Modelo hidrodinámico del Mar Menor: Modelo ROMS

Presentación del modelado integral del Mar Menor y su cuenca vertiente

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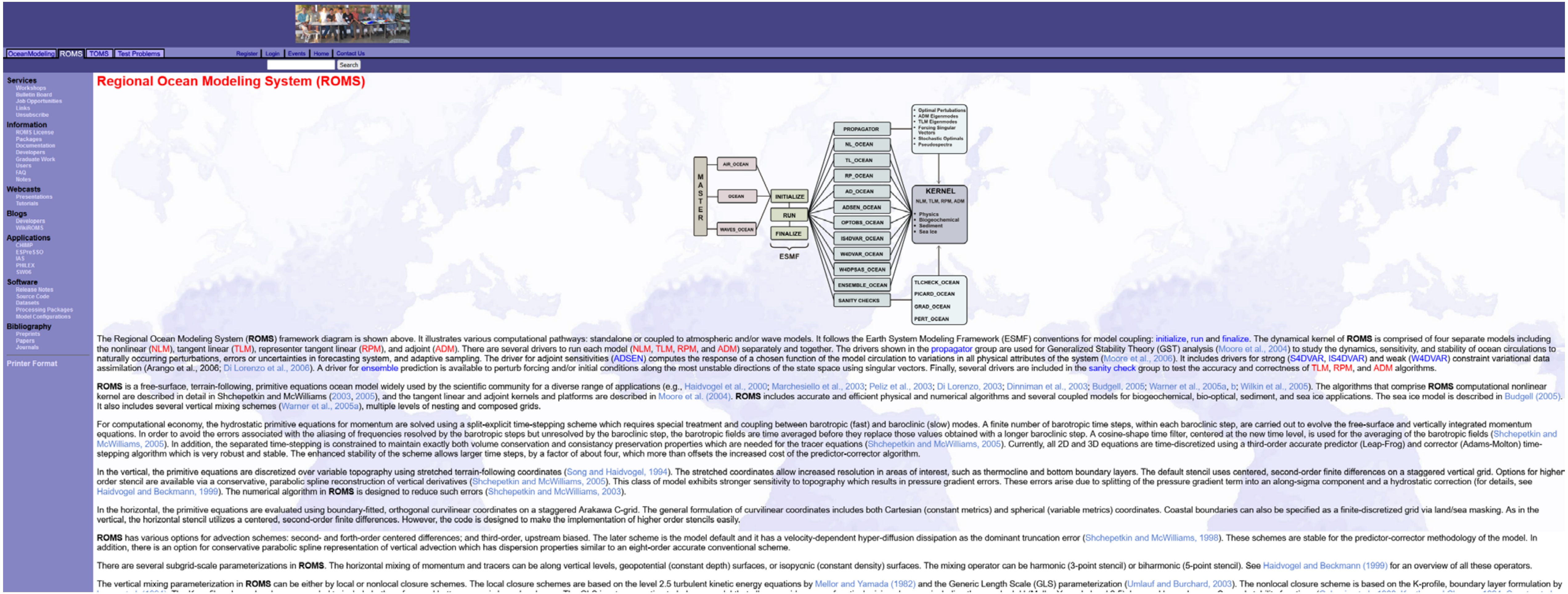
ROMS – Regional Ocean Model System

1. Introducción al Regional Ocean Model System (ROMS) y motivo de su elección.

2. Aplicaciones del modelo ROMS al Mar Menor.

3. Integración del modelo hidrodinámico y ecológico ROMS en el modelo integral del Mar Menor y su cuenca vertiente del Observatorio del Mar Menor.

Introducción al Regional Ocean Model System (ROMS) y motivo de su elección.



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Regional Ocean Modeling System (ROMS)

The Regional Ocean Modeling System (**ROMS**) framework diagram is shown above. It illustrates various computational pathways: standalone or coupled to atmospheric and/or wave models. It follows the Earth System Modeling Framework (ESMF) conventions for model coupling: initialize, run and finalize. The dynamical kernel of **ROMS** is comprised of four separate models including the nonlinear (NLM), tangent linear (TLM), representer tangent linear (RPM), and adjoint (ADM). There are several drivers to run each model (NLM, TLM, RPM, and ADM) separately and together. The drivers shown in the propagator group are used for Generalized Stability Theory (GST) analysis (Moore et al., 2004) to study the dynamics, sensitivity, and stability of ocean circulations to naturally occurring perturbations, errors or uncertainties in forecasting system, and adaptive sampling. The driver for adjoint sensitivities (ADSEN) computes the response of a chosen function of the model circulation to variations in all physical attributes of the system (Moore et al., 2006). It includes drivers for strong (S4DVAR, IS4DVAR) and weak (W4DVAR) constraint variational data assimilation (Arango et al., 2006; Di Lorenzo et al., 2006). A driver for ensemble prediction is available to perturb forcing and/or initial conditions along the most unstable directions of the state space using singular vectors. Finally, several drivers are included in the sanity check group to test the accuracy and correctness of TLM, RPM, and ADM algorithms.

ROMS is a free-surface, terrain-following, primitive equations ocean model widely used by the scientific community for a diverse range of applications (e.g., Haidvogel et al., 2000; Marchesiello et al., 2003; Peliz et al., 2003; Di Lorenzo, 2003; Dinniman et al., 2003; Budgell, 2005; Warner et al., 2005a, b; Wilkin et al., 2005). The algorithms that comprise **ROMS** computational nonlinear kernel are described in detail in Shchepetkin and McWilliams (2003, 2005), and the tangent linear and adjoint kernels and platforms are described in Moore et al. (2004). **ROMS** includes accurate and efficient physical and numerical algorithms and several coupled models for biogeochemical, bio-optical, sediment, and sea ice applications. The sea ice model is described in Budgell (2005). It also includes several vertical mixing schemes (Warner et al., 2005a), multiple levels of nesting and composed grids.

For computational economy, the hydrostatic primitive equations for momentum are solved using a split-explicit time-stepping scheme which requires special treatment and coupling between barotropic (fast) and baroclinic (slow) modes. A finite number of barotropic time steps, within each baroclinic step, are carried out to evolve the free-surface and vertically integrated momentum equations. In order to avoid the errors associated with the aliasing of frequencies resolved by the barotropic steps but unresolved by the baroclinic step, the barotropic fields are time averaged before they replace those values obtained with a longer baroclinic step. A cosine-shape time filter, centered at the new time level, is used for the averaging of the barotropic fields (Shchepetkin and McWilliams, 2005). In addition, the separated time-stepping is constrained to maintain exactly both volume conservation and consistancy preservation properties which are needed for the tracer equations (Shchepetkin and McWilliams, 2005). Currently, all 2D and 3D equations are time-discretized using a third-order accurate predictor (Leap-Frog) and corrector (Adams-Molton) time-stepping algorithm which is very robust and stable. The enhanced stability of the scheme allows larger time steps, by a factor of about four, which more than offsets the increased cost of the predictor-corrector algorithm.

In the vertical, the primitive equations are discretized over variable topography using stretched terrain-following coordinates (Song and Haidvogel, 1994). The stretched coordinates allow increased resolution in areas of interest, such as thermocline and bottom boundary layers. The default stencil uses centered, second-order finite differences on a staggered vertical grid. Options for higher order stencil are available via a conservative, parabolic spline reconstruction of vertical derivatives (Shchepetkin and McWilliams, 2005). This class of model exhibits stronger sensitivity to topography which results in pressure gradient errors. These errors arise due to splitting of the pressure gradient term into an along-sigma component and a hydrostatic correction (for details, see Haidvogel and Beckmann, 1999). The numerical algorithm in **ROMS** is designed to reduce such errors (Shchepetkin and McWilliams, 2003).

In the horizontal, the primitive equations are evaluated using boundary-fitted, orthogonal curvilinear coordinates on a staggered Arakawa C-grid. The general formulation of curvilinear coordinates includes both Cartesian (constant metrics) and spherical (variable metrics) coordinates. Coastal boundaries can also be specified as a finite-discretized grid via land/sea masking. As in the vertical, the horizontal stencil utilizes a centered, second-order finite differences. However, the code is designed to make the implementation of higher order stencils easily.

ROMS has various options for advection schemes: second- and forth-order centered differences; and third-order, upstream biased. The later scheme is the model default and it has a velocity-dependent hyper-diffusion dissipation as the dominant truncation error (Shchepetkin and McWilliams, 1998). These schemes are stable for the predictor-corrector methodology of the model. In addition, there is an option for conservative parabolic spline representation of vertical advection which has dispersion properties similar to an eight-order accurate conventional scheme.

There are several subgrid-scale parameterizations in **ROMS**. The horizontal mixing of momentum and tracers can be along vertical levels, geopotential (constant depth) surfaces, or isopycnic (constant density) surfaces. The mixing operator can be harmonic (3-point stencil) or biharmonic (5-point stencil). See Haidvogel and Beckmann (1999) for an overview of all these operators.

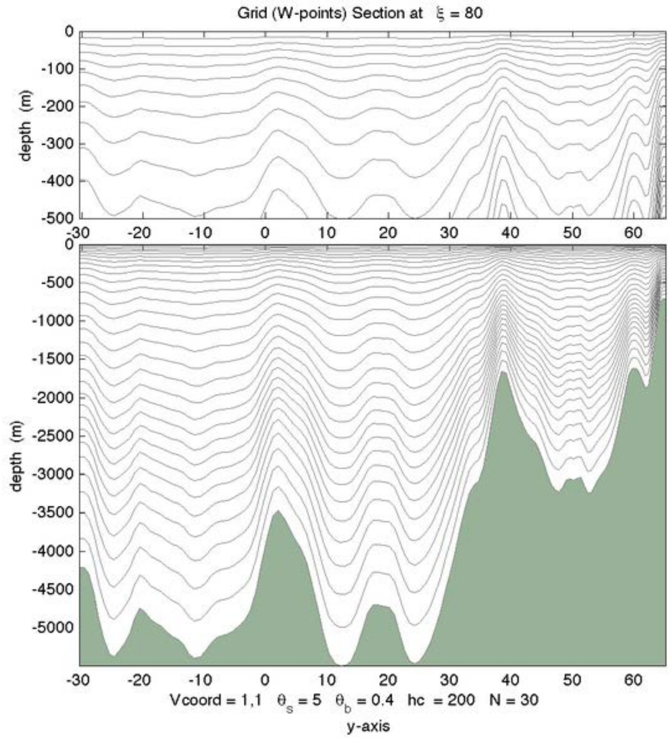
The vertical mixing parameterization in **ROMS** can be either by local or nonlocal closure schemes. The local closure schemes are based on the level 2.5 turbulent kinetic energy equations by Mellor and Yamada (1982) and the Generic Length Scale (GLS) parameterization (Umlauf and Burchard, 2003). The nonlocal closure scheme is based on the K-profile, boundary layer formulation by

https://www.myroms.org/99/

Introducción al Regional Ocean Model System (ROMS)

El Modelo **TOMS** (Terrain-following Ocean Modeling System) / **ROMS** (Regional Ocean Model System) fue una iniciativa de la Office of Naval Research (ONR), de la marina estadounidense desarrollado inicialmente en las universidades de Princeton, Rutgers, UCLA y Stanford.

ROMS es un modelo oceánico de ecuaciones primitivas de superficie libre que sigue el terreno que utiliza la aproximación de Boussinesq para resolver las ecuaciones de Navier-Stokes.



Momentum equations

$$\frac{\partial u}{\partial t} - fv + \vec{v}\cdot\nabla u = -\frac{\partial \phi}{\partial x} - \left(\frac{g\rho}{\rho_o}\right)\frac{\partial z}{\partial x} - g\frac{\partial \zeta}{\partial x} + \frac{1}{H_z}\frac{\partial}{\partial \sigma}\left[\frac{(K_m+\nu)}{H_z}\frac{\partial u}{\partial \sigma}\right] + \mathcal{F}_u + \mathcal{D}_u$$

$$\frac{\partial v}{\partial t} + fu + \vec{v}\cdot\nabla v = -\frac{\partial \phi}{\partial y} - \left(\frac{g\rho}{\rho_o}\right)\frac{\partial z}{\partial y} - g\frac{\partial \zeta}{\partial y} + \frac{1}{H_z}\frac{\partial}{\partial \sigma}\left[\frac{(K_m+\nu)}{H_z}\frac{\partial v}{\partial \sigma}\right] + \mathcal{F}_v + \mathcal{D}_v$$

Tracer equation

$$\frac{\partial C}{\partial t} + \vec{v}\cdot\nabla C = \frac{1}{H_z}\frac{\partial}{\partial \sigma}\left[\frac{(K_C+\nu)}{H_z}\frac{\partial C}{\partial \sigma}\right] + \mathcal{F}_C + \mathcal{D}_C$$

Equation of the state

$$\rho = \rho(T, S, P)$$

Hydrostatic equation

$$\frac{\partial \phi}{\partial \sigma} = \left(\frac{-gH_z\rho}{\rho_o}\right)$$

Continuity equation

$$\frac{\partial H_z}{\partial t} + \frac{\partial (H_z u)}{\partial x} + \frac{\partial (H_z v)}{\partial y} + \frac{\partial (H_z \Omega)}{\partial \sigma} = 0$$

$$\vec{v} = (u, v, \Omega)$$

$$\vec{v}\cdot\nabla = u\frac{\partial}{\partial x} + v\frac{\partial}{\partial y} + \Omega\frac{\partial}{\partial \sigma}$$

Consta de una serie de desarrollos computacionales independientes o acoplados a modelos atmosféricos, de oleaje, de sedimentos, biogeoquímicos, bioópticos, biológicos y ecológicos.

El núcleo dinámico de ROMS se compone de cuatro algoritmos separados que incluyen el no lineal (NLM), el tangente lineal (TLM), el representativo tangente lineal (RPM) y el contiguo (ADM). Dispone de varios algoritmos de control para ejecutar cada uno de ellos, tanto juntos como por separado, para estudiar la dinámica, la sensibilidad y la estabilidad de los resultados ante perturbaciones y errores, confiriéndole una gran estabilidad.

Incluye algoritmos para la asimilación de datos.

Esquema numérico:

Las ecuaciones primitivas se resuelven utilizando un esquema de pasos de tiempo explícito dividido que requiere un tratamiento especial y acoplamiento entre los modos barotrópico (rápido) y baroclínico (lento).

Se lleva a cabo un número finito de pasos de tiempo barotrópico, dentro de cada paso baroclínico, para evolucionar las ecuaciones de momento integradas verticalmente y de superficie libre. Se usa un filtro de tiempo en forma de coseno, centrado en el nuevo nivel de tiempo, para promediar los campos barotrópicos para evitar aliasing.

Todas las ecuaciones 2D y 3D se derivan en el tiempo utilizando un algoritmo de paso de tiempo predictivo (Leap-Frog) y corrector (Adams-Molton) robusto y estable.

La estabilidad mejorada del esquema permite pasos de tiempo más largos que compensa con creces el aumento del costo del algoritmo predictor-corrector.

Discretización vertical:

- Utiliza coordenadas de seguimiento del terreno (σ) que permiten una mayor resolución en áreas de interés, como la termoclina y las capas límite inferiores.

- Utiliza diferencias finitas centradas de segundo orden en una cuadrícula vertical escalonada pudiendo modificarse el orden a través de una reconstrucción parabólica de derivadas verticales.

- Dispone de algoritmos específicos para corrección de errores del gradiente de presión.

Discretización Horizontal:

- Utiliza coordenadas curvilíneas ortogonales ajustadas a los límites en una rejilla Arakawa-C escalonada.

Incluye coordenadas cartesianas (métricas constantes) y esféricas (métricas variables).

- Los límites costeros se pueden especificar como una cuadrícula finita discretizada a través del enmascaramiento de tierra / mar.

- Utiliza diferencias finitas centradas y de segundo orden, auqnue el código está diseñado para facilitar la implementación ordenes superiores.

Parametrización de mezcla vertical:

- Puede ser por esquemas de cierre locales o no locales.

- El esquemas de cierre local se basa en las ecuaciones de energía cinética turbulenta de nivel 2.5 de Mellor y Yamada y la parametrización de la Escala de Longitud Genérica (GLS). El de Mellor and Yamada (1982) presenta jerarquía de complejidad incremental. ROMS proporciona hasta el nivel 2.5. Añade, además una ecuación de pronóstico para la energía cinética turbulenta.

El esquema de cierre no local se basa en la formulación de capa límite de perfil K de Large et al. (1994). El esquema de perfil K se ha ampliado para incluir tanto las capas límite oceánicas superficiales como las inferiores.

- El GLS es un modelo de turbulencia de dos ecuaciones que permite una amplia gama de cierres de mezcla verticales, incluidos los populares esquemas k-kl (Mellor-Yamada nivel 2.5), k-ε y k-ω.

- El rendimiento de estos cierres en ROMS es relevante para las aplicaciones de transporte de sedimentos.

Esquemas de Advección:

- ROMS tiene varias opciones para esquemas de advección: diferencias centradas de segundo y cuarto orden; y de tercer orden, en sentido ascendente.

- Dispone, además de una opción para la representación conservadora spline parabólica de la advección vertical que tiene propiedades de dispersión similares a un esquema convencional preciso de ocho órdenes.

- La mezcla horizontal de trazadores puede realizarse a lo largo de niveles verticales, superficies geopotenciales (profundidad constante) o superficies isopícnicas (densidad constante). El operador de mezcla puede ser armónico o biharmonic.

Introducción al Regional Ocean Model System (ROMS)

Corre bajo UNIX – LINUX y requiere preprocesador de C.

Las directivas de paralelización OpenMP 2.0 y MPI.

Las entradas y salidas se realizan en ficheros con formato NetCDF.

Código abierto e interoperable, de desarrollo distribuido y mantenido por la comunidad de desarrolladores y usuarios

Introducción al Regional Ocean Model System (ROMS)

Regional Ocean Model System (ROMS)

- Modelo de comunidad con más de 6.000 usuarios y 8.000 artículos científicos publicados
- Estandar de desarrollo en comunidad, en continuo desarrollo.
- Permite acoplamiento a otros modelos, p.e. atmósfera/océano, SWAN (oleaje) o Meteorológicos (WRF, MVFs, HARMONIE), etc.
- Dispone de una gran cantidad de módulos disponibles que se ejecutan en conjunto o separadamente
- Capacidad de simulación de zonas de inundación y anidamiento de mallas bidireccionales
- Ampliamente probado en oceanografía operacional

Introducción al Regional Ocean Model System (ROMS)

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Improving Operational Ocean Models for the Spanish Port Authorities: Assessment of the SAMOA Coastal Forecasting Service Upgrades

by Manuel García-León [1,2,*], Marcos G. Sotillo [2,3], Marc Mestres [4], Manuel Espino [4] and Enrique Álvarez Fanjul [2]

Abstract

The Puertos del Estado SAMOA coastal and port ocean forecast service delivers operational ocean forecasts to the Spanish Port Authorities since 01/2017 (originally set-up for 9 ports). In its second development phase (2019–2021), the SAMOA service has been extended to 31 ports (practically, the whole Spanish Port System). Besides, the next generation of the SAMOA service is being developed. Research is being focused on (1) updating atmospheric forcing (by combining the AEMET HARMONIE 2.5 Km forecasts and the IFS-ECMWF ones), (2) upgrading the circulation model (ROMS), and (3) testing new methodologies to nest SAMOA systems in the Copernicus IBI-MFC regional solution (with emphasis on its 3D hourly dataset). Evaluation of specific model upgrades is here presented. Model sensitivity tests have been assessed using the available in-situ and remoted sensed (i.e., RadarHF) observations. The results show that SAMOA outperforms IBI-MFC in sea level forecasting at meso- and macro-tidal environments. Improvements by the herein proposed upgrades are incremental: some of these set-ups were used in the last SAMOA operational releases (i.e., the SAM_INI and the SAM_ADV ones; the later currently in operations), whereas the latest test (SAM_H3D) ensures more nesting consistency with the IBI-MFC and improves significantly surface currents and sea-surface temperature simulations.

DOWNLOAD THIS USE CASE

Overview

INSTITUTO ESPAÑOL DE OCEANOGRAFÍA (IEO) has developed a habitat model for predicting spawning distribution of Sardine along the European Atlantic coast. Sardine catches have been decreasing regularly since 1980 and an assessment of the stock is needed. IEO has developed a modelling suite involving hydrodynamical models and ecological models and ending in an advection and dispersion model for Sardine eggs and larvae. The ROMS high-resolution hydrodynamical model is downscaled from the Copernicus Marine Service Iberian-Biscay-Irish Sea model. Dynamical downscaling is a method for obtaining high-resolution local models from lower resolution Copernicus Marinemodels as forcing conditions.

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NOAA's Ocean Climate Change Web Portal

Regional Ocean Model:

We used the Regional Ocean Modeling System (ROMS, Shchepetkin and McWilliams 2003, 2005) to investigate the effects of climate change on the northwest Atlantic. ROMS is a terrain-following primitive equation model with a free surface using incompressible and hydrostatic approximations. The version used here was configured by Kang and Curchitser (2003) has a horizontal grid spacing of 7 km and 40 vertical levels with higher resolution near the surface. The domain extends along the east coast of North America from approximately 10N to 52N, covering the western Caribbean, Gulf of Mexico, and the western North Atlantic from Florida to Newfoundland and includes the Loop Current, Florida Current, Gulf Stream and the southern portion of the Labrador current. The initial and oceanic boundary forcing for the control simulation over the period 1976 to 2005 is obtained from the Simple Ocean Data Assimilation (SODA v2.1.6; Carton and Giese 2008) and the surface forcing from the Co-ordinated Ocean-Ice Reference Experiments (CORE v2; Large and Yeager 2009). Kang and Curchitser (2013) found that the mean path of the Gulf Stream and the distribution of eddy kinetic energy simulated by ROMS was in good agreement with satellite observations.

High-resolution downscaling of CMEMS oceanographic reanalysis in the area of the Tuscany Archipelago (Italy)

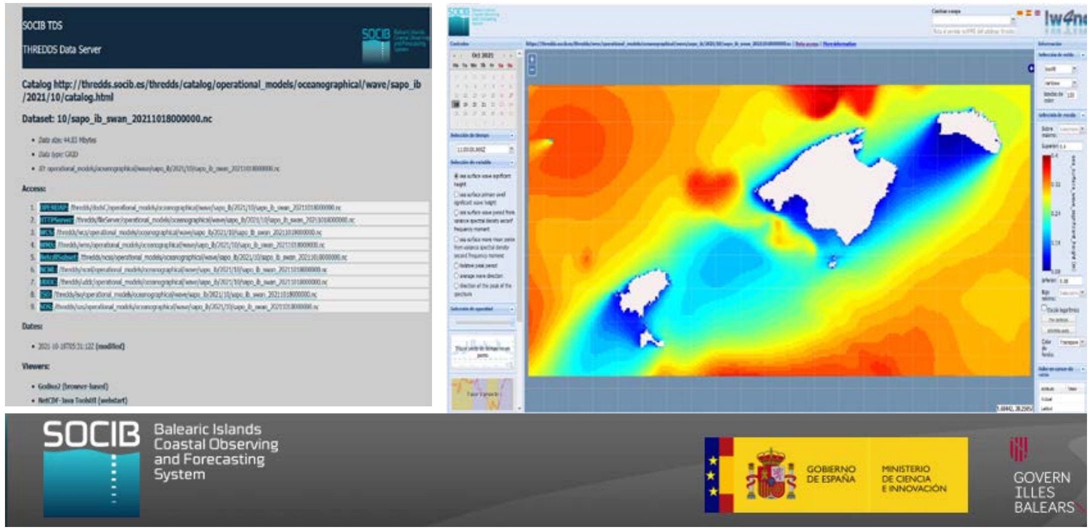
Michele Bendoni, Maria Fattorini, Stefano Taddei & Carlo Brandini

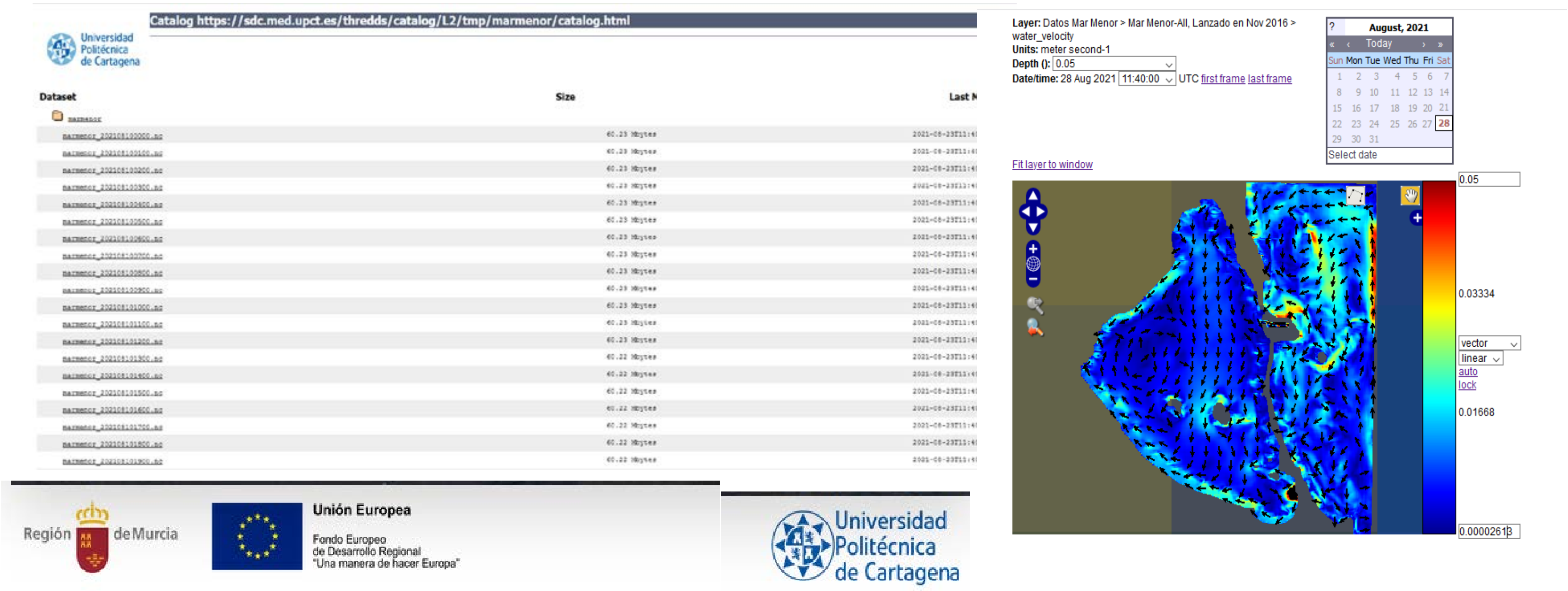
Ocean Dynamics **72**, 295–312 (2022) | Cite this article

Abstract

A native nested configuration of the ROMS model is implemented on the marine area between the Ligurian and Tyrrhenian basins, which includes the Tuscany Archipelago. Initial and boundary conditions are provided by the CMEMS Mediterranean Sea Physical Reanalysis product (1/16°), feeding the parent ROMS model (BLUE, 1/72°), in which a high-resolution grid is nested (PURPLE, 1/216°). Atmospheric forcing comes from a downscaled version of ERA5 reanalysis. Temperature and salinity profiles from gliders and floats, and HF-radar-derived surface currents, are compared to model outputs within the high-resolution area for the whole year 2017. Results show the downscaling procedure is able to reduce model errors

Introducción al Regional Ocean Model System (ROMS)





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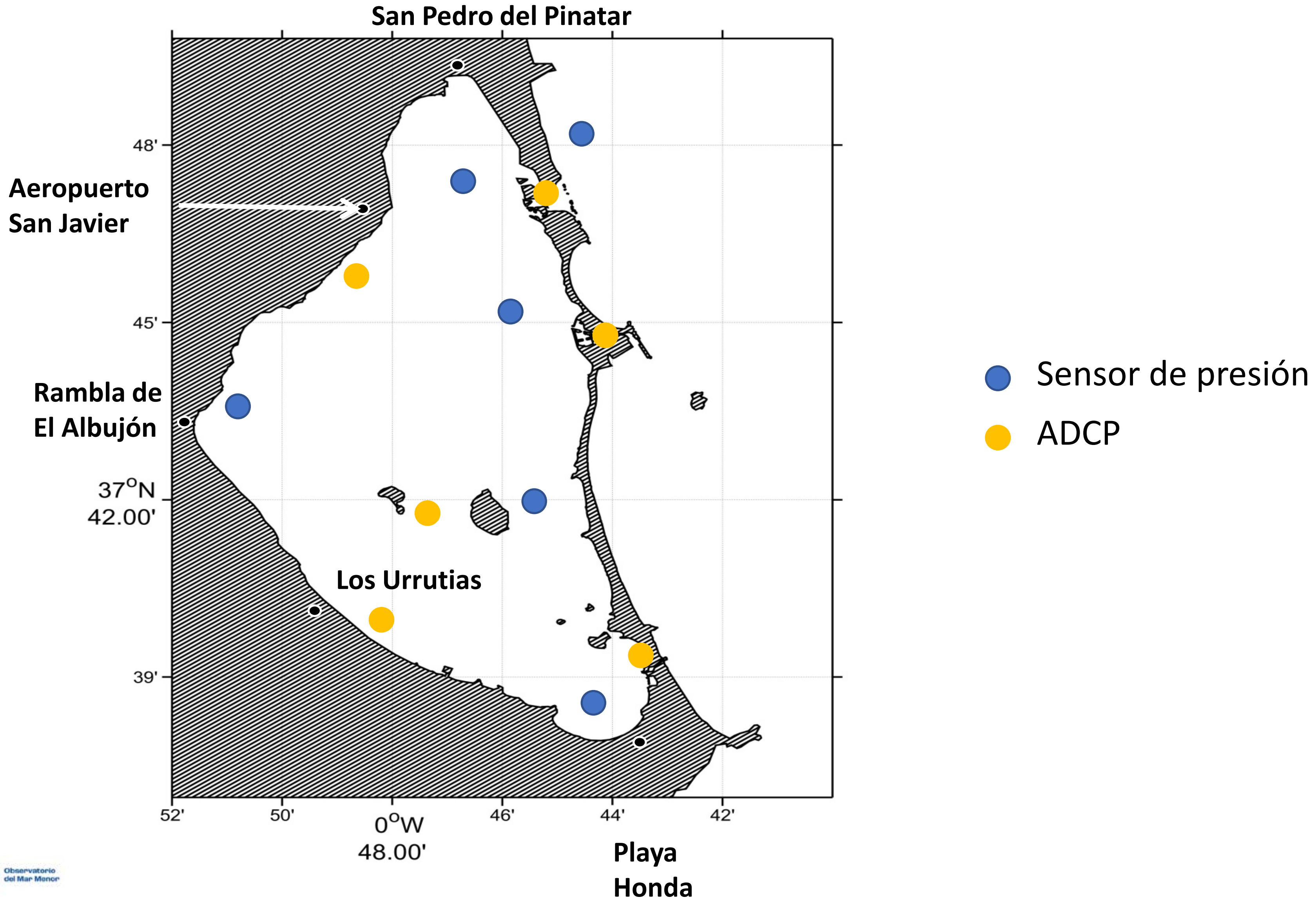
Aplicaciones del modelo ROMS al Mar Menor.

- Validación
- Anidamiento mallas bidireccionales
- Zonas inundables
- Atmósfera / Océano
- Modelo de corrientes
- Intercambio Mar Menor - Mediterráneo
- Oleaje
- Transporte de Sedimentos

Aplicaciones del modelo ROMS al Mar Menor.

Estudio Oceanográfico del Mar Menor

Equipos fondeados



Observatorio del Mar Menor

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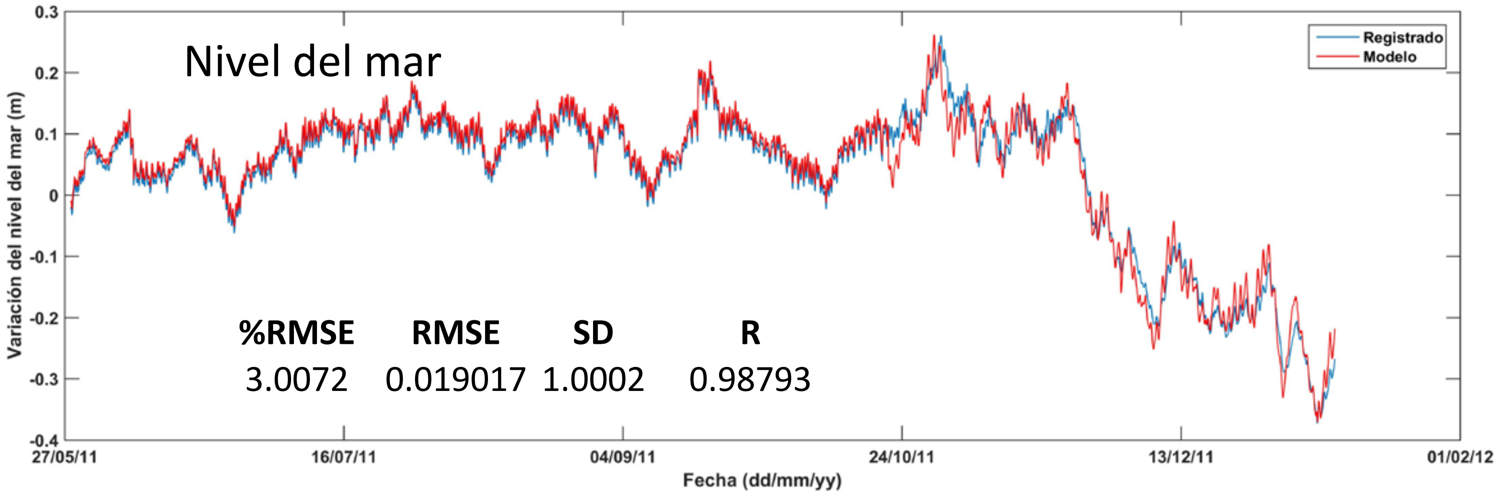
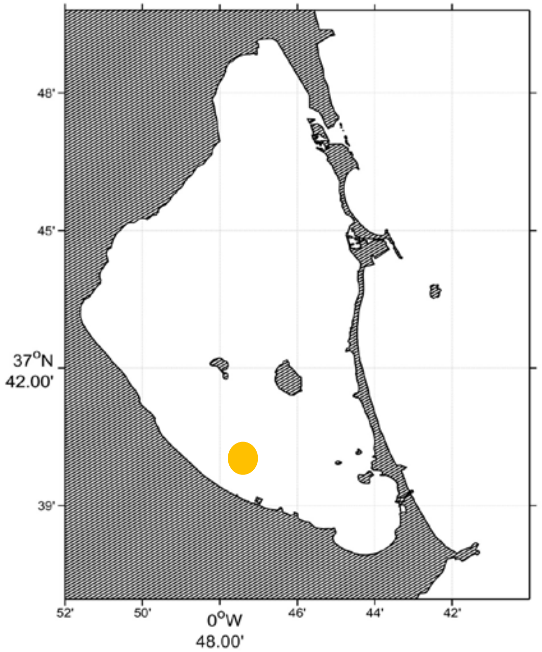
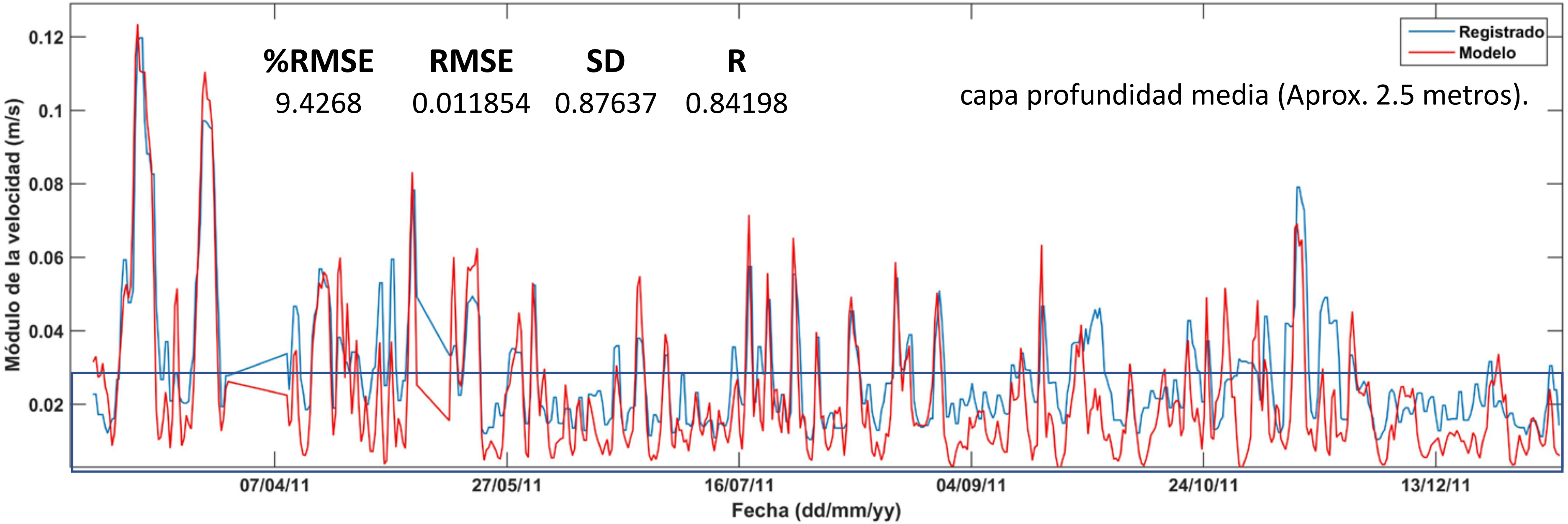
Aplicaciones del modelo ROMS al Mar Menor.

Validación

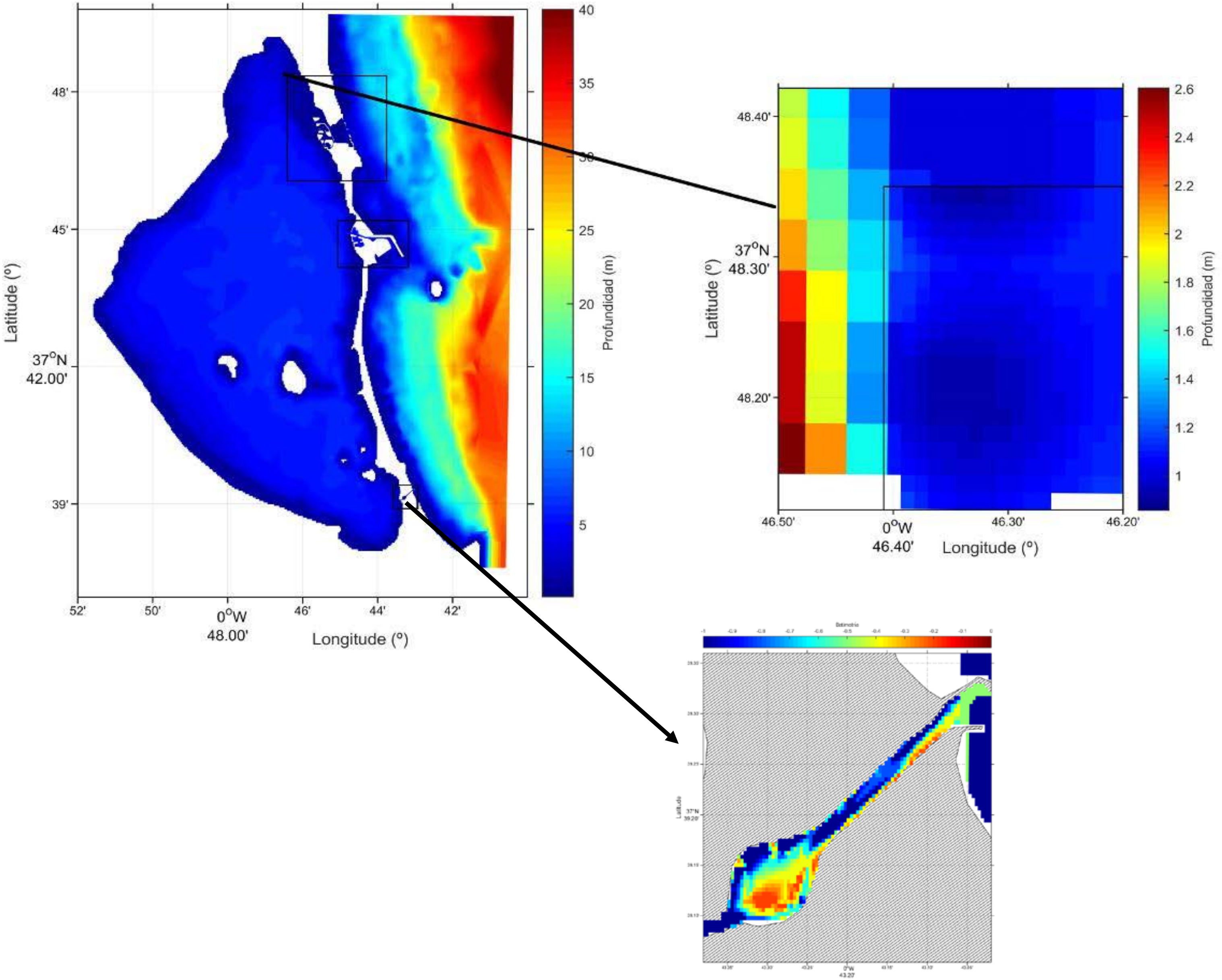






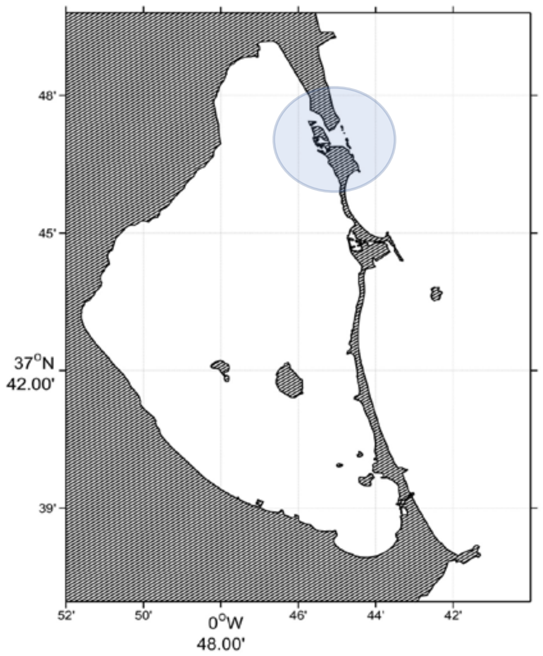
Aplicaciones del modelo ROMS al Mar Menor.

Anidamiento mallas bidireccionale



Aplicaciones del modelo ROMS al Mar Menor.

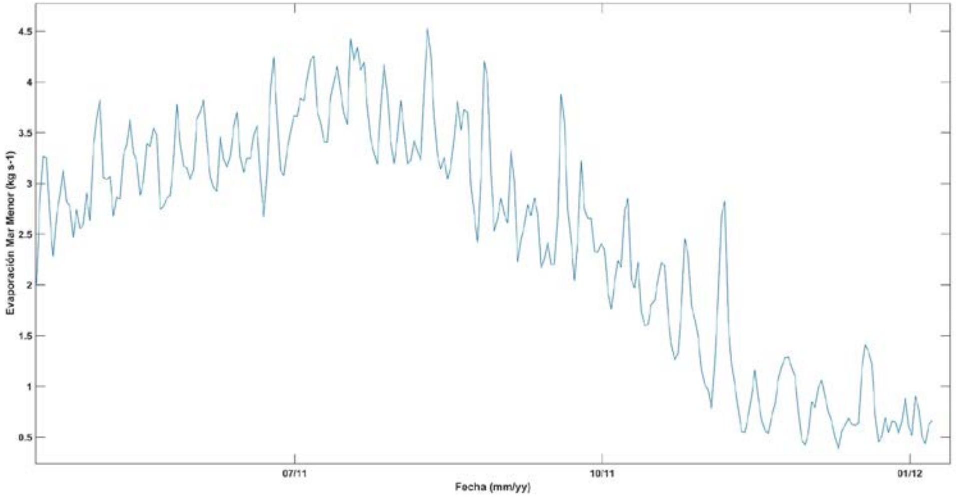
Zonas inundables



Atmósfera / Océano

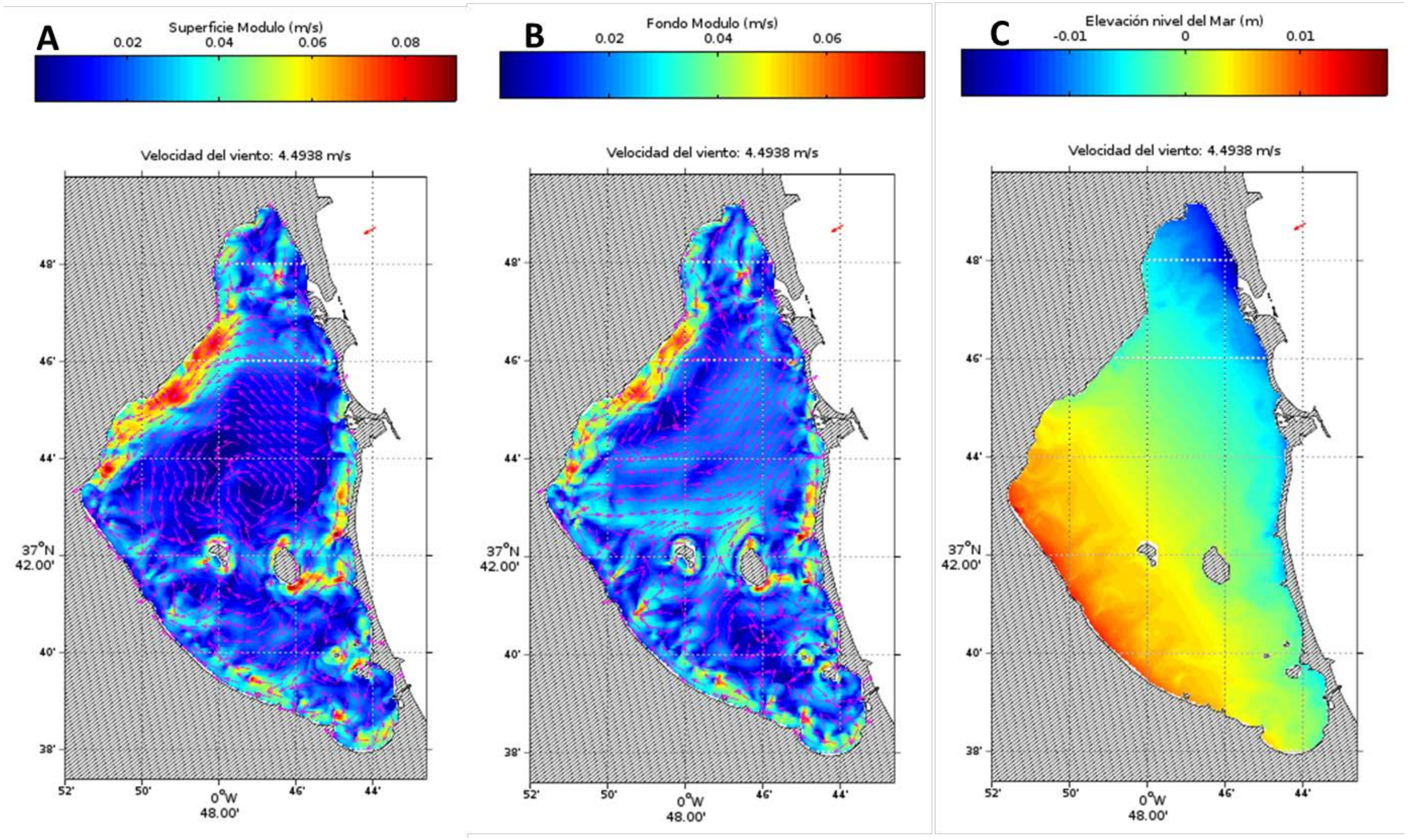
Coupled Ocean–Atmosphere Response Experiment – COARE 3.0
(Webster and Lukas 1992; Fairall et al. 1994, 2003) – > 37 parámetros

Salinidad diferencias menores
de 0.2 PSU en perfiles puntuales



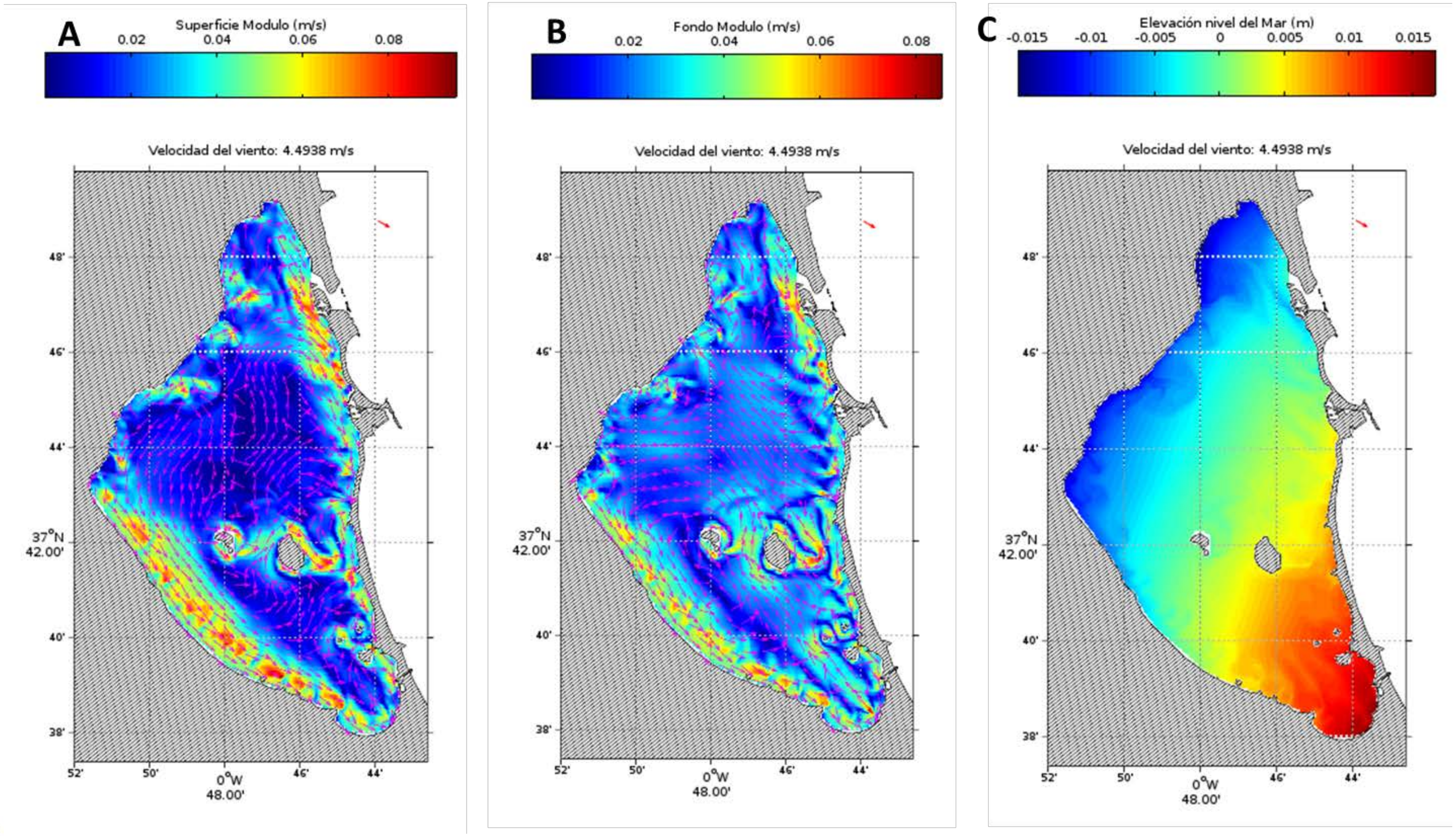
Aplicaciones del modelo ROMS al Mar Menor.

Modelo de corrientes



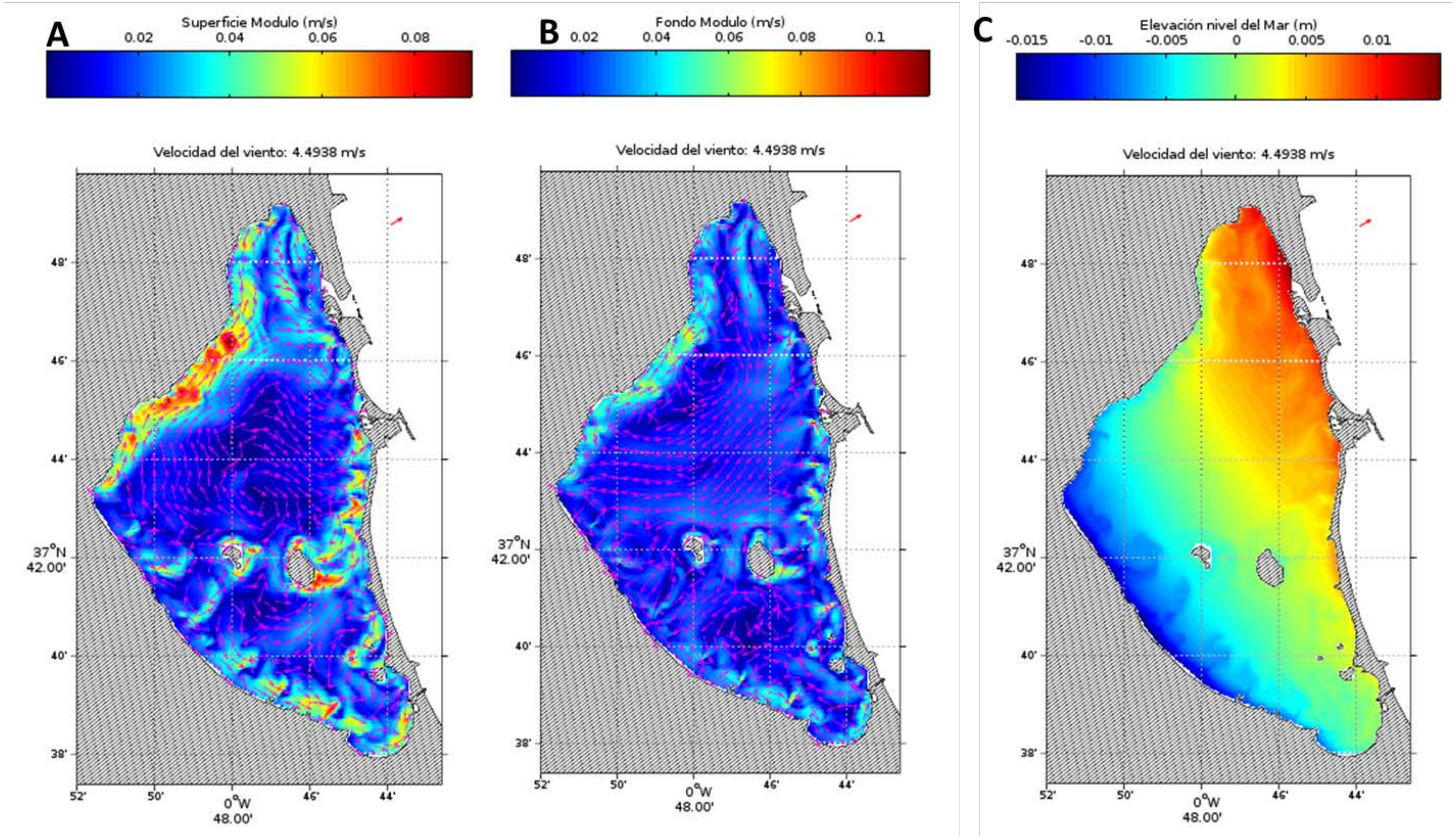
Aplicaciones del modelo ROMS al Mar Menor.

Modelo de corrientes



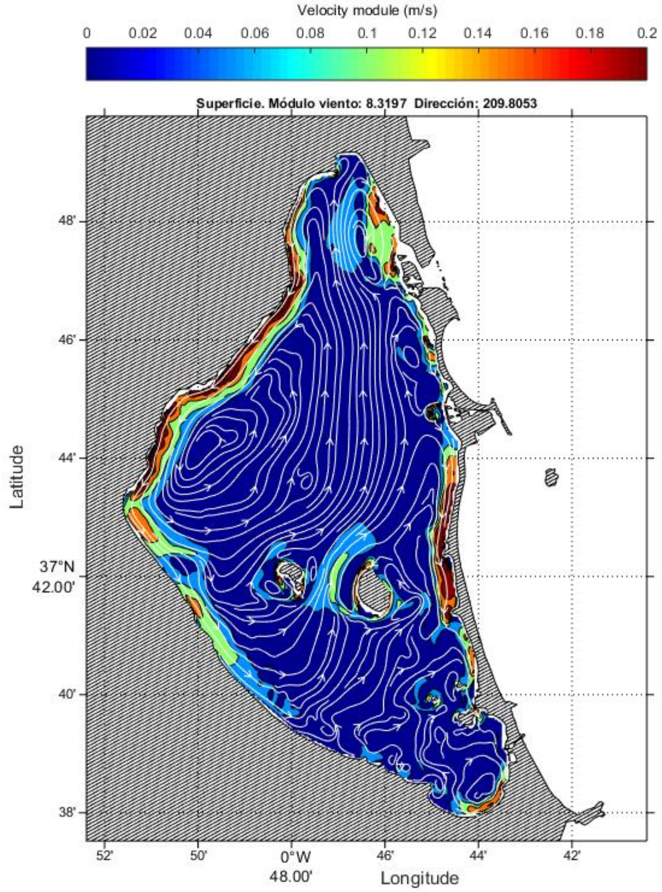
Aplicaciones del modelo ROMS al Mar Menor.

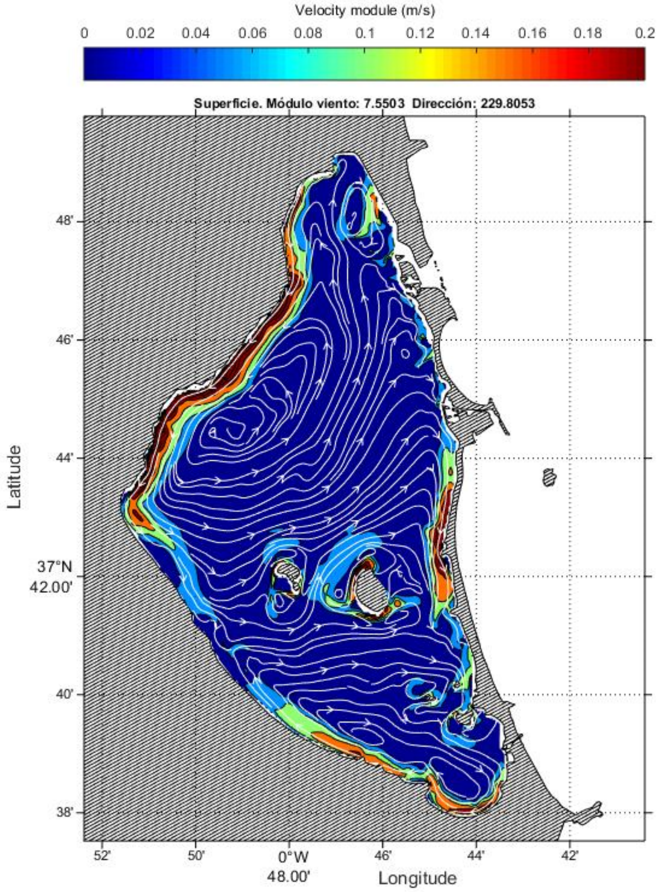
Modelo de corrientes

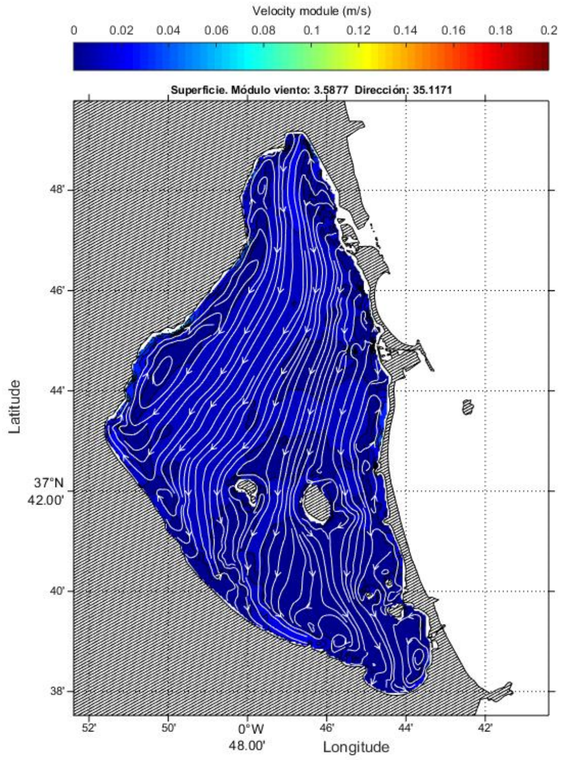


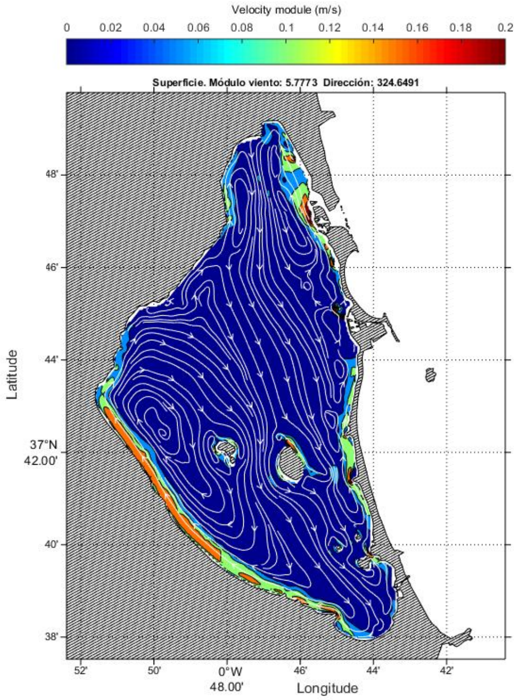
Aplicaciones del modelo ROMS al Mar Menor.

Modelo de corrientes



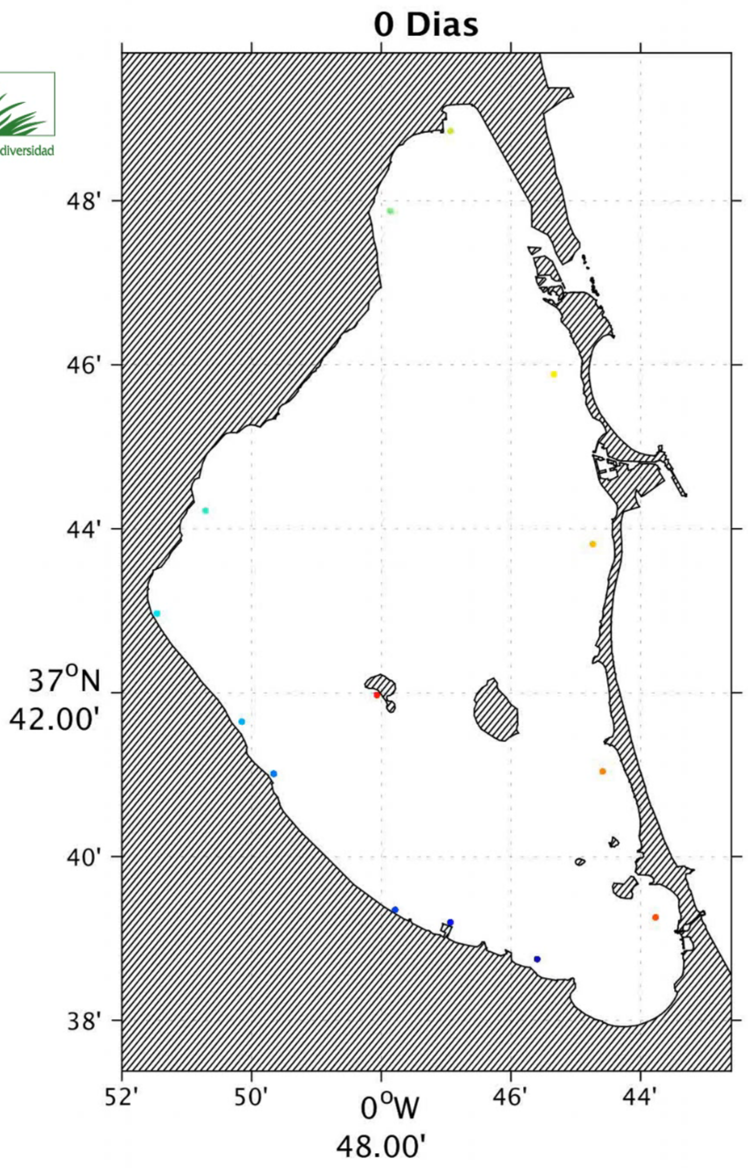






Aplicaciones del modelo ROMS al Mar Menor.

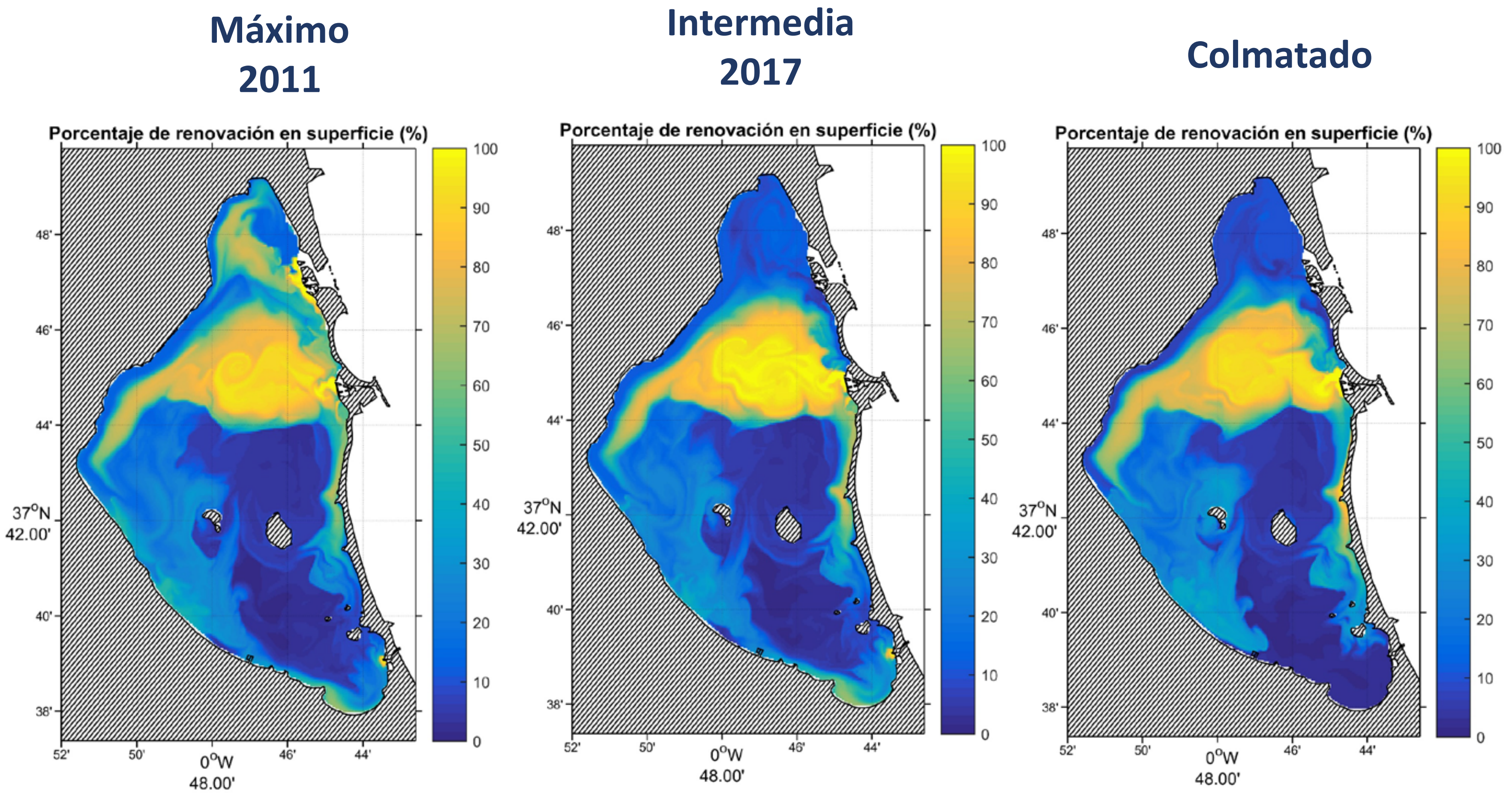
Modelo de corrientes



Aplicaciones del modelo ROMS al Mar Menor.

Intercambio Mar Menor – Mediterráneo Tasas renovación

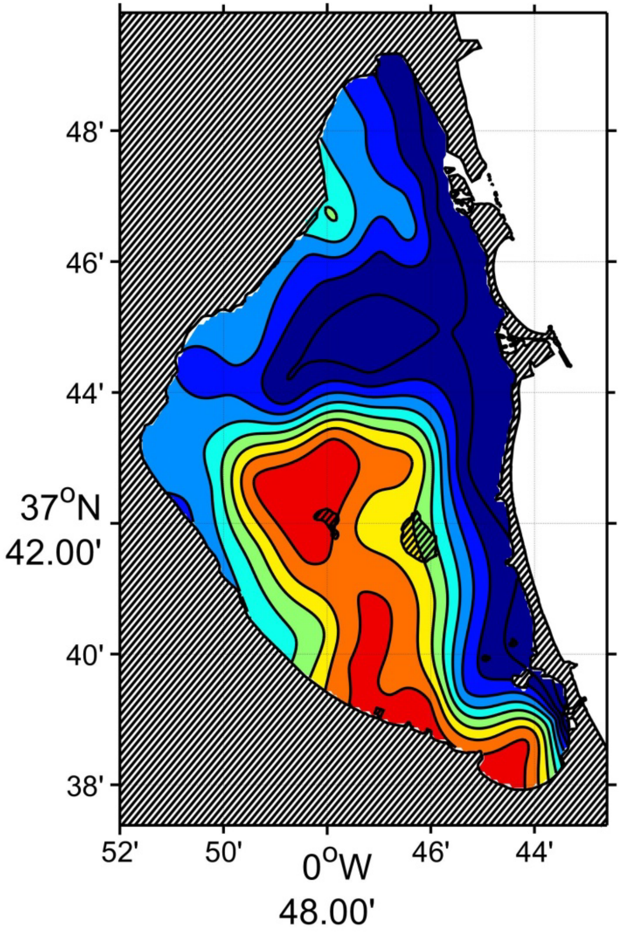
INVIERNO % de renovación en **SUPERFICIE**



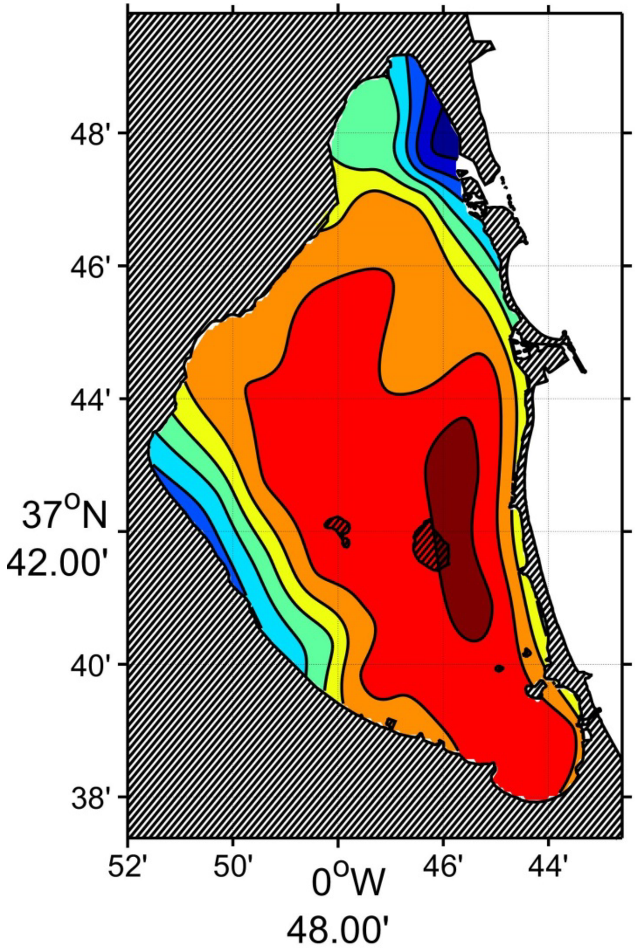
Aplicaciones del modelo ROMS al Mar Menor.

Intercambio Mar Menor – Mediterráneo

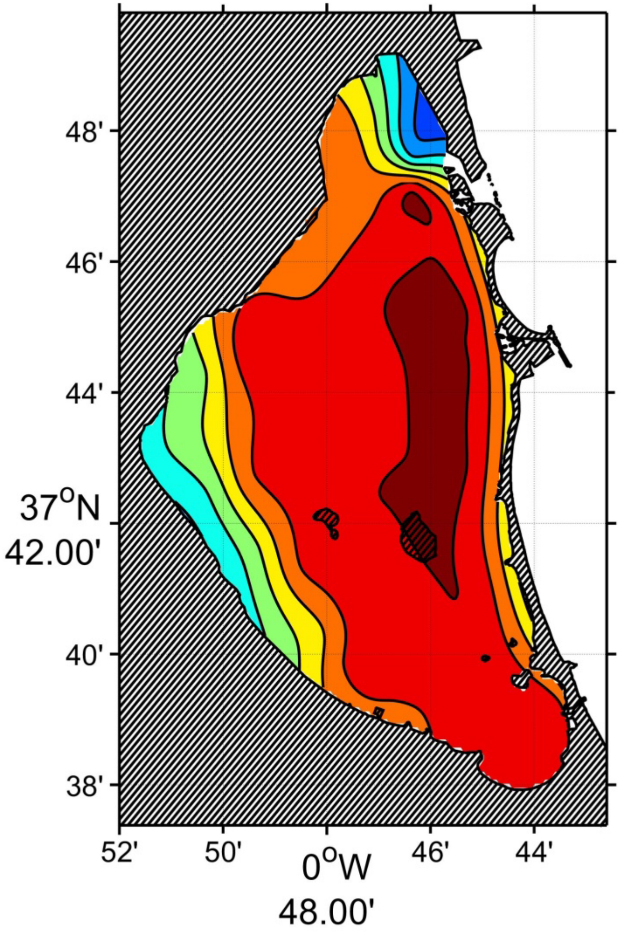
Superficie



Media



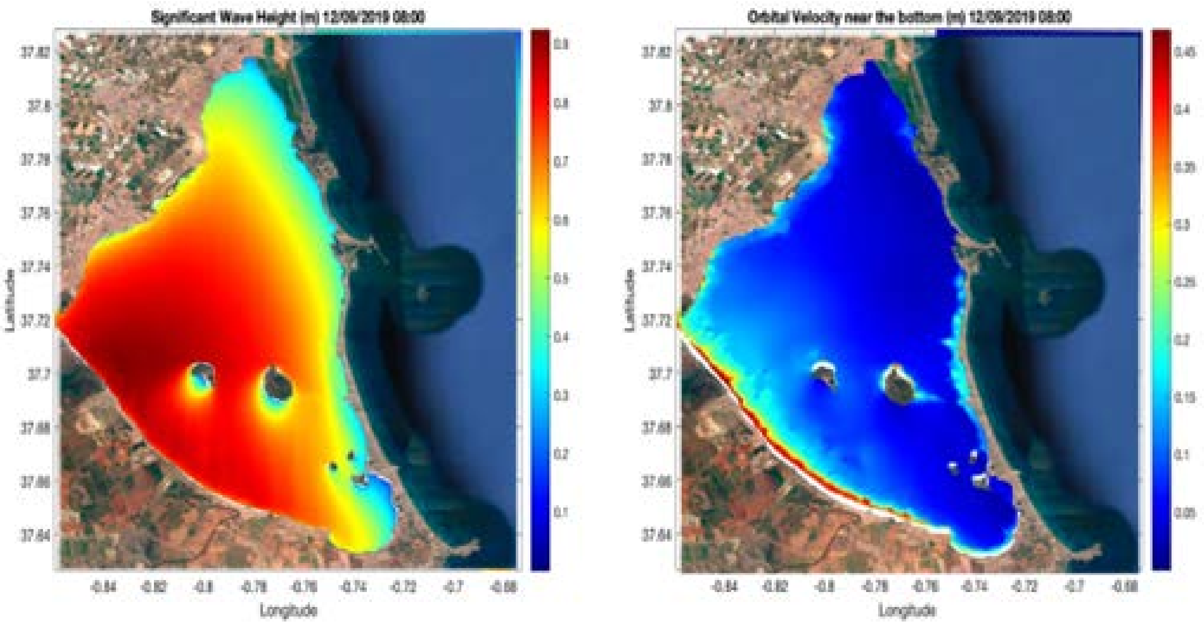
Fondo



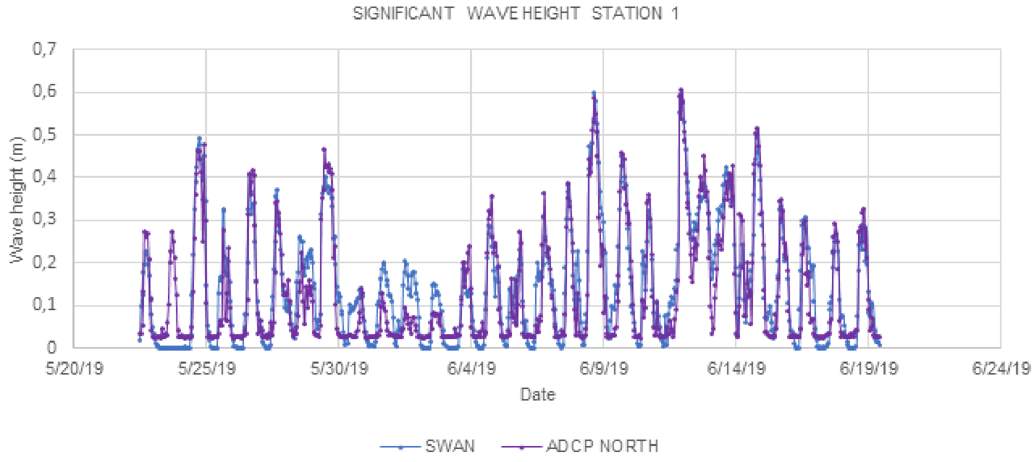
Aplicaciones del modelo ROMS al Mar Menor.

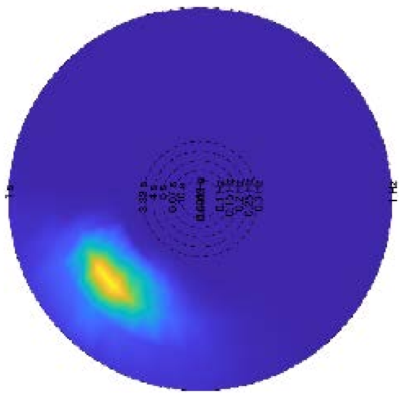
Oleaje

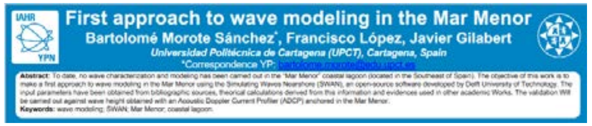
Simulating WAves Nearshore (SWAN)



Significant wave height and orbital velocity near the bottom







First approach to wave modeling in the Mar Menor

Bartolomé Morote Sánchez*, Francisco López, Javier Gilabert

Universidad Politécnica de Cartagena (UPCT), Cartagena, Spain

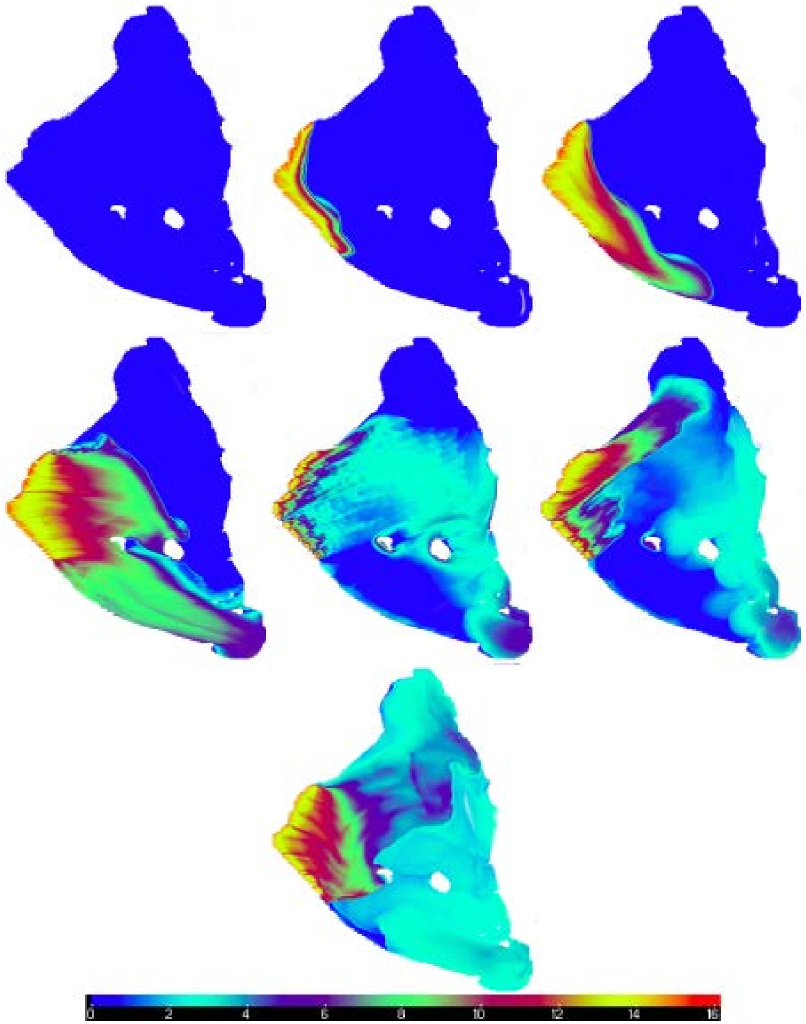
*Correspondence YP:

Abstract: To date, no wave characterization and modeling has been carried out in the "Mar Menor" coastal lagoon (located in the Southeast of Spain). The objective of this work is to make a first approach to wave modeling in the Mar Menor using the Simulating Waves Nearshore (SWAN), an open-source software developed by Delft University of Technology. The input parameters have been obtained from bibliographic sources, theorical calculations derived from this information and evidences used in other academic Works. The validation Will be carried out against wave height obtained with an Acoustic Doppler Current Profiler (ADCP) anchored in the Mar Menor.

Keywords: wave modeling; SWAN; Mar Menor; coastal lagoon.

Aplicaciones del modelo ROMS al Mar Menor.

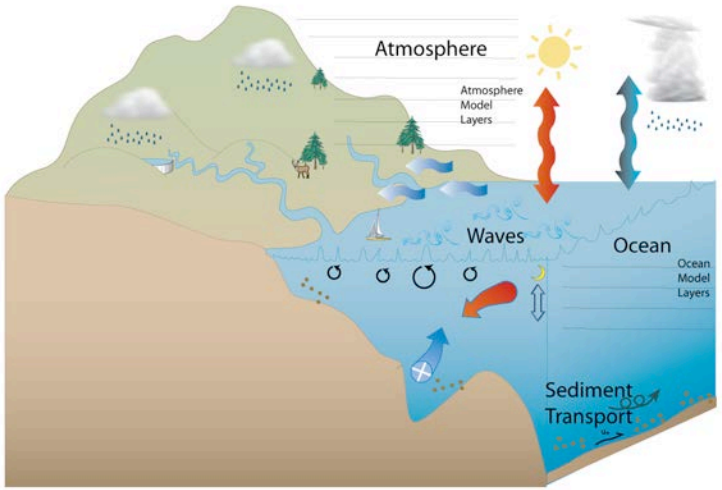
Transporte de Sedimentos

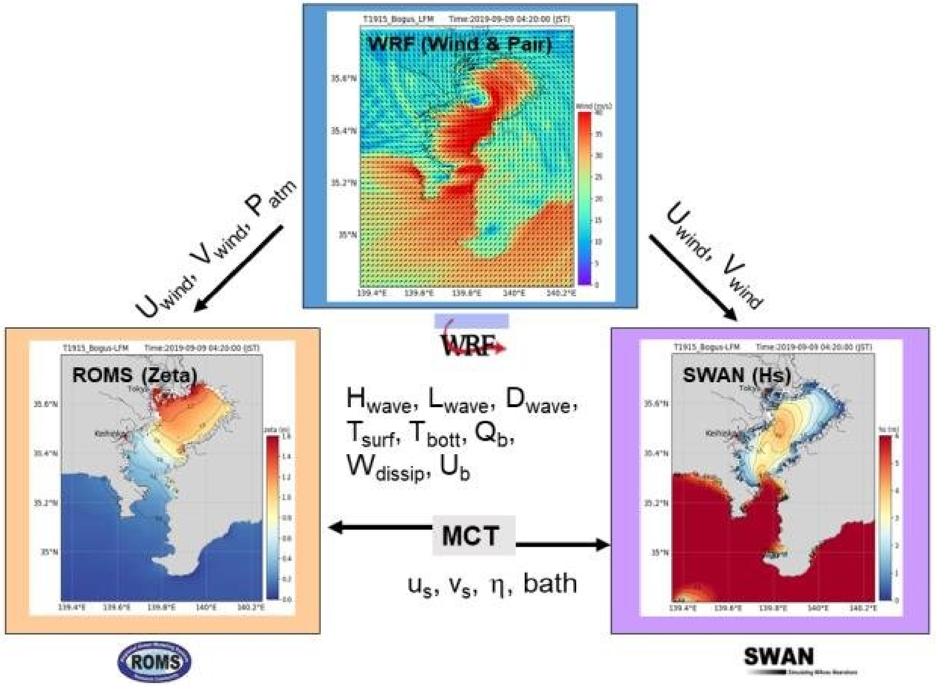


Concentracion de sedimento no cohesivo en suspension (kg/m3) en el fondo a las 0 horas, 4 horas, 8 horas, 12 horas, 16 horas, 20 horas y 24 horas de simulacion.

COAWST

COAWST: A Coupled-Ocean-Atmosphere-Wave-Sediment Transport Modeling System



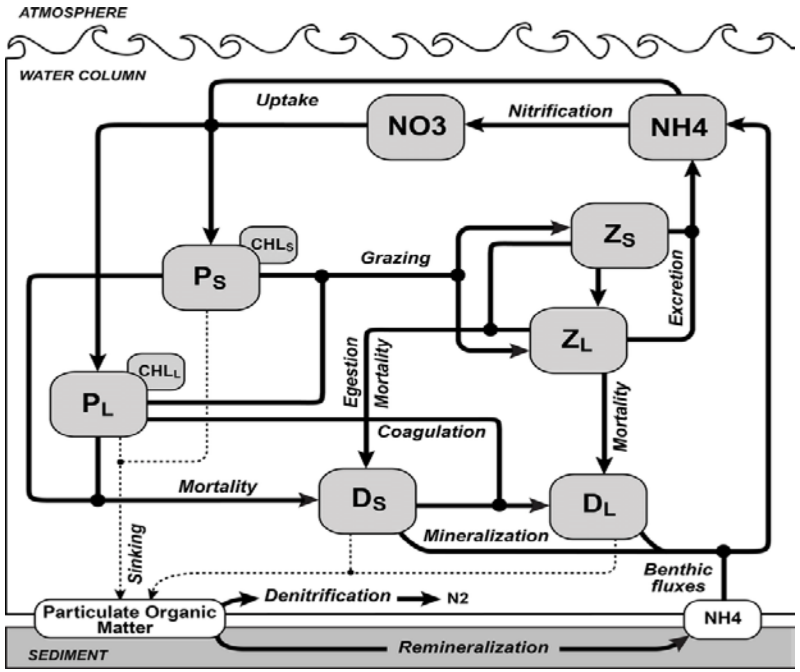


Fuente: Typhoon-induced storm surge analysis with coawst on different modelled forcing

Woods Hole Coastal and Marine Science Center – USGS
IMEDEA

Modelo ecológico

bio_Fennel.in

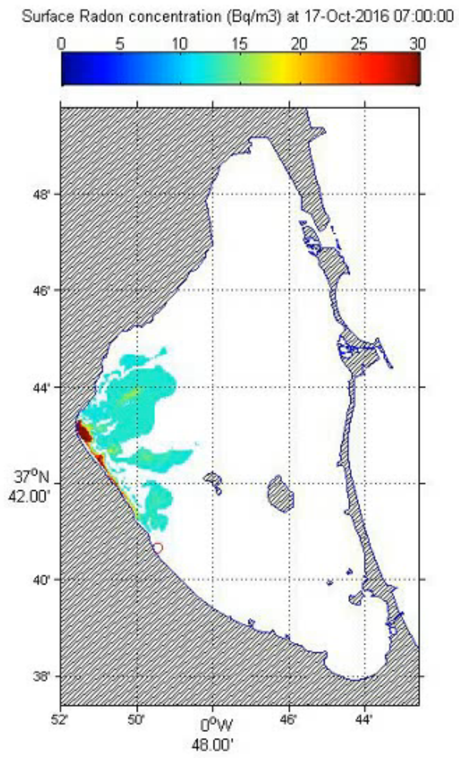


Fuente: An observation-based evaluation and ranking of historical Earth system model simulations in the northwest North Atlantic Ocean

#	index	Description	Units	NetCDF variable
1	iNO3_	Nitrate concentration	mmol/m^3	NO3
2	iNH4_	Ammonium concentration	mmol/m^3	NH4
3	iChlo	Chorophyll concentration	mmol/m^3	chlorophyll
4	iPhyt	Phytoplankton biomass	mmol/m^3	phytoplankton
5	iZoop	Zooplankton biomass	mmol/m^3	zooplankton
6	iLDeN	Large detritus N-concentration	mmol/m^3	LdetritusN
7	iSDeN	Small detritus N-concentration	mmol/m^3	SdetritusN
8	iLDeC	Large detritus C-concentration	mmol/m^3	LdetritusC
9	iSDeC	Small detritus C-concentration	mmol/m^3	SdetritusC
10	iTIC_	Total inorganic carbon	mmol/m^3	TIC
11	iTAlk	Alkalinity	mmol/m^3	alkalinity
12	iOxyg	Oxygen concentration	mmol/m^3	oxygen

Liège University

Integración del modelo ROMS en el modelo integral del Mar Menor



ELSEVIER

Journal of Hydrology
Volume 525, June 2015, Pages 55-71

Combining radon, short-lived radium isotopes and hydrodynamic modeling to assess submarine groundwater discharge from an anthropized semiarid watershed to a Mediterranean lagoon (Mar Menor, SE Spain)

Paul Baudron [a, b, h, i], Sabine Cockenpot [c], Francisco Lopez-Castejon [d], Olivier Radakovitch [c], Javier Gilabert [d], Adriano Mayer [e], José Luis Garcia-Arostegui [f, g], David Martinez-Vicente [a, g], Christian Leduc [b], Christelle Claude [c]

Show more

Towed sensors and hydrodynamic model evidence the need to include submarine in coastal lagoons water balance, the Mar Menor example (SE Spain).

Francisco López-Castejón[1], Paul Baudron[2], Javier Gilabert[1], Sabine Cockenpot[3], Adriano Mayer[4], Olivier Radakovitch[3], José Luis García Aróstegui[5], Christian Leduc[6] and Christelle Claude[3]

1) Universidad Politécnica de Cartagena. Alfonso XIII 52, Cartagena (Spain)

2) Department of Civil, Geological and Mining Engineering, École Polytechnique de Montréal, Québec (Canada).

3) CEREGE, UMR7330, Université d'Aix-en-Provence (France).

4) EMMAH, UMR 1114, Université d'Avignon, Avignon (France).

5) Insituto Geológico y Minero de España, Madrid (Spain).

6) Institut de Recherche pour le Développement, UMR G-EAU, Montpellier (France).

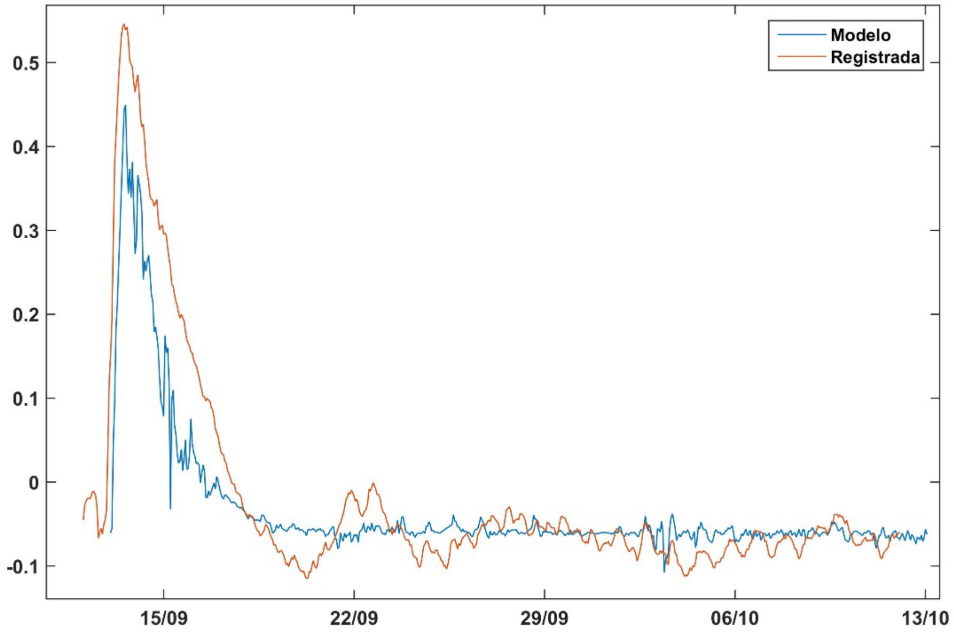
Abstract – Hydrodynamic models have proven to be powerful tools to provide a better understanding of hydrological and biological processes occurring in water masses. Sea level gauges, meteorological stations, current meters and surface water stream gauging stations, between others, permit their calibration and validation.

hydrodynamic of the lagoon and the water balance of the system.

In the Mar Menor coastal lagoon, data for model calibration was obtained from several studies on the

Integración del modelo ROMS en el modelo integral del Mar Menor

Modelo operacional – DANA 2019, estratificación, anoxia



IAHS2022-581
https://doi.org/10.5194/iahs2022-581
IAHS-AISH Scientific Assembly 2022

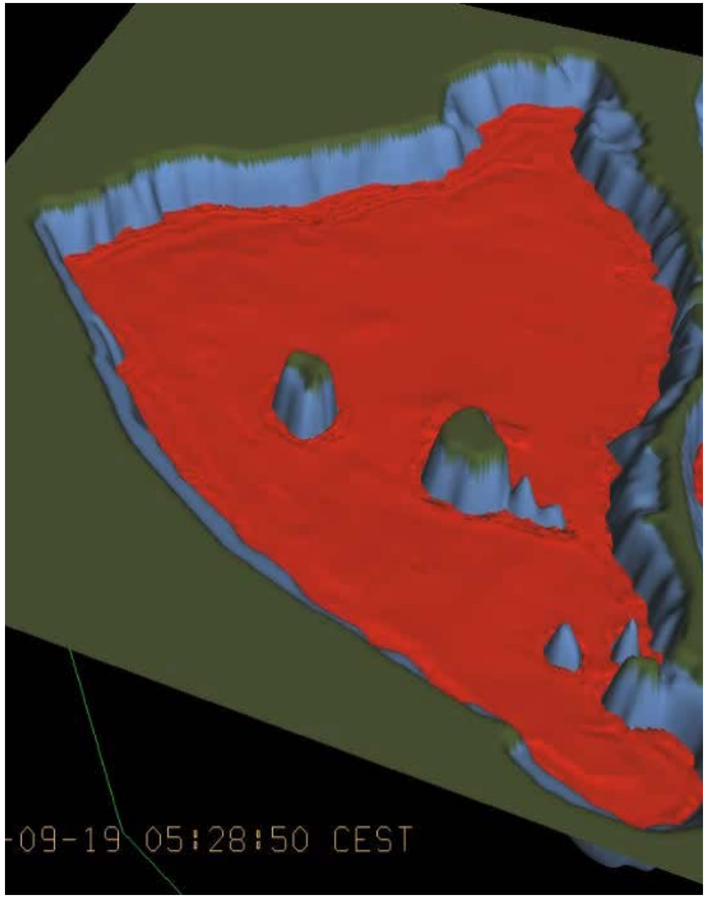
Modelling of a strong flood event on the Mar Menor coastal lagoon with ROMS

Francisco López Castejón, Javier Gilabert Cervera, Nuria Alcaraz Oliver, Dionisio Tudela Meroño, and Carolina Rodriguez de Mesas
Universidad Politécnica de Cartagena, Departamento de Ingeniería Química y Ambiental, Spain (francisco.lopez@upct.es)

The objective of the OPAL (ref: PID2019-110311RB-C22) project is to identify and assess the major pathways delivering nutrients, trace metals and pollutants originated from anthropogenic activities to coastal Mediterranean lagoons connected to intensively used aquifers and their consequences on the lagoon geochemical cycles. One of its goals is "To assess of the role of storms and episodic events in the input of nutrients, metals and pollutants". Within this framework, the capability of the hydrodynamic model Regional Ocean Model System (ROMS) to simulate fast increase of the Mar Menor coastal lagoon sea level due to extreme flood was tested. In September 2019 the stronger storm and flood registered in the Spanish Levantine area in 87 years occurred. In only 13 hours the

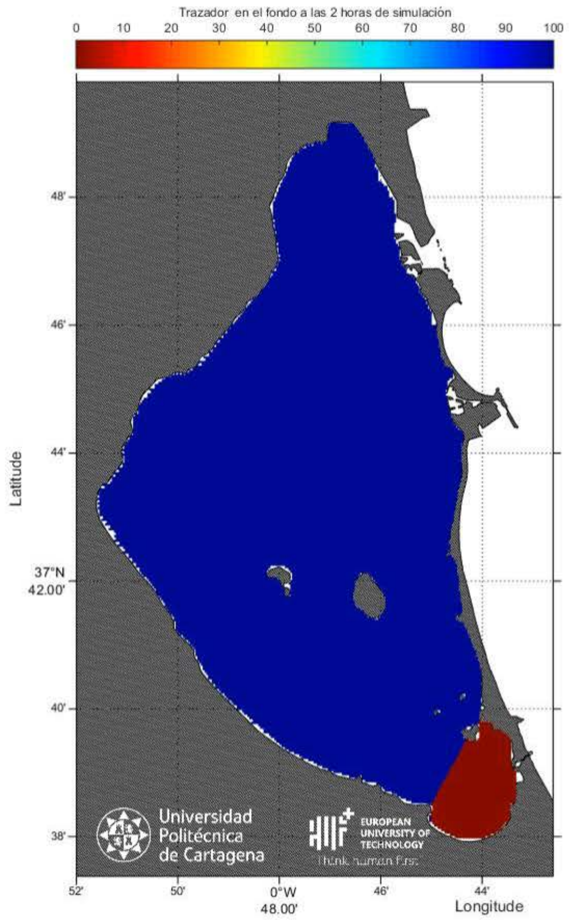
Integración del modelo ROMS en el modelo integral del Mar Menor

Modelo operacional – DANA 2019, estratificación, anoxia



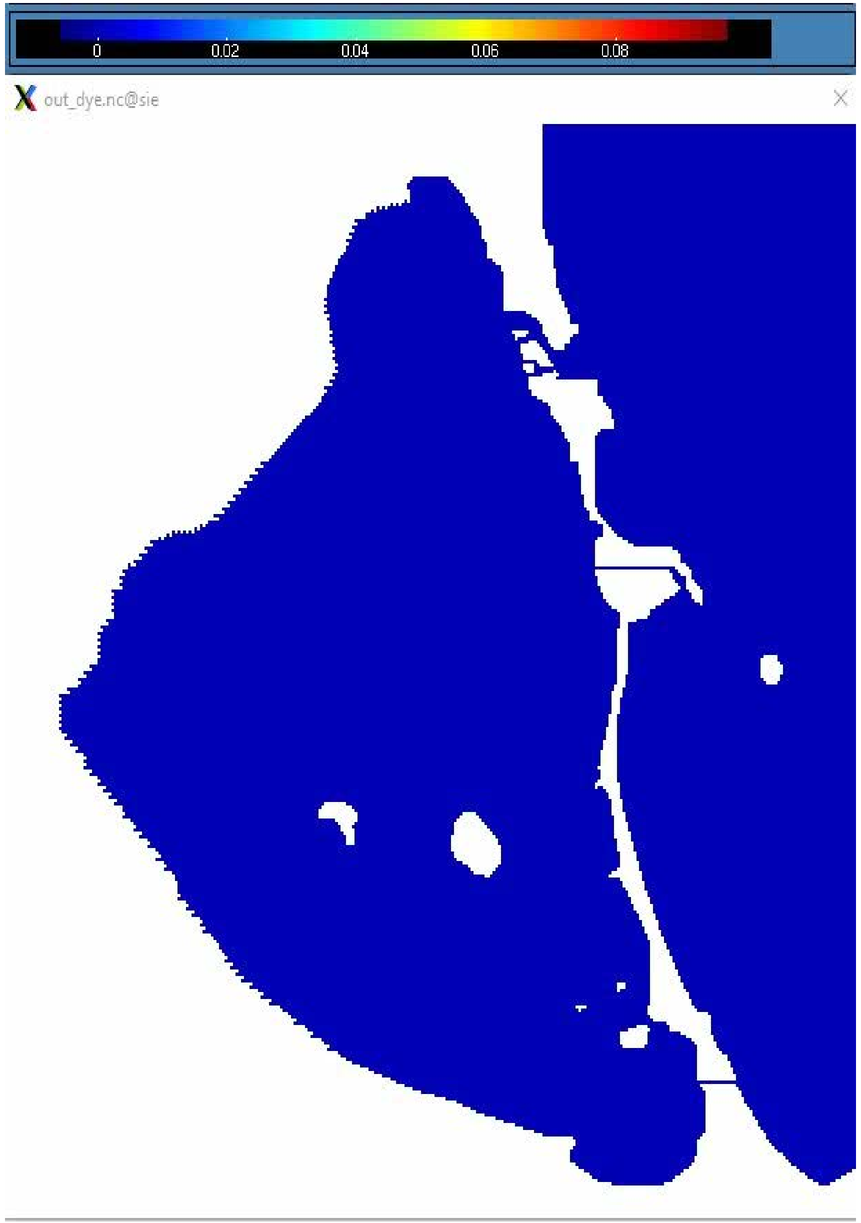
Integración del modelo ROMS en el modelo integral del Mar Menor

Modelo operacional – anoxia verano 2021



Integración del modelo ROMS en el modelo integral del Mar Menor

Harmonie + SUTRAN



Gracias por su atención