Liu, P. L.-F. and Orfila, A. (2004) Viscous effects on transient long wave propagation. J. Fluid Mech., 520: 83-92.

Liu, P. L.-F. (2006) Turbulent boundary layer effects on transient wave propagation in shallow water. Proc. Roy. Soc. London, 462 (2075): 3481-3491.

Liu, P. L.-F., Simarro, G., VanDever, J., and Orfila, A. (2006) Experimental and numerical investigation of viscous effects on solitary wave propagation in a wave tank. Coastal Eng., 53 (2/3): 181-190.

Orfila, A., Simarro, G. and Liu P. L.-F. (2007) Bottom friction and its effects on periodic long wave propagation, Coastal Eng., 54: 856-864.

Simarro, G., Orfila, A. and Liu, P. L.-F. (2008) Turbulent wave-current boundary layer. J. Hydraulic Eng., doi: 10.1061(ASCE)0733-9429(2008) 134: 2(225).

Institute/Department: Rutgers Ocean Modelling Group
Group Leader: John Wilkin
E-mail: wilkin@marine.rutgers.edu
Center: Institute of Marine and Coastal Sciences
Institution: Rutgers University
Address: 71 Dudley Road, New Brunswick, NJ 08901, USA
www: http://marine.rutgers.edu/~wilkin/

Cahill, B., O. Schofield, R. Chant, J. Wilkin, E. Hunter, S. Glenn, and P. Bissett (2008), Dynamics of turbid buoyant plumes and the feedbacks on near-shore biogeochemistry and physics, Geophys Res. Lett., 35, L10605, doi: 10.1029/2008GL033595.

Hofmann, E. E., J.-N. Druon, K. Fennel, M. Friedrichs, D. Haidvogel, C. Lee, A. Mannino, C. McClain, R. Najjar, J. Siewert, J. O'Reilly, D. Pollard, M. Previdi, S. Seitzinger, S. Signorini, J. Wilkin, (2008), Eastern U.S. Continental Shelf Carbon Budget: Integrating Models, Data Assimilation, and Analysis, Oceanography, 21, 86-104.

Haidvogel, D. B., H. Arango, W. P. Budgell, B. D. Cornuelle, E. Curchitser, E. Di Lorenzo, K. Fennel, W. R. Geyer, A. J. Hermann, L. Lanerolle, J. Levin, J. C. McWilliams, A. J. Miller, A. M. Moore,T. M. Powell, A. F. Shchepetkin, C. R. Sherwood, R. P. Signell, J. C. Warner and J. Wilkin, (2008), Ocean forecasting in terrain-following coordinates: Formulation and skill assessment of the Regional Ocean Modeling System, Journal of Computational Physics, 227, 3595-3624.

Castelao, R., S. Glenn, O. Schofield, R. Chant, J. Wilkin and J. Kohut, (2008): Seasonal evolution of hydrographic fields in the central Middle Atlantic Bight from glider observations, Geophys. Res. Lett. 35, L03617, doi: 10.1029/2007GL032335.

Choi, B.-J. and J. L. Wilkin, (2007): The effect of wind on the dispersal of the Hudson River plume. Journal of Physical Oceanography. 37, 1878-1897.

Institute/Department: Underwater System Laboratory
Group Leader: Gwyn Griffiths
E-mail: gxg@noc.soton.ac.uk
Institution: National Oceanography Centre, Southampton
Address: European Way, Southampton, SO14 3ZH, UK
www: http://www.noc.soton.ac.uk/OED/gxg/

Griffiths, G., C. Jones, J. Ferguson and N. Bose, 2007. Undersea gliders. Journal of Ocean Technology, 2(2): 64-75.

Griffiths, G., L. Merckelbach and D. Smeed, 2007. On the performance of three deep-diving underwater gliders. Proceedings Oceans 2007, Aberdeen, June 2007. IEEE, Piscataway. ISBN: 978-1-4244-0635-7.

Griffiths, G., 2008. Glider and autonomous vehicle observing systems. Chapter 13 in: M. Babin, C.S. Roesler and J.J. Cullen (eds). Real-time Coastal Observing Systems for Marine Ecosystem Dynamics and Harmful Algal Blooms: Theory, Instrumentation and Modelling, Intergovernmental Oceanographic Commission of UNESCO. (Monographs on Oceanographic Methodology), Paris.

Merckelbach, L.M., D.A. Smeed and Testor, P., 2007. Observing deep ocean convection with gliders Geophysical Research Abstracts. 9, 05482.

Merckelbach, L., R. Briggs, D Smeed and G. Griffiths, 2008. Current measurements from autonomous underwater gliders. Proceedings 9th Working Conference, March 2008, Charleston, SC. IEEE, Piscataway: 61-67.

Institute/Department: Scripps
Group Leader: Uwe Send
E-mail: usend@ucsd.edu
Institution: Scripps Institution of Oceanography
Adress: Scripps Institution of Oceanography, Mail Code 0230 University of California, San Diego La Jolla CA 92093-0230 USA
www: http://iod.ucsd.edu/

Send, U., G. Krahmann, D. Mauuary, Y. Desaubies, F. Gaillard, T. Terre, J. Papadakis, M. Taroudakis, E. Skarsoulis, and C. Millot, Acoustic observations of heat content across the Mediterranean sea, Nature London. 385: 615-617, 1997.

Send, U., J. Font, G. Krahmann, C. Millot, M. Rhein, J. Tintoré, Recent advances in observing the physical oceanography of the western Mediterranean Sea, Progress in oceanography. 44: 37-64, 1999.

Skarsoulis E.K., U. Send, G. Piperakis, and P. Testor, 2004: Acoustic thermometry of the western Mediterranean Basin, J. Acous. Soc. Amer., 116 (2), 790-798.

Skarsoulis, E.K. and U. Send, One-step analysis of non-linear travel-time data in ocean acoustic tomography, J. Atmos. Ocean. Technol. 17: 240–254, 2000.

Testor P., U. Send, J.-C. Gascard, C. Millot, I. Taupier-Letage, and K. Béranger, 2005: The mean circulation of the southwestern Mediterranean Sea - the Algerian Gyres, J. Geophys. Res., 110, C11017, doi: 10.1029/2004JC002861, 2005.

Institute/Department: Operational Oceanography Systems Department
Group Leader: Pierre-Yves Le Traon
E-mail: Pierre.Yves.Le.Traon@ifremer.fr
Institution: IFREMER
Address: Brest, F-29280 Plouzane, France
www: http://www.ifremer.fr/brest/

Le Traon, PY, P. Klein, BL. Hua et al. Do altimeter wavenumber spectra agree with the interior or surface quasigeostrophic theory? Journal of Physical Oceanography. 38, 5: 1137-1142, 2008.

Johannessen, JA., PY. Le Traon, I. Robinson et al., Marine environment and security for the European area - Toward operational oceanography, Bulletin Of The American Meteorological Society. 87, 8, 2006.

Ducet, N., PY. Le Traon, G. Reverdin, Global high-resolution mapping of ocean circulation from TOPEX/Poseidon and ERS-1 and-2, Journal of Geophysical Research-Oceans. 105, C8: 19477-19498, 2000.

Le Traon, PY., F Nadal, N. Ducet, An improved mapping method of multisatellite altimeter data, Journal of Atmospheric and Oceanic Technology. 15, 2: 522-534, 1998.

Le Traon, PY., F. Ogor, ERS-1/2 orbit improvement using TOPEX/POSEIDON: The 2cm challenge, Journal of Geophysical Research-Oceans.103, C4: 8045-8057, 1998.

4.3. List of 5 selective advantages

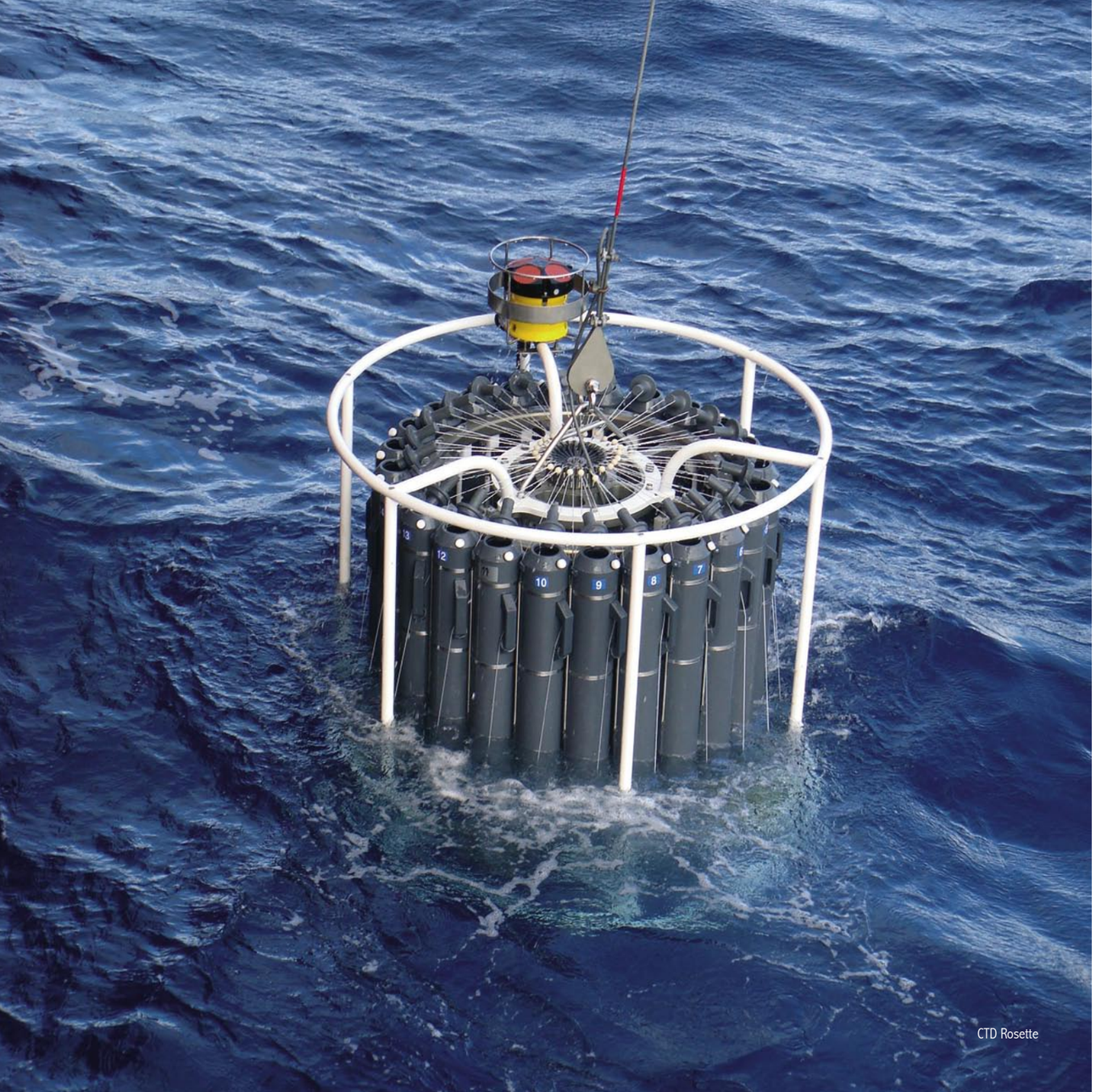
1. High degree of specialisation in physical oceanography (disciplinary excellence), progressively having focused on the coastal ocean, maintaining integral and global views and for multidisciplinary approaches. Disciplinary excellence in a multidisciplinary environment.

2. Capacity to combine fundamental process studies, observational, numerical and technological issues to attack complex problems at the front edge of science and technology development and also capacity to respond to complex society problems and to transfer knowledge to society advancing toward more science based Integrated Coastal Zone Management.

3. Facilities, equipments and tools of first quality, small but well equipped labs and workshops for technology development that have gained international recognition in the field.

4. Unique (or almost!) approach that can be summarized as 'Towards science and technology based operational oceanography of the coastal ocean (from the near-shore processes to the open ocean)'.

5. Leadership in implementation of new technological ocean monitoring tools such as gliders, and leadership also in the understanding of mesoscale and submesoscale contributions to coastal variability.



CTD Rosette

5. Annexes

Annex 1: TMOOS instrumentation and facilities available (March 2009)

Coastal ocean and near-shore processes - Instrumentation and laboratories

Field instrumentation	Units	Manufacturer/Model	TMOOS Lab
Argo Floats	4	Webb Research / APEX	Operational Oceanog-AUV's,Gliders Lab
Deep Webb Res. Glider	3	Webb Res / Electric 1000m	Operational Oceanog-AUV's,Gliders Lab
Coastal Web Res Glider	1	Webb Res / Electric 200m	Operational Oceanog-AUV's,Gliders Lab
Weather Station	1	Aanderaa / AWS2700	Operational Oceanog - Instruments Lab
Sea level and wave recorder	5	SeaBird / SBE26	Operational Oceanog - Instruments Lab
Thermistor string	1	Aanderaa / TR7	Operational Oceanog - Instruments Lab
Propeler Currentmeter	1	Aanderaa / RCM7	Operational Oceanog - Instruments Lab
Doppler Currentmeter	1	Aanderaa / RCM9	Operational Oceanog - Instruments Lab
Nortek ADCP profiler	3	Nortek / Aquadopp	Operational Oceanog - Instruments Lab
RDI ADCP Profiler	2	WorkHorse 150Khz 600Khz	Operational Oceanog - Instruments Lab
CTD Profiler	1	SeaBird / SBE19	Operational Oceanog - Instruments Lab
RDI HADP Profiler	1	RDI / HADCP	Operational Oceanog - Instruments Lab
Nortek ADV currentmeter	8	Nortek / Vector	Coastal Morphodynamics Processes Lab
ROV	1	Praesentist / PRO	Coastal Morphodynamics Processes Lab
Optical Backscatter Sensor (OBS)	4	Nortek	Coastal Morphodynamics Processes Lab

Field instrumentation developed in TMOOS marine tech. laboratories

AUV	AHV3 - Cormoran prototype
AUV	FOLAGA, AHV1 & AHV2 prototype
Mini ROV	No name
Surface Coastal GSM Drifters	No name

TMOOS facilities for coastal operations

Glider balasting facility	Water tank, grave, scales, salinometer, etc.
Pick-up	Nissan / Pick-up
Coastal sampling rubber boat (6 m)	Valiant / DR650

TMOOS facilities for computing and data management

Numerical Modelling	Linux Computer Cluster-128 procesors
Data Management	Center Operational Data Management
Computer servers	SGI ALSX-R

TMOOS facilities in marine technology - Mechanical workshop 1

CNC Milling Center	John Ford / VMC80/96
Vacuum Casting Machine	MCP / 4/01

TMOOS facilities in marine technology - Mechanical workshop 2

Pressure Test Facility	PROTECO-SUB / 10bar
Mechanical Workshop	
Manual Lathe with digital readout	Jet / GH-1440W3 x 1000
Manual lathe	Chester / B-multi
3-D Printer (Rapid Prototyping)	Zcorp / Z310
Manual mill	Chester
Band sawing machines	Holzkraft / HBS 351
Welding machine	MIG

TMOOS facilities in marine technology - Electronics lab.

Solding Station for PCB	
SMD Solding Station	JBC / AM6500
Digital Oscilloscope 100 MHz	Tektronix / TDS 1012
Digital Oscilloscope 100 MHz	Tektronix / TDS 1012B
Function Generator 25MHz	Tektronix / AFG3021B
Function Generator	ISOTECH
Power Supply	ISOTECH / IPS-3610D
Universal Programmer	HILO-Systems / ALL-11
Ultraviolet Chip Eraser	STAG / SE11
Multimeter	Promax / PD185
Acid attack kit	MEGA-Electronics / PA310
Mini Drill	Dremel
Solding Frame	RS
Microcontroller Emulator	KEIL / EPM900
Inertial Sensor	Xsense / MTI DK
SMD Convection Oven	LPKF Protoflow
PCB circuit board plotter	LPKF S62 + Dust Extraction
PCB Through-Hole Plating	LPKF Minicontact III
SMD Pick-And-Place System	LPKF Protoplace + Compressor

MINI ROV IMEDEA

TECHNICAL SPECIFICATIONS

Dimension: 340 x 220 x 180 mm	Hull: PVC chassis and aluminum tube
Total Height: 530 mm	Propulsion System: electrical motor & propeller
Weight: 4.5 Kg	Movement System: 2 horizontal motors & 1 immersion motor
Max. Depth: 40 meter	Camera: Analog 300 lines with 180o of tilt and directional light
Diving Speed: 0.25 m/s	Orientation System: 2-axis electronic compass
Linear Speed: 0.5 m/s	Control System: PC-based by joystick
Cable Length / Diameter: 50 meters / 12 mm	Communication System: GSM and low-range radiolink modem
Power Supply: 12V / 150W	Integrated Sensors: Pressure

◆IMEDEA (2006) has developed a low-cost Mini-ROV (Remotely Operated Vehicle) controlled by PC for scientific-technical purposes and for recreational and professional Nautical. Mini-Rov has also safety capabilities (ships hull inspection, pier survey, ...). Due to its analog camera and its light this instrument allows underwater navigation and visualization at 40 meters depth.

◆This technology has been transferred to the company Albatros Marine Technologies S.L.

AMT50 MICRO ROV REMOTELLY OPERATED VEHICLE

TECHNICAL SPECIFICATIONS

Dimensions	31 x 24 x 20 cm
Weight	2,5 kg
Depth Rating	50 meters
Camera	Color 420 TVL x 0,5 lux / 180º TILT
Lightning	2 x led tilting lights
Control Unit	Wireless gamepad controller 2 hours autonomy batteries standard rca video output
Supplier	Albatros Marine Technologies

◆MicroROV designed thinking on the user: Small and easy to transport, easy to use, reliable & robust.

◆Ocenography applications: Hull & propeller inspection, instrument and object location, wildlife sightseeing, diving support, mooring inspection.

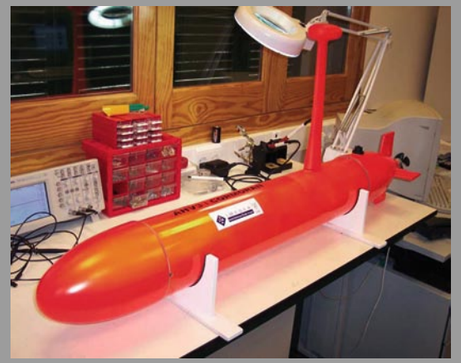
FOLAGA - AHV1 & AHV2

TECHNICAL SPECIFICATIONS

Length: 3160 mm modified to 1.5 m	Propulsion System: two electrical motors with pumps
Diameter: 100 mm	Turning System: two electrical motors with pumps
Total Weight: 30 Kgr	Diving System: Dynamic immersion (two electrical motors with pumps)
Max. Depth: 50 meter	Orientation System: 2-axis electronic compass & GPS
Diving Speed: 60 cm/s	Control System: PC-104 & software on Linux
Linear Speed: 3 knots	Communication System: GSM
Hull: two fiberglass tubes	Integrated Sensors: CTD (Conductivity – Temperature – Pressure)

◆Based on a idea of a CSIC scientist (Alberto Álvarez Díaz) the first Autonomous Hybrid Vehicle (AHV-1) was designed and built during a collaboration within Pisa University and Saclant Undersea Research Center (Italy) in order to obtain a low-cost CTD platform to validate ocean scientific models.

◆The result of a further collaboration between Pisa University and Saclant Undersea Research Center (Italy) has lead to the construction of a second prototype Folaga (AHV-2) bought by IMEDEA (at 2005). For the purpose of his scientific studies IMEDEA modified the vehicle by reducing its length (from 3 meters to 1.35 meters) and by adding a second fiberglass fairing to improve its hydrodynamic efficiency.



AHV-CORMORAN

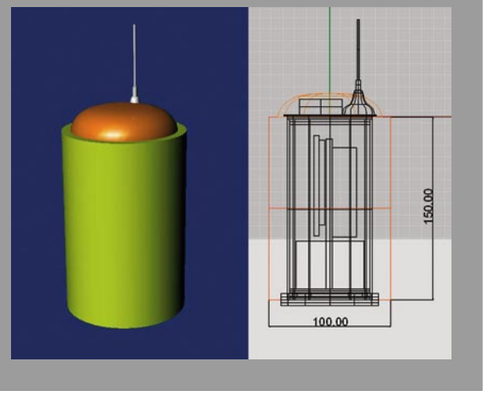
TECHNICAL SPECIFICATIONS

Length: 1440 mm	Double Hull: aluminum and fiberglass external & methacrylate internal
Diameter: 160 mm	Propulsion System: electrical motor & propeller
Total Height: 530 mm	Turning System: servo rudder
Weight: 25.4 Kg	Diving System: Static immersion by piston (buoyancy change).
Max. Depth: 25 meter	Orientation System: 3-axis electronic compass & GPS
Diving Speed: 0,5 m/s	Control System: PC-104 & software on Linux
Linear Speed: 1.5 m/s	Communication System: GSM and low-range radiolink modem
Turn Radius: 6 meter.	Integrated Sensors: CTD (Conductivity – Temperature – Pressure)

◆AHV3-CORMORAN is a low-cost autonomous underwater vehicle to measure the coastal marine environment. AHV (Autonomous Hybrid Vehicle) is an hybrid system capable of surface GPS navigation through planned waypoints, where it is also diving to collect CTD profiles in the water column.

◆Project "Desarrollo de una nueva plataforma de observación oceánica móvil y autónoma" REN2003-07787-C02-01 (2004 - 2006) financed by Ministerio de Ciencia y Tecnologia.

Annex 2



SURFACE DRIFTERS

TECHNICAL SPECIFICATIONS

Length: 200 mm	Position System: GPS
Diameter: 100 mm	Communication System: Short Message System (SMS) of GSM
Hull: PVC structure covered by foam to add floatability and security	Integrated Sensors: Temperature – Battery – Coverage
Control System: low power microcontroller	Software: GIS (shapefiles) and KML based
Life-Time: Depending on measurement frequency (max. 45 days with one measurement at day)	Operation Modes: real-time mode & total power down mode, configured by a SMS

◆Surface drifters are buoys to measure the marine diffusion or dispersion coefficients (currents). Traditionally those buoys are built to work far away from the coast, but due to their big dimension they are less suitable to measure the upper layer currents (they may also represent a risk for maritime traffic). Moreover the usual communication system used in those buoys are expensive satellite systems.

◆In the frame of COOL project a new design buoy has been developed for the coastal zone. By proportioning weight and height and by using the GSM short message system (SMS), the overall cost of the entire system has been minimized, also improving the security for maritime traffic. This buoy has been used in the 2008 Oil Spill campaign during project ESEOO in Mediterranean Sea.

◆Project COOL (2007 – 2009): "Acoplamiento hidrodinámico, tasas de dispersión y corrientes". CTM2006 – 12072.

GLIDERS

TECHNICAL SPECIFICATIONS

Length: 1500 mm	Endurance: Dependent on measurement and communication (typ. 30 days)
Diameter: 213 mm	Range: 1500 Km
Weight in air: 52 Kg	Propulsion System: buoyancy change
Weight in water: Neutrally buoyant	Turning System: servo rudder
Max. Depth: 200 meters (Coastal version) 1000 meters (Deep version)	Orientation System: 3-axis electronic compass & GPS & dead reckoning
Diving Speed: 0.2 m/s	Control System: Persistor & software on PicoDOS
Linear Speed: 0.4 m/s	Communication System: Iridium & Argos & RF high-range radiomodem
Energy: Alkaline Batteries	Integrated Sensors: CTD (Conductivity – Temperature – Pressure), Fluorescence, Turbidity and Oxygen

◆Versatile, maneuverable and powered with alkaline batteries the SLOCUM electric glider can be deployed for a period of 15 up to 30 days with a range from 600 to 1500km.

◆Gliders main feature is that the forward propulsion is created by varying vehicle buoyancy. Wings and control surfaces convert the vertical velocity into forward velocity so that the vehicle glides downward when denser than water and glides upward when buoyant.

Annex 3: Some examples of TMOOS open facilities

CIRCUIT BOARD PLOTTER FACILITY

TECHNICAL SPECIFICATIONS

LPKF Protomat S62	Automatic Tool Change Three dimensional Operation (z-axis drive) Integrated head light Acoustic cabinet CAM software (BoardMaster 5.0) High speed motor (62,000 RPM/150mm per sec) Vacuum table for board fixing
Dust Extraction	2 stage filter system with HEPA filter Dimension: 25 x 30 x 35 cm weight: 13 kg variable speed controller max. static pressure: 22.500 Pa AutoSwitch
Resolution	Working Area: 229 x 305 x 38 mm Resolution X/Y: 0.25 um (0.01 mils) Resolution Z: 0.5 um (0.02 mils) Minimum Track Width: 0.1mm (4 mils) Minimum Isolation Width: 0.1mm (4 mils) Minimum Drill Hole Diameter: 0.15mm (6 mils)

◆This facility is a circuit board plotter for rapid and high resolution PCB (Printed Circuit Board) prototyping to design new instrumentation and control systems. The working process is milling the board's copper where there must not be a connection.

◆This technology has been used in the prototyping of CORMORAN project.

REFLOW SOLDERING FACILITY

TECHNICAL SPECIFICATIONS

LPKF Protoflow	Maximum circuit board size: 230 mm x 305 mm Maximum preheating: 220° C / 999 seconds Maximum reflow: 320° C (608° F) / 600 seconds Long thermal treatment: 220° C (428° F) / 64 hours Temperature stabilization time: < 5 minutes PCB cooling: Two bottom mounted fans Power Supply 220-240 V, 50-60 Hz, 16 A Maximum power consumption 3200 Watts Dimensions 647 mm x 450 mm x 315 mm Weight 22 kg (48.5 lbs)

◆Surface Mount Technology Devices (SMD) are electronic components extremely small. To sold accurately this kind of components to a circuit board by hand is a complicated or even impossible task.

◆This convection oven has the capability to apply many predefined temperature profiles to sold different types of solder paste. It is a key component in rapid SMD prototyping and small batch production.

THROUGH-HOLE PLATING

TECHNICAL SPECIFICATIONS

LPKF MiniContact III	Number of baths (steps): 4 active Display and microprocessor control. Technology "Reverse Pulse Plating" Activator: Carbon. Max. board size: 220 x 340 mm. Max. PCB size: 130 x 250 mm. Minimum hole size: 0.2 mm. Number of holes: unlimited Dimensions: 870 x 640 x 570 mm.

◆Electronic circuits are boards with metallic connections between components (chips, resistances, capacitors, ...). Those nets are routed all around the board, even in different layers, to connect all devices.

◆Interconnection of the different layers of a circuit board is mandatory to create a conductivity path for electronic signals and power supply.

◆This facility has 4 chemical baths used to add a layer of copper over all the board, interconnecting all the holes. It is a required component to guarantee a good interconnection between nets of different layers.

RAPID PROTOTYPING 3-D PRINTER Z310-Plus

TECHNICAL SPECIFICATIONS

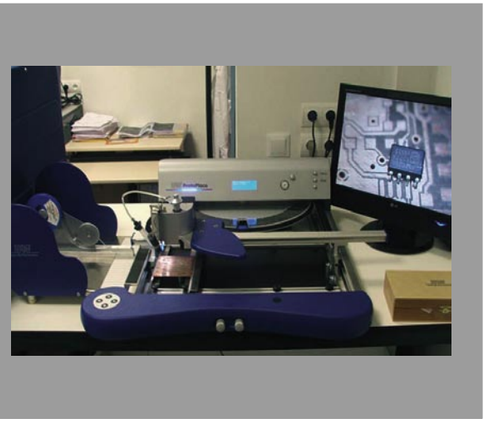
Build Speed	2-4 layers / minute
Build Size	203 x 254 x 253 mm
Layer Thickness	0,089 – 0,203 mm
Material Options	High performance composite
Material Options	74 x 86 x 109 cm
Model Formats	STL, VRML PLY, and 3DS

◆3d printer to create physical models directly from 3-d cad digital data by additive building of 2d layers.

◆Fast, versatile and simple equipment to produce concept models and functional test parts.

◆Rapid prototyping, models created in hours.

◆Allows to make parts for concept evaluation or patterns for casting applications.



PICK AND PLACE SYSTEM FACILITY

TECHNICAL SPECIFICATIONS

LPKF Protoplace	Semiautomatic LCD Display and Keyboard Components Manipulator Solder-Paste Dispenser Air Regulator Motorized Turntable Microcamera and monitor	Dimensions: 1000 mm x 900 mm x 250 mm Vacuum Maximum: 0.8 bar Weight: 35 kg Operating air pressure: 0.1 to 4 bar
Compressor	Air reservoir 15 (litres) Max Pressure 8 (bar) Air delivery 45 (l/min.)	Dimensions B/H/T: 350/350/580 mm Weight: 22,4 kg Noise level: 40 db (A)
RESOLUTION	Working Area: 297 mm x 420 mm Minimum size of components: 0201 chip	Pulse / Pause duration: 0.1 - 9s / 0.1 - 2s Number of dosing points: Up to 300 per minute Dosing quantity Minimum: 0.2 µliters

◆This facility is a high resolution position fixer of electronic components and solder paste (working together with the reflow oven). It is a required component of soldering small package SMT (Surface Mount Technology) devices.

CNC VERTICAL MILLING CENTER

TECHNICAL SPECIFICATIONS

Table Working Surface	950 mm x 450 mm
Vertical Travel (Z)	610 mm
Spindle Speed	60-6000 rpm
Cutting Feed	1-4000 mm/min
No of Tools	20

◆Vertical machining center for metal, plastic and wood cutting.

◆Capability of machining moulds, master pieces, and mechanical components.

◆CNC interface for manual programming.

◆High 3-D precision of 0.001 mm.

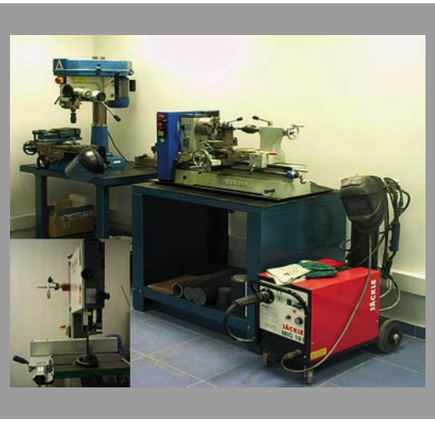
◆PC connection for cam (computer aided manufacturing).

LATHE

TECHNICAL SPECIFICATIONS

Distance Between Points	1000 mm
Diameter Admitted on Large Stone Bench	500 mm
Spindle Speed	40/1800 rpm
Speeds	12
Route Cross-Sectional Car	350
Route Charriote	750
Main Engine Power 2.20 Kw	

- Manual lathe with digital 3 axis readout with 0.001mm precision.
- Allows automatic threading and turning in 2 axis.
- Tools for metal and plastic working.



MECHANICAL WORKSHOP

TECHNICAL SPECIFICATIONS

Length: 200 mm	Position System: GPS
Diameter: 100 mm	Communication System: Short Message System (SMS) of GSM
Hull: PVC structure covered by foam to add floatability and security	Integrated Sensors: Temperature – Battery – Coverage
Control System: low power microcontroller	Software: GIS (shapefiles) and KML based
Life-Time: Depending on measurement frequency (max. 45 days with one measurement at day)	Operation Modes: real-time mode & total power down mode, configured by a SMS

- Surface drifters are buoys to measure the marine diffusion or dispersion coefficients (currents). Traditionally those buoys are built to work far away from the coast, but due to their big dimension they are less suitable to measure the upper layer currents (they may also represent a risk for maritime traffic). Moreover the usual communication system used in those buoys are expensive satellite systems.
- In the frame of COOL project a new design buoy has been developed for the coastal zone. By proportioning weight and height and by using the GSM short message system (SMS), the overall cost of the entire system has been minimized, also improving the security for maritime traffic. This buoy has been used in the 2008 Oil Spill campaign during project ESEOO in Mediterranean Sea.
- Project COOL (2007 – 2009): "Acoplamiento hidrodinámico, tasas de dispersión y corrientes". CTM2006 – 12072.

VACUUM CASTING MACHINE

TECHNICAL SPECIFICATIONS

Height	1175 mm
Weight	900 mm
Depth	595 mm
Space Requirement	0,48 m2
Maxim Mould Size (H x W x D)	530 x 450 x 425
Casting Volume	1,25 kg

- Manufacturing of silicone moulds from a master piece or component.
- Manufacturing of pieces by vaccum casting from a silicon or rigid mould.
- Posibility of multiple plastic resins with different technical specifications simulating standard injection materials as pp, abs, pvc, pu, ...

PRESSURE TEST FACILITY

TECHNICAL SPECIFICATIONS

Length: 200 mm	Position System: GPS
Diameter: 100 mm	Communication System: Short Message System (SMS) of GSM
Hull: PVC structure covered by foam to add floatability and security	Integrated Sensors: Temperature – Battery – Coverage
Control System: low power microcontroller	Software: GIS (shapefiles) and KML based
Life-Time: Depending on measurement frequency (max. 45 days with one measurement at day)	Operation Modes: real-time mode & total power down mode, configured by a SMS

- Surface drifters are buoys to measure the marine diffusion or dispersion coefficients (currents). Traditionally those buoys are built to work far away from the coast, but due to their big dimension they are less suitable to measure the upper layer currents (they may also represent a risk for maritime traffic). Moreover the usual communication system used in those buoys are expensive satellite systems.
- In the frame of COOL project a new design buoy has been developed for the coastal zone. By proportioning weight and height and by using the GSM short message system (SMS), the overall cost of the entire system has been minimized, also improving the security for maritime traffic. This buoy has been used in the 2008 Oil Spill campaign during project ESEOO in Mediterranean Sea.
- Project COOL (2007 – 2009): "Acoplamiento hidrodinámico, tasas de dispersión y corrientes". CTM2006 – 12072.

TMOOS, IMEDEA (CSIC-UIB)

C./ Miquel Marqués, 21
07190 Esporles
Mallorca
Spain

www.imedea.uib-csic.es/tmoos

WRITING
Joaquín Tintoré
Alberto Álvarez
Alejandro Orfila
Salvador Balle
Ananda Pascual
Simón Ruiz
Guillermo Vizoso
Saül Pitarch

COORDINATION
Ananda Pascual

GRAPHIC DESIGN AND EDITING
Angel P. Rodrigo

PHOTOGRAPHIES
Enrique Vidal Vijande (Outside & inside covers & pages 8-9, 12-13, 17, 23, 33, 42, 49)
Eduardo Infantes Oanes (Pages 6, 14, 15)
ESA (Page 11)
Benjamín Casas (Page 18)
UTM (Page 20)
Mercator-Ocean (Page 21)
IOOS (Page 22)
CNES (Pages 34-35)
Simón Ruiz (Page 50)

PRINTING
Impremta Muro SL

DL: PM-
ISBN
RECYCLED PAPER