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Encontro de Oceanografia Sesimbra 2026

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Encontro de Oceanografia

Sesimbra 2026

APOCEAN

ASSOCIAÇÃO PORTUGUESA DE OCEANOGRAFIA

A **Associação Portuguesa de Oceanografia** (APOCEAN), constituída em 2013 na sequência da reformulação da antiga Associação Portuguesa de Paleoceanografia, é uma sociedade científica composta por profissionais - investigadores, técnicos, estudantes, entre outros - que desenvolvem atividade na área da oceanografia, em todas as suas vertentes - oceanografia física, química, biológica, geológica e operacional, paleoceanografia e clima. Tem como principais objetivos:

- Promover o intercâmbio científico através da realização de encontros, reuniões e workshops;
- Identificar e propor soluções para os desafios comuns enfrentados por quem investiga o oceano;
- Promover a interdisciplinaridade, reunindo cientistas de diferentes áreas do conhecimento;
- Apoiar a internacionalização da oceanografia portuguesa, incentivando a cooperação com associações congéneres e instituições internacionais;
- Incentivar a divulgação da investigação científica junto da sociedade civil;
- Contribuir para o reforço da formação em oceanografia nas universidades;
- Divulgar a relevância social, económica e ambiental do estudo dos oceanos;
- Promover uma visão atual, integrada e cientificamente sólida da oceanografia;
- Participar ativamente na definição de políticas de investigação sobre o oceano;
- Apoiar a representação portuguesa em organismos internacionais dedicados à investigação e exploração do oceano.

A associação integra profissionais da área da oceanografia ligados a centros e unidades de investigação, laboratórios, institutos públicos e universidades com atividade no domínio das ciências do mar em Portugal.

Este ano, o Encontro de Oceanografia, promovido pela APOCEAN, terá lugar nos dias **21 e 22 de maio**, em **Sesimbra**.

Encontro de Oceanografia Sesimbra 2026

APOCEAN
ASSOCIAÇÃO PORTUGUESA DE OCEANOGRAFIA

The **Portuguese Oceanography Society** (APOCEAN), established in 2013 following the restructuring of the former Portuguese Association of Paleoceanography, is a scientific society composed of professionals (researchers, technicians, students, among others) who work in the field of oceanography in all its branches, including physical, chemical, biological, geological, and operational oceanography, as well as paleoceanography and climate studies. Its main objectives are:

- To promote scientific exchange through the organization of conferences, meetings, and workshops;
- To identify and propose solutions to common challenges faced by those conducting ocean research;
- To foster interdisciplinarity by bringing together scientists from different fields of knowledge;
- To support the internationalization of Portuguese oceanography by encouraging cooperation with similar associations and international institutions;
- To encourage the dissemination of scientific research to civil society;
- To contribute to strengthening oceanography education in universities;
- To highlight the social, economic, and environmental relevance of ocean studies;
- To promote a modern, integrated, and scientifically robust vision of oceanography;
- To actively participate in the definition of ocean research policies;
- To support Portuguese representation in international organizations dedicated to ocean research and exploration.

The association brings together oceanography professionals affiliated with research centers and units, laboratories, public institutes, and universities engaged in marine science activities in Portugal.

The biennial national Oceanography Meeting, organized by APOCEAN, will take place on **May 21–22** in **Sesimbra**.

Encontro de Oceanografia Sesimbra 2026

PROGRAMA | PROGRAMME

INVITED SPEAKER

José-Abel Flores

Pioneer in Spain and internationally in the study of coccolithophores, key planktonic algae in the carbon cycle and climate evolution, he has made major contributions to their use as paleoenvironmental indicators. Building on early biostratigraphic studies, he developed quantitative tools for high-resolution reconstructions of ocean history over the last million years, spanning both high and low latitudes.

His career has been closely linked to international ocean drilling programs (ODP and IODP), where he has also participated in decision-making processes as the Spanish representative. He is a Professor at the University of Salamanca and Visiting Professor in several countries, having established an international scientific school and trained researchers across Europe, the Americas, Asia, and Australia. He has also been particularly active in collaborations with South America and Japan, including his role as Director of the Spanish-Japanese Cultural Center.

He is currently Manager of the National Program for Earth and Water Sciences at the Spanish State Research Agency and a member of the International Commission on Stratigraphy. He is the founder and coordinator of the MC3G network (Climate Change, Global Change), which brings together researchers, civil society, and government agencies to promote research, dissemination, and advisory activities on environmental and societal change.

INVITED SPEAKER

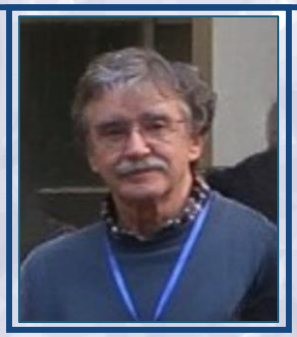
Cristina Luís

Cristina Luís, who holds a PhD in Biology, is an Assistant Professor at the NOVA School of Science and Technology and an integrated researcher at the CIUHCT. She teaches in the fields of science communication and public engagement with science. Throughout her career, she has been involved in numerous public engagement projects and initiatives, including the co-curation of several exhibitions.

More recently, she has coordinated and actively participated in various citizen science projects and initiatives. She is a founding member and president of the Portuguese Citizen Science Network and coordinates a research project dedicated to the contributions of amateur women to natural history and astronomy in Portugal. She has taken part in several national and European Commission-funded projects, while also collaborating as an evaluator for different funding agencies at both national and international levels. Her career also includes an extensive body of scientific publications and science communication work.

INVITED SPEAKERS

Pierre Flament

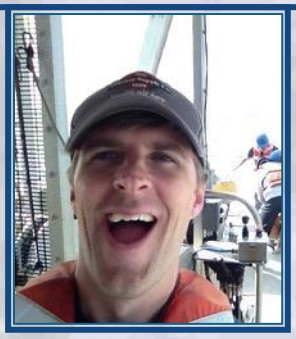


Pierre Flament is a physical oceanographer best known for his research on ocean circulation, air–sea interactions, and radar remote sensing. He earned a B.Sc. in Engineering Physics and an M.Sc. in Theoretical Physics from the Université Libre de Bruxelles and completed his Ph.D. in Physical Oceanography at the University of California San Diego.

Since 1988, he has been a professor at the University of Hawai'i at Mānoa, where he founded the Radio Oceanography Laboratory and conducted major research on Pacific Ocean dynamics.

Flament has played an important role in advancing ocean observation technology, especially through the use of high-frequency radar systems to monitor ocean currents around Hawai'i and the Pacific. His studies on island wakes, internal tides, and mesoscale ocean processes have been widely recognized in the field of physical oceanography.

Anthony Kirincich



Anthony Kirincich is a physical oceanographer and associate scientist at the Woods Hole Oceanographic Institution. His research focuses on coastal ocean circulation, ocean mixing, and the use of remote sensing technologies to study ocean and atmospheric processes. Kirincich earned a B.E. in Environmental Engineering from Vanderbilt University, an M.S. in Physical Oceanography from the University of Rhode Island, and a Ph.D. in Physical Oceanography from Oregon State University in 2007.

Kirincich uses *in situ* and remotely sensed observations to study turbulent coastal flows and the processes governing exchange across the shelf. Because these processes are often small signals embedded in a highly dynamic coastal environment, he develops and deploys new observational tools and operates long-term coastal observatories to resolve them. His sustained measurement programs support both his own research and broader community efforts to monitor changing coastal ecosystems and assess implications for ocean users and marine environments.

HIGHLIGHT SPEAKERS

Ana Mata

PhD in Environmental Engineering, Assistant Professor at the Setúbal School of Technology, Polytechnic Institute of Setúbal, Coordinator of the Bachelor's Degree in Environmental and Marine Technologies, Researcher at MARE-IPS, and Coordinator of the Environment and Aquaculture research subgroup.

Current research areas: Water quality monitoring, oyster aquaculture, environmental biotechnology.

Current projects: Strapshell (Advancing Oyster Cultivation Through Sustainable Tape), Sines Nexus (task 8 – Green and Energy Solutions for Ports and Logistics)

Latest publications: "Modelling the effects of temperature and chlorophyll on growth and survival of the oyster Crassostrea gigas in two different cultivation systems". Aquacultural Engineering 113 (2026), https://doi.org/10.1016/j.aquaeng.2026.102696; "Development of a water quality index as a management tool to Sado coastal estuarine areas". Journal of Coastal Conservation 27 3 (2023): http://dx.doi.org/10.1007/s11852-023-00946-y.

José Guerreiro

José Guerreiro is currently President of the Portuguese Institute for Sea and Atmosphere (IPMA). He is a biologist, holds a PhD in Ecology and Biosystematics, with Habilitation in Marine Sciences, and is a professor at the Faculty of Sciences of the University of Lisbon (FCUL). His research focuses on Marine and Environmental Governance and Nature Conservation. He also taught at the Faculties of Sciences of the Agostinho Neto University in Angola and Eduardo Mondlane University in Moçambique. Since 1992, he has participated in several international projects across multiple African countries and Brazil. He also served as Executive Administrator of the Institute of Applied Science and Technology at FCUL and General Coordinator of the blue entrepreneurship support initiative MareStartup.

He has also held several public positions, including Secretary of State for the Environment, Director-General for the Environment, President of the Environmental Promotion Institute, President of the Monitoring Commission for the Vasco da Gama Bridge construction project, President of the Portuguese Order of Biologists, and member of the National Council for the Environment and Sustainable Development.

Encontro de Oceanografia Sesimbra 2026

21/05 – Quinta-feira | Thursday

- 09:00-10:00 **Receção e Registo | Reception and Registration**
- 10:00-10:15 **Sessão de Abertura | Opening Session**
- 10:15-10:45 **Palestra Convidada 1 | Invited Speaker 1 – José-Abel Flores**
  The scientific drilling in the oceans in the origin and development of the paradigms: the case of the Iberian Margin
- 10:45-11:30 **Apresentações Orais | Oral Presentations**

10:45-11:00 Oral 1	**Abrantes, F.**, Cordeiro, L., Rodrigues, T., Salgueiro, E., Salvado, M., Santana, A., González-Martín, M., Cabezas, M. P., Carreira, R., Shemesh, A., Ribeiro, S., Drago, T., Magalhães, V., Zorzi, C., Flores, J-A., Rigual-Hernández, A., Gil, I., Serrão, E., Engelen, A., Rufino, M. *Impact of climate warming in the coastal upwelling system and primary production off Portugal: a study linking classical and emergent proxies*
11:00-11:15 Oral 2	**Pires, R. F. T.**, Bartilotti, C., Lopes, C. , Lobo-Arteaga, J. *Neustonic zooplankton of the Madeira-Tore seamounts: Biodiversity in an oceanographic context*
11:15-11:30 Oral 3	**Biguino, B.**, Pereira, H., Dias, J. M., Cruz, J. P. C., Haigh, I. D., Brito, A. C. *Modeling past variability and future climate-driven changes in water temperature and salinity in the Sado Estuary*

- 11:30-12:00 **Coffee Break + Foto de Grupo | Group photo**
- 12:00-13:00 **Apresentações Orais | Oral Presentations**

12:00-12:15 Oral 4	**Barosa, J.**, Azeiteiro, U. M., Bacelar-Nicolau, P. *Reconnecting society and the ocean: Emotional connectivity and the legacy of the Independent World Commission on the Oceans*
12:15-12:30 Oral 5	**Alves, J.**, Caldeira, R. *Mixed Layer Depth evolution from 1981 to 2020 in four Eastern Boundary Upwelling Systems*

12:30-12:45 Oral 6 — **Silva, G. C. M.**, Ribeiro, C. C.
Baseline spatial and biogeochemical variability in Maxwell Bay (Antarctica)

12:45-13:00 Oral 7 — **Pereira, F.**, López-Castejón, F., Francés, F., Alcolea, A., Jiménez-Martínez, J., Dias, J. M., Gilabert, J.
Stratification dynamics in Mar Menor during an extreme flash flood event

- 13:00-14:30 **Almoço | Lunch**

- 14:30-14:50 **Palestra Highlight 1 | Highlight Speaker 1 – Ana Mata**
Rede Portuguesa de Monitorização Costeira: dados de monitorização dos ecossistemas costeiros portugueses

- 14:50-15:50 **Apresentações Orais | Oral Presentations**

14:50-15:05 Oral 8 — **Santos-Ferreira, A. M.**, Pinelo, J., da Silva, J. C. B., Magalhães, J. M., Johannessen, J. A., Gonçalves, J.
A Global Observation-Based Platform for Internal Solitary Waves

15:05-15:20 Oral 9 — **Barbosa, V.**, Piassi, F., Silveira, T.
O Estado promotor de campanhas oceanográficas: implicações jurídico-operacionais para o IPMA enquanto proprietário, armador e operador científico de navios de investigação

15:20-15:35 Oral 10 — **Cadima, M.**, Castellanos, P., Dias, J., Mantea, R.
Salinity Variability and Recent Increase in Tropical Atlantic Western Boundary: Insights from 3D EOF Analysis

15:35-15:50 Oral 11 — **Esteves, R.**, Dias, T., Fortes, I., Barata, P., Dias, E., Marques, C.
NODC-PT: Ligando Dados, Instituições e Pessoas ao Serviço de um Oceano Sustentável

15:50-16:05 Oral 12 — Hodell,D., **Abrantes, F.**, Zarikian, C., Herbert, T., Du, M., Crowhurst, S., MleneckVautravers, M., Rolfe, J., Chen, X., Brooks, H., Clark, W., Dauchy-Tric, L., Rocha, V., Flores, J-A., Hines, S., Huang, H-H., Ikeda, H., Kaboth-Bahr, S., Kuroda, J., Link, J., McManus, J., Mitsunaga, B., Yobo, L., Pallone, C., Pang, X., Péral, M. , Salgueiro, E., Sanchez, S., Verma, K., Wu, J., Xuan, C., Yu, J., Haygood, L., Liebrand, D., Magalhães, V., Alonso-Garcia, M., Duque-Castaño, M., Ferreira, F., Freitas, M., Cordeiro, L., Gil, I., González-Martín, M., Lopes, A., Lopes, C., Margari, V., Martín-García, L., Matos, L., Mega, A., Molina, G., Naughton, F., Oliveira, D., Rebotim, A., Rodrigues, T., Santana, A., Trejos-Tamayo, R., Tzedakis, P.
Onset of millennial climate variability with the intensification of Northern Hemisphere glaciation

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- 16:05-16:20 **Pitch Posters**
- 16:20-17:20 **Coffee Break + Sessão Posters | Poster Session**
- 17:20-18:35 **Apresentações Orais | Oral Presentations**

17:20-17:35 Oral 13	**Salgueiro, E.**, Salvado, M., Mega, A. M., Voelker, A., Abrantes, F. *Linking oceanographic conditions to planktonic foraminifera distribution along the western Iberian Margin*
17:35-17:50 Oral 14	**Guerreiro, C. V.**, Finini, A., Malavolta, F., Pinto, C., Ferreira, A., Cros, L., Baker, A., Suut, J-B., Tracana, A., Veloso, V., Rees, A. P., Cachão, M., Brotas, V. *Tracking the Ecological Imprint of Desert Dust across the Atlantic: Insights from Calcifying Phytoplankton*
17:50-18:05 Oral 15	**Verdelho, G.**, Teles-Machado, A., Plecha, S. *Variabilidade no Oceano e Ocorrência de Eventos Extremos no Sistema de Correntes Ibérico*
18:05-18:20 Oral 16	**Romão, S.**, Bonadad, C., Campuzano, F., Bose, N., Costa, T. *Integrating Observations and Modelling for Coastal Risk and Blue Economy Support in Lisbon Metropolitan Area*
18:20-18:35 Oral 17	**Valente, A.**, Giusti, A., Pacheco, C., Shukla, P., Melo, J., Ávila, M., Lima, A., Faria, J., Borges, D., Sousa-Pinto, I., Gonçalves, J. A., Priou, P., Dierssen, H., Bandara, K., Ratha, D., Camus, L. *Optical Earth Observation in Biological Oceanography Across Multiple Scales: From Whales to Zooplankton*

- 18:35-19:00 **Trajectórias na Oceanografia | Trajectories in Oceanography**
- 19:00-20:00 **Tempo livre | Free time**
- 20:00-21:30 **Jantar | Dinner**
- 21:30 **Convívio Social | Social Gathering**

Encontro de Oceanografia Sesimbra 2026

22/05 – Sexta-feira | Friday

- 09:00-09:30 **Palestra Convidada 2 | Invited Speaker 2 – Cristina Luís**
  Navegando com a Sociedade: Ciência Cidadã e Comunicação no Contexto dos Oceanos

- 09:30-10:15 **Apresentações Orais | Oral Presentations**

  09:30-09:45 Oral 18 — **Oliveira, P. B.**, Nunes, P. R., Henriques, E., Magalhaes, J. M., Rodrigues, E. G., Angélico, M. M.
  Salpicos da Oceanografia da Costa Azul

  09:45-10:00 Oral 19 — **Sousa, F.**, Salgueiro, E., Matos, L., Rebotim, A., Rosa, T., Santos, M., Dias, J., Lopes, D., Frias, H., Magalhães, V.
  Is the ENACW changing its thermohaline properties?

  10:00-10:15 Oral 20 — **Rodrigues, M.**, Fortunato, A. B., Martins, R. J., Oliveira, A.
  Towards Digital Twins to support bathing waters quality management: the case of Albufeira (Portugal)

- 10:15-10:30 **Coffee Break**

- 10:30-11:00 **Apresentações Orais | Oral Presentations**

  10:30-10:45 Oral 21 — **Gardoki, J.**, Cearreta, A., García-Artola, A., Romero, E.
  Foraminiferal microhabitats and test geochemistry around shallow gas fields in the Ría of Vigo (NW Spain)

  10:45-11:00 Oral 22 — **Domingos, M., Silva, G., Carvalho, M. U., Ribeiro, C. C.**
  Cytotoxicity of Fluoxetine in Hemocytes of Marine Bivalves Crassostrea brasiliana and Mytella charruana: a 24-Hour In Vitro Assessment

- 11:00-12:30 **Assembleia APOCEAN | APOCEAN Assembly**

- 13:00-14:30 **Almoço | Lunch**

- 14:30-14:50 **Palestra Highlight 2 | Highlight Speaker 2 – José Guerreiro**
  A nova Economia do Oceano: de Tordesilhas ao Crescimento Azul. Desafios da governança, ordenamento e gestão do espaço marítimo

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- 14:50-15:50 **Apresentações Orais | Oral Presentations**

14:50-15:05 Oral 23
Castro, A., Pereira, H., Dias, J. M., Lopes, C. L.
Análise da Variação Sazonal da Turbidez na Ria de Aveiro: Combinação de Dados in situ com Dados de Satélite Sentinel-2

15:05-15:20 Oral 24
Piecho-Santos, A. M., Esteves, R.
FVON - Uma Rede de Observação Oceânica com Embarcações de Pesca

15:20-15:35 Oral 25
Lopes, D., Teles-Machado, A., Garrido, S.
Impacto das Condições Oceanográficas na Dispersão e Sobrevivência de Ovos e Larvas de Sardinha

15:35-15:50 Oral 26
Ribeiro, C. C., Rautenbach, S. A., Sousa, C. M., Relvas, P.
Mediterranean Outflow Water at anomalously shallow depths along the Portuguese continental margin: observations, dynamics and interannual recurrence

- 15:50-16:30 **Coffee Break + Sessão Posters | Poster Session**

- 16:30-18:00 **Apresentações Orais | Oral Presentations**

16:30-16:45 Oral 27
Saibro, M. B., Martins, M. V. A., Salgueiro, M. E., Socorro, O. A., Terroso, D., Silva, E. B., Simões, F. C. F., Figueira, R. C. L., Rocha, F.
Influência do soerguimento do Istmo do Panamá na sedimentação do Mar do Caribe

16:45-17:00 Oral 28
Fernandes, R., Tomé, R., Teles-Machado, A.
Effect of Floating Offshore Wind Turbines on the Atmospheric and Oceanic Environment in the Western Iberian Margin

17:00-17:15 Oral 29
Leal-Rosa, T., Peliz, A., Piecho-Santos, A.M.
Modelling pelagic eggs and larval dispersal on the NW Portuguese shelf during winter conditions

17:15-17:30 Oral 30
Guimarães, M. V., Oliveira, O.M.P., Ribeiro, C.C.
Water quality, nutrient dynamics, and ecotoxicological assessment of the Itanhaém Estuary, southeastern Brazil: a multi-campaign seasonal approach

17:30-17:45
Oral 31

Sousa, C., Piecho-Santos, A. M., Relvas, P.
The EMSO ERIC Iberian Margin Regional Facility: Infrastructure Development and Scientific Scope

17:45-18:00
Oral 32

Mendes, R., Silva, P. R., Pereira, J., Bernachhi, L., Bogas, J., Gabriel, B., Venâncio, L., Gonçalves, P., Santos, R., Neiva, J., Ribeiro, M., Galante, J., Dias, P., Halicki, A., Figueiredo, L., Campuzano, F., Fonteles, C., Sousa, J. B.
A Setback or a Stepping Stone? JUNO Insights from a Wave-Propelled USV Transect

- 18:00-18:20 **Palestra Convidada 3 | Invited Speaker 3 – Pierre Flament & Anthony Kirincich**
Sustained observations of small scale structures in the coastal ocean via High Frequency Radar: Methods, Results, and New Field Efforts

- 18:20-18:30 **Sessão de encerramento + Entrega de Prémios | Closing Session + Awards Ceremony**

Posters

Poster 1
Lasluisa, E., García, M. A., Sierro, F. J., Cascón, J., Salgueiro, E.
Climate Variability in the SW Iberian Margin during Middle to Late Pleistocene (IODP Site 1587)

Poster 2
Cordeiro, L. G. M. S., Villanueva, J., Penalva-Arias, N., Carreira, R., Bouloubassi, I., Muacho, S., Lima, M., Fraga, M., Freitas, R., Matos, L., Salgueiro, E., Magalhães, V., Santos, R., Fontela, M., Abrantes, F.
Distribution of recent wildfire particles in the Iberian Margin through pyrogenic compounds

Poster 3
Guilherme, F. M., Neves, M. C.
Análise Comparativa dos Registos dos Marégrafos e Altimetria por Satélites na Costa de Angola

Poster 4
Paulo, F. K., Neves, M. C.
Development of a Web-Based GIS Decision Support System for Mapping and Management of Pelagic Fisheries in Angola

Poster 5
Nunes, P. R., Teles-Machado, A., Moreno, A., Angélico, M. M., Peliz, Á., e Oliveira, P. B.
Modelação numérica da salinidade na zona costeira, como definir o forçamento fluvial?

Poster 6
Oliveira, P. B., Henriques, S., Machado, A., Nunes, P., Bartilotti, C., Moura, T.
Trend analysis of bottom environmental variables off W Iberia using numerical model solutions

Poster 7
Rodrigues, V., Ribeiro, A. S., Dias, J. M., Sousa, M. C.
Modelação numérica da dispersão e da retenção de microplásticos na Ria de Arousa

Poster 8
Esteves, R., Piecho-Santos, A. M., Rosa, T. L.
O Programa Argo em Portugal: Contributo do IPMA para a Observação do Oceano na ZEE Portuguesa

Poster 9
Griffioen, A., Relvas, P., Neves, M.
Resolving coastal mesoscale and sub mesoscale structures south of Cape São Vicente using SWOT altimetry

Posters

Poster 10
Guerreiro, C. V., Yellena, C., Oliveira, C., Borges, C., Cruz, J., João, D., Brotas, V., Duarte, J., Costa, P. J. M., Gonçalves, M. A., Gonçalves, A. S., Fialho, A. C., Frazão, B., Churro, C., Angélico, M. M., Henriques, E., Nogueira, S., David, H., Dâmaso, L., Ferreira, A., Marquês, J.4,5, Almeida, R., Branco, A., Gonçalves, R., Rafael-Fernades, M., Salgado, X. A. A., Cachão, M., Morino, M. H., Amorim, A.
Plankton Dynamics Under Ocean Alkalinity Enhancement

Poster 11
Lanhoso de Freitas, M., Geilert, S., Heuser, A., Wallmann, K., Magalhães, V. H.
Exploring Natural Carbon Sequestration in Marine Serpentinite Mud Volcanoes through Mineral Carbonation

Poster 12
Barata, P., Marques, C., Esteves, R., Dias, E.
SOMOSATLÂNTICO: Interoperabilidade entre a SOMOSATLÂNTICO e as plataformas de dados nacionais NODC-PT, Dados.gov e SNIG

Poster 13
Sousa, M. C., Ribeiro, A. S., Pereira, H., Vaz, N., Gomes-Gesteira, M., Dias, J. M.
Wind-tide interactions drive microplastic export and retention in the Ria de Vigo (NW Spain)

Poster 14
Teixeira, F., Salgueiro, E., Fatela, F., Soares, W., Lopes, A., Carvalho, V., Gebara, L., Abrantes, F.
Reconstrução oceanográfica da Margem SW Portuguesa durante a Crise de Salinidade do Messiniano: temperatura, produtividade e biodiversidade a partir de foraminíferos

Poster 15
Pereira, H., Ribeiro, A. S., Picado, A., Pinheiro, J., Lopes, C. L., Dias, J. M.
Cross-sectional Structure of Estuarine Currents: the Case of Espinheiro Channel (Ria de Aveiro)

Poster 16
Matos, L., Gebara, L., Lopes, C., Magalhães, V., Rodrigues, T., Salgueiro, E., Voelker, A., Abrantes, F.
How much carbon is buried beneath Portuguese ocean waters?

Poster 17
Arguilé-Pérez, B., Costoya, X., Ribeiro, A. S., de Castro, M., Carracedo, P., Gómez Gesteira, M.
The Future of Atlantic Wave Climate in Europe: A High-Resolution Database Based on CMIP6 Projections

Posters

Poster 18
Picado, A., Pereira, H., Dias, J. M
Projected changes in the seasonal timing of SST and surface chlorophyll-a maxima along the Portuguese margin

Poster 19
Monarca, M., Cravo, A., **Relvas, P.**, Santos, M., Sousa, C.
O afloramento costeiro na região do Cabo de São Vicente sob a lente de um perfilador autónomo

Poster 20
Rodrigues, T., Grimalt, J. O., Goñi, M. F. S., Oliveira, D.
Sea Surface Temperature Variability During the Mid-Piacenzian Warm Period: Implications for Mediterranean Hydroclimate

Poster 21
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Encontro de Oceanografia Sesimbra 2026

Resumos | Abstracts

Palestra Convidada 1 | Invited Speaker 1

The scientific drilling in the oceans in the origin and development of the paradigms: the case of the Iberian Margin

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Abstract

The scientific drilling began in the ’60 with projects like MOHOLE and the DSDP in the Atlantic and Pacific oceans. The material extracted and the data generated have allowed test the seafloor spreading. Later, in the equatorial Pacific, the orbital theory of Milankovich materialized in the sedimentary record in new initiatives such as the Ocean Drilling Program, and in the last decade Integrated Ocean Discovery Program. These are two of the outstanding paradigms tracked today in Geology.

To carry out these discoveries the development of new Biostratigraphy scales was determinant, particularly those developed with Calcareous Nannofossils and Planktonic Foraminifera. On the other hand, the definition of cyclical sequences in the Mediterranean and in the Atlantic margins of Iberia offer the possibility to link the marine sedimentary record with global processes and the refinement of geochronological scales.

Another important aspect is the high-resolution reconstruction of climatic and oceanic changes along the margin, using micropaleontological (calcareous nannofossils, foraminifers, diatoms, palynomorphs…) together with biogeochemical and geophysical techniques, particularly during significant episodes such as the Messinian Salinity Crisis and the subsequent evolution of the North Atlantic and Mediterranean basins.

We review the contributions of these pioneers as a tribute to their significant work.

Palestra Convidada 2 | Invited Speaker 2

Navegando com a Sociedade: Ciência Cidadã e Comunicação no Contexto dos Oceanos

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Resumo

Num contexto de crescentes desafios ambientais e com uma necessidade urgente de tomada de decisões informadas, as ciências do oceano desempenham um papel central na sustentabilidade global. Esta palestra pretende oferecer uma reflexão crítica sobre de que forma a ciência cidadã, combinada com estratégias eficazes de comunicação de ciência, pode melhorar a literacia do oceano, aproximar a sociedade do conhecimento científico e aumentar o impacto da investigação nas políticas públicas desta tão importante área do conhecimento. Recorrendo a uma perspetiva interdisciplinar que fará a ponte entre os campos da ciência e da sociedade, serão explorados exemplos e abordagens que destacam o potencial transformador da participação pública na produção de conhecimento, bem como o papel da comunicação na construção da confiança, do envolvimento e da responsabilidade coletiva.

Ao destacar oportunidades, desafios e implicações práticas, pretende-se contribuir para estimular o diálogo entre investigadores, decisores políticos e a sociedade em geral, para que seja possível o desenvolvimento de ecossistemas científicos mais abertos, participativos e com impacto social.

Palestra Convidada 3 | Invited Speaker 3

Sustained observations of small scale structures in the coastal ocean via High Frequency Radar: Methods, Results, and New Field Efforts

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Abstract

The transport and exchange of water masses across the shelf from transient, spatially varying features is a critical but poorly resolved component of the total exchange and mixing over continental shelves. Previous studies over the inner part of the shelf have found that the turbulent flow field, composed of fronts, squirts, jets, and eddies can cause additional exchange that is similar in magnitude to that of the often-studied along-shelf uniform wind-driven exchange. Novel implementations of oceanographic High Frequency surface wave radar (HFR) sensing of the coastal zone have the potential to resolve these features over the dense temporal and spatial scales required to understand their dynamics and impacts. A survey of HFR sensing is presented along with recent examples of HFR-based observations within the US and elsewhere. Focusing on the results from an array off the US east coast, a recent analysis of eddy structures over the mid-shelf is then present, illustrating the size, scope, and variability of stirring and mixing across the coastal zone. Finally, a new HFR effort within Portugal, with the goal to observe circulation between Capo Espichel and Cabo do Sines will be described.

Palestra Highlight 1 | Highlight Speaker 1

Rede Portuguesa de Monitorização Costeira: dados de monitorização dos ecossistemas costeiros portugueses

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Resumo

A CoastNet, coordenada pelo MARE – Centro de Ciências do Mar e do Ambiente, é uma infraestrutura nacional de monitorização estuarina e costeira, que recolhe e integra dados físicos, químicos e biológicos em tempo quase real, disponibilizando-os numa plataforma aberta acessível a investigadores, entidades públicas e agentes económicos. A recente integração do MARE-IPS nesta infraestrutura com a expansão da rede para o estuário do Rio Sado e para a costa de Sines, com a instalação de novas sondas multiparamétricas, é particularmente relevante para o distrito de Setúbal, ao apoiar decisões informadas em áreas como gestão ambiental, conservação da natureza, aquacultura, ordenamento costeiro e apoio aos stakeholders regionais. Esta evolução reforça o papel da CoastNet como ferramenta estratégica nacional promovendo uma gestão mais sustentável baseada em informação científica atualizada.

Palestra Highlight 2 | Highlight Speaker 2

A nova Economia do Oceano: de Tordesilhas ao Crescimento Azul Desafios da governança, ordenamento, gestão e conservação do espaço marítimo

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Resumo

A evolução histórica e estratégica de domínio e uso do espaço marítimo, que remonta ao Tratado de Tordesilhas, sofreu no Sec. XXI uma rutura de paradigma com o advento da Economia do Mar e do Crescimento Azul. Nas duas últimas décadas, as temáticas da Governança do Oceano, da Economia Azul e, associada a estas, a Conservação e o Ordenamento do Espaço Marítimo, têm ganho cada vez mais destaque, não só na literatura científica, mas na sociedade e no discurso político. Fruto da evolução do conhecimento científico, em particular no pós II Guerra Mundial, o oceano deixou de ser apenas um espaço de navegação e exploração de recursos vivos, tendo hoje um papel central na transição energética, segurança alimentar, inovação tecnológica, conservação da biodiversidade e mitigação das alterações climáticas. Neste contexto, a valorização económica do mar exigiu novos modelos de governança capazes de equilibrar desenvolvimento económico, sustentabilidade ambiental e interesses geopolíticos.
Mas o que realmente desencadeou este movimento à escala global?

Que transformações trouxe no modelo e instrumentos de governança dos oceanos?

Que mudanças terão ocorrido ao nível político-institucional?

Que desafios futuros enfrentamos na relação com o espaço marítimo e a sua sustentabilidade?

Qual o papel, desafios e oportunidades para Portugal?

Oral 1

Impact of climate warming in the coastal upwelling system and primary production off Portugal: a study linking classical and emergent proxies

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Abstract

The Iberian Margin is part of the Canary Eastern Boundary Upwelling System (EBUS), characterized by wind-driven coastal upwelling. These systems are among the most productive areas of the global ocean and play a crucial role in climate regulation and fisheries. Predicting how EBUS will respond to climate change remains challenging due to uncertainties in future ocean dynamics, including warming, freshening, and related changes in currents. Understanding the environmental and climatic factors that influenced past changes in primary production (PP) can improve our understanding of these responses.

This study examines sediment cores from offshore the Douro and Tagus Rivers and from Faro on the southern shelf. Chronologies are established using ^{210}Pb and AMS ^{14}C dating, covering the last millennium, including the Medieval Climate Anomaly (MCA; 850–1300 CE), Little Ice Age (LIA; 1350–1850 CE), and post-1850 Modern Warming.

A multi-proxy approach combines microfossil assemblages of diatoms, coccolithophores, dinoflagellates, planktonic, and benthic foraminifera, with geochemical and isotopic data (including $\delta^{18}O$ and $\delta^{13}C$ in planktonic foraminifera, Fe, TOC, $CaCO_3$, $\delta^{13}C$ in benthic foraminifera, organic matter $\delta^{13}C$, and $\delta^{15}N$) and biomarkers, phytosterols, alkenones, and

sedaDNA. Combining these datasets enables a comprehensive reconstruction of PP variability, its drivers, and its connections to the North Atlantic circulation.

Previous studies show a long-term cooling from 0 CE to the early 20th century, consistently observed across SST records, reflecting decreased Northern Hemisphere summer insolation after the Holocene Optimum. PP at the Douro site follows this decline, while PP at Tagus and Faro shows increasing trends. Terrestrial proxies (Fe, long-chain n-alkanes and n-alcohols, C/N) exhibit patterns opposite to PP. Superimposed multi-decadal to centennial SST variability aligns with major Northern Hemisphere climate intervals, with warming around 1800 CE marking the Onset of the Industrial Era—low in Porto but noticeable in Faro. Simultaneously, PP proxies indicate a weakening of upwelling in the north but a strengthening in the south.

Oral 2

Neustonic zooplankton of the Madeira-Tore seamounts: Biodiversity in an oceanographic context

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Abstract

In the open ocean, seamounts create unique environmental conditions through the interaction of topography, ocean circulation and ecological processes, promoting biological aggregations, and supporting the spawning and foraging of diverse marine communities. These areas are known to generate the uplift of nutrient-rich deeper waters, which may enhance the concentration of plankton in the vicinity of the seamounts [1]. Zooplankton samples were collected from the neustonic layer (first 20 cm of the water column) of the Madeira-Tore seamount region, located in the northeastern Atlantic Ocean. A Manta trawl net was used in night hauls, during an oceanographic research survey conducted in 2022. The organisms were morphologically identified and taxonomic analyses revealed highly diverse communities, including copepods, gelatinous zooplankton, decapod larvae, amphipods, polychaetes, and fish larvae. The study presents novel insights into the neustonic zooplankton communities of the Madeira-Tore seamount complex and contributes with valuable information to ongoing efforts in biodiversity assessment and marine conservation planning. The taxa composition revealed important distinctions from mainland Portugal, with the presence of several species less observed in coastal areas and some rarely recorded for the region, highlighting the uniqueness and ecological value of these offshore habitats. Integrative taxonomy combining morphological observations with molecular tools was applied in selected cases to confirm species identity and resolve taxonomic uncertainties. The findings emphasize the ecological significance of the Madeira-Tore complex and add important data to understand the dynamic and understudied ocean-atmosphere interface. The study underscores the need to integrate zooplankton data into marine spatial planning and the designation of Marine Protected Areas, while also contributing to a broader understanding of trophic dynamics and biogeochemical cycling in open-ocean ecosystems.

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Oral 3

Modeling past variability and future climate-driven changes in water temperature and salinity in the Sado Estuary

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Abstract

Although the future remains uncertain, global projections suggest that climate change will destabilize estuarine ecosystems, with important implications for coastal habitats and communities. However, the vulnerability of these systems varies regionally, making it essential to better understand the challenges that coastal ecosystems and populations may face.

Many estuaries worldwide still lack quantitative projections of future environmental conditions, limiting the development of climate-resilient management strategies. The Sado Estuary is one such system. This study therefore aims to project the impacts of climate change on estuarine water temperature and salinity, using the Sado Estuary as a case study and the Delft3D modeling suite as a numerical laboratory. Three objectives were defined: *i*) to evaluate seasonal variations in water temperature and salinity; *ii*) to quantify long-term trends along the estuary; and *iii*) to identify the main drivers of these changes. Both hindcast and forecast analyses were conducted. Hindcast simulations examined past and present patterns of water temperature and salinity through comparison with *in situ* observations and satellite data, validating the model's ability to represent the estuarine system while providing a robust long-term historical assessment. Forecast simulations projected future water temperature and salinity under the SSP2-4.5 and SSP5-8.5 scenarios until 2100.

Results show that Delft3D effectively reproduces water properties in well-mixed estuaries such as the Sado, outperforming satellite data in capturing seasonal variability in water temperature. Projections indicate a warming trend in the estuary, with average increases of 0.109 °C per decade under SSP2-4.5 and 0.275 °C per decade under SSP5-8.5, consistent with global warming patterns. In contrast, the two scenarios show opposite salinity trends, mainly driven by projected changes in river flow. These results provide important insights into the sensitivity of the system to climate and socio-economic pressures and support the development of effective regional mitigation strategies.

Oral 4

Reconnecting society and the ocean: Emotional connectivity and the legacy of the Independent World Commission on the Oceans

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Abstract

The United Nations Decade of Ocean Science for Sustainable Development (2021–2030) recognizes that achieving ocean sustainability requires more than scientific knowledge and policy innovation. Challenge 10 calls for restoring society's relationship with the ocean by integrating cultural and emotional dimensions into ocean governance. Understanding how these human dimensions shape public engagement is therefore critical for advancing transformative sustainability pathways.

In this context, the Independent World Commission on the Oceans (IWCO), chaired by Mário Soares and scientifically coordinated by the oceanographer Mário Ruivo, represented a pioneering attempt to articulate an integrated vision of ocean governance. Its report The Ocean, Our Future (1998) linked scientific knowledge, public policy and societal responsibility as pillars for transforming the society–ocean relationship, anticipating principles that underpin contemporary sustainability frameworks.

Despite its influence in shaping international debates on ocean governance, IWCO's conceptual legacy remains underexplored. This doctoral research addresses this gap by reassessing the Commission's contributions while empirically analyzing how emotional connectivity with the ocean can strengthen public participation and support more effective socioecological policy frameworks.

The study adopts a mixed methods approach combining document analysis, a quantitative survey of the Portuguese population, and semi structured interviews with key stakeholders. Preliminary findings suggest that IWCO contributed to shaping the development of several national and European ocean policy initiatives. By revisiting this legacy and examining the interplay between emotion, knowledge and public participation, this study aims to contribute to emerging debates on the human dimensions of ocean sustainability and identify pathways towards more integrated and participatory ocean governance aligned with the ambitions of the Ocean Decade.

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Oral 5

Mixed Layer Depth evolution from 1981 to 2020 in four Eastern Boundary Upwelling Systems

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Abstract

Given the importance of Eastern Boundary Upwelling Systems (EBUS) for marine habitats, the fishing industry, and atmospheric conditions in some of the most densely populated coastal regions, it is pertinent to assess the recent multidecadal evolution of EBUS using widely used reanalysis data. By analysing atmospheric (ERA5) and oceanic (SODA3) data, both with approximately ¼° spatial resolution over a 40-year historical period (1981–2020) in the four main EBUS (Canary, California, Humboldt, and Benguela), we linked the seasonal meridional displacement of subtropical anticyclones and the evolution of thermal low intensity to trends in coastal wind stress. Within the upper ocean layers, we assessed the prevailing and competing roles of ocean surface warming and wind stress strengthening on the evolution of Mixed Layer Depth (MLD), a key variable regulating upper ocean heat content, CO_2 transfer rates at the ocean–atmosphere interface, and nutrient concentration within the upper ocean layers. Results show prevailing seasonal poleward shifts in the southern hemisphere subtropical anticyclones and poleward or equatorward meridional shifts in the northern hemisphere. Thermal lows predominantly exhibit strengthening trends, with significant differences in intensity across EBUS and seasons. For coastal wind stress, a predominant strengthening is observed in the four EBUS, with heterogeneities linked to the seasonal meridional displacement of the Azores subtropical high in the Canary EBUS and to the strengthening of the thermal low in California. In the upper ocean, dominant wind-stress strengthening leads to prevailing MLD deepening in the Canary and Benguela, highlighting the primary role of wind stress, whereas intermittent opposing MLD trends in California and Humboldt indicate competing effects of ocean surface warming and wind-stress strengthening.

Oral 6

Baseline spatial and biogeochemical variability in Maxwell Bay (Antarctica)

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Abstract

The Antarctic Peninsula is one of the fastest-warming regions on Earth, where glacial melt and oceanographic changes strongly influence coastal ecosystems. Understanding physicochemical and biogeochemical dynamics in this region is essential for assessing climate-driven impacts. This study aims to characterise the coupled physicochemical and biogeochemical dynamics of Maxwell Bay (Fildes Peninsula, King George Island, South Shetland Islands, 62°S) during the POLAR BIOMAP 2026 campaign (January–February 2026). Six surveys, including open-bay transects, a 24-hour fixed station, and inshore sampling, yielded 66 water samples across 50stations. Surface temperature ranged from 1.5 to 5.7°C and salinity from 21.0 to 34.9 PSU, revealing a low-salinity, high-CDOM plume linked to glacial meltwater from Collins and Nelson glaciers. At 4 m depth, a cold core (< 2°C) suggests subsurface stratification driven by subglacial discharge. Silicate dominated dissolved nutrients (49.5–93.3 µmol L^{-1}; Si:DIN = 17–36), indicating strong glacial input. Dissolved inorganic nitrogen (DIN) remained stable across surveys (2.82–2.98 µmol L^{-1}; $p = 0.39$), while phosphate showed significant variability, with depletion at bloom peak and enrichment later ($p < 0.001$). Chlorophyll-a peaked in mid-January (2.68–3.20 µg L^{-1}) and declined to 0.19–0.82 µg L^{-1} by early February, capturing the full cycle of a diatom-dominated bloom. Elevated Chl-a near the Nelson Glacier indicates sustained iron fertilisation. A lateral oceanic intrusion increased DIN (up to 4.96 µmol L^{-1}) and phosphate, while a nitrite anomaly (2.50 µmol L^{-1}) suggests ornithogenic nutrient input. These findings establish a robust baseline and highlight the key role of glacial forcing and oceanographic processes in shaping coastal Antarctic ecosystems under ongoing warming and ocean acidification.

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Oral 7

Stratification dynamics in Mar Menor during an extreme flash flood event

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Abstract

In restricted coastal lagoons located in microtidal areas, tidal influence is limited, and hydrodynamics and hydrology are highly sensitive to atmospheric forcing [1]. This is the case of Mar Menor, a hypersaline lagoon located on the southeastern coast of Spain. The study area is characterized by a predominantly dry and irregular rainfall regime, where surface runoff and groundwater discharge from a nearby aquifer constitute the main freshwater inputs to the lagoon, gaining particular relevance during extreme rainfall events. Therefore, watershed models are valuable tools for reproducing both surface runoff and groundwater discharge into the lagoon, ensuring greater accuracy in simulated conditions.

In this work, a previously-validated implementation of the Regional Ocean Modeling System (ROMS) was coupled with a watershed model (TETIS) [2,3] and a groundwater flow model (SUTRA) [4] to simulate lagoon stratification dynamics during an extreme freshwater runoff event (the September 2019 cold drop, DANA). Large volumes of water and nutrients were flushed from the surrounding agricultural watershed, triggering anoxia and subsequent marine species mortality [5], highlighting the importance of accurately reproducing hydrodynamics to understand the physical mechanisms driving environmental degradation.

This event led to an unprecedented hydrological scenario, characterized by strong vertical stratification persisting for over one month. The underlying mechanisms were investigated through the development of idealized wind forcing scenarios, which showed that the inhibition of shear instability under calm wind conditions in the weeks following the event allowed buoyancy forces, induced by density gradients, to dominate the vertical structure of the lagoon. Although a two-layer counterflow developed near the bottom, it was not sufficient to break the stability of the water column [6].

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Oral 8

A Global Observation-Based Platform for Internal Solitary Waves

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Abstract

Internal solitary waves (ISWs) are ubiquitous features of the stratified ocean, playing a fundamental role in ocean dynamics by contributing to vertical mixing, energy redistribution, and biogeochemical exchanges, and can also affect offshore structures and navigation. However, their global observation remains highly fragmented, with existing studies typically limited to regional or case-specific investigations.

To address this gap, we present the Internal Waves Service (IWS), an emerging international initiative developing a unified, observation-based system for the detection and mapping of ISWs globally. The current IWS prototype is built upon the continuous processing of Sentinel-1 Synthetic Aperture Radar (SAR) Wave Mode imagery, enabling consistent, near-real-time monitoring of ISW signatures across the open ocean. Coastal regions are only partially covered, as Wave Mode acquisitions are not systematically available near the coast; the integration of additional Sentinel-1 acquisition modes is planned for future developments.

This approach reveals where ISWs occur and where they are absent, helping to overcome publication biases and providing a more complete picture of their distribution. An AI-driven classifier, under iterative development, automatically identifies ISW signatures in SAR vignettes, generating an open, persistent, and searchable dataset with associated metadata. An interactive expert-validation interface supports continuous curation and model improvement, ensuring scientific rigor and accuracy (Pinelo et al. 2025).

Developed in collaboration with more than twenty international partner institutions, the IWS fosters an active and growing community of users and contributors. An annual dedicated IWS Workshop is being organized to promote focused discussions, gather expert feedback, and guide the scientific and technical development of the service (Santos-Ferreira et al. 2025).

By combining automation, global coverage, high temporal resolution, and open access, the IWS establishes a new data-science infrastructure for operational oceanography, climate research, and ecosystem studies, delivering systematic monitoring of ISWs worldwide.

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Oral 9

O Estado promotor de campanhas oceanográficas: implicações jurídico-operacionais para o IPMA enquanto proprietário, armador e operador científico de navios de investigação

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Resumo

As campanhas oceanográficas promovidas pelo Estado constituem um pilar central para as ciências marinhas em Portugal, não só sustentando a avaliação de recursos marinhos, monitorização ambiental e o apoio à decisão pública, como também promovendo o suporte aos avanços na oceanografia operacional. Enquanto entidade pública promotora de investigação científica, o IPMA atua simultaneamente como proprietário, armador e operador científico de navios de investigação do Estado, afetos ao serviço público não comercial, assumindo responsabilidades acrescidas no plano jurídico-operacional.

O Estado, nos vários papeis assumidos na execução de campanhas oceanográficas, está obrigado ao cumprimento articulado de normas de diferentes níveis: internacional, designadamente Convenção das Nações Unidas sobre o Direito do Mar[1]; europeu, como Política Comum das Pescas[2] ou Diretiva-Quadro Estratégia Marinha[3]; e nacional, como Lei de Bases da Política de Ordenamento e de Gestão do Espaço Marítimo Nacional[4], e Estratégia Nacional para o Mar. Estas obrigações subsistem independentemente da utilização de meios próprios ou de navios fretados, sem prejuízo do cumprimento das obrigações de proteção e preservação do meio marinho e das convenções internacionais de segurança e ambiente (SOLAS, STCW, MARPOL)[5,6,7].

A utilização de navios do e pelo Estado implica articulação com as autoridades nacionais competentes, encontrando-se sujeita à jurisdição do Estado de bandeira e beneficio de imunidades aplicáveis. Em águas sob jurisdição de outros Estados, à necessidade de consentimento do Estado costeiro, acresce a necessidade de articulação diplomática e coordenação reforçada entre entidades científicas e autoridades marítimas. O recurso a navios fretados introduz maior complexidade operacional e na repartição de responsabilidades, designadamente em matéria ambiental[8,9].

A integração precoce do enquadramento jurídico no planeamento de campanhas constitui condição crítica para a eficiência operacional, mitigação de risco e reforço da credibilidade do Estado português enquanto proprietário, armador, e operador de navios e promotor de investigação científica marinha no contexto da governação do oceano.

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Oral 10

Salinity Variability and Recent Increase in Tropical Atlantic Western Boundary: Insights from 3D EOF Analysis

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Abstract

Salinity plays a key role in ocean circulation by influencing seawater density and stratification, yet the processes controlling its variability in the western tropical Atlantic (WTA) remain incompletely understood, despite the particular importance of this region for large-scale circulation. In the WTA, the North Brazil Current (NBC), which crosses the equator, acts as a bottleneck for the northward flow of Atlantic Meridional Overturning Circulation (AMOC).

Recently, studies such as Hummels et al. (2015) and Chidichimo et al. (2023) have found observational evidence that upper layer waters in the southwestern tropical Atlantic, near northeastern Brazil, have become saltier in recent years. The mechanisms driving this salinity increase are still under debate, with both local air–sea fluxes and large-scale circulation proposed as potential drivers.

To address this problem, we investigate the dominant processes governing salinity variability using a 30-year (1994–2023) ECCO2 reanalysis (Menemenlis et al., 2008). A three-dimensional empirical orthogonal function (3D EOF) analysis is applied to resolve the coupled variability across depth, capturing surface–subsurface interactions that are not represented in conventional approaches (Lafarga et al, 2023).

The leading mode of variability reveals a vertically coherent structure with a pronounced salinity increase centered between 150 and 250 m, consistent with a subsurface intensification of high-salinity waters. This signal is spatially aligned with the pathway of the North Brazil Undercurrent (NBUC), suggesting a dominant role of alongshore advection. Supporting evidence from the displacement of salinity maximum waters, together with analyses of volume transport and flow-weighted salinity, demonstrates that changes in the properties of advected waters, rather than variations in transport magnitude, are the main

contributors to the observed trends. By highlighting the role of large-scale circulation in redistributing salinity, these results demonstrate that subsurface advective processes associated with the NBUC are the primary drivers of decadal trends in salinity variability in the western tropical Atlantic Ocean.

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Oral 11

NODC-PT: Ligando Dados, Instituições e Pessoas ao Serviço de um Oceano Sustentável

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Resumo

O Centro Nacional de Dados Oceanográficos (NODC-PT) afirma-se como uma infraestrutura estratégica de catalogação e disponibilização de dados marinhos em Portugal, inserida na rede global coordenada pelo programa International Oceanographic Data and Information Exchange (IODE) da Comissão Oceanográfica Intergovernamental (COI) da UNESCO. Funciona como ponto central de acesso à informação marinha nacional, sendo sustentado por uma governação colaborativa entre o Instituto Hidrográfico, o Instituto Português do Mar e da Atmosfera e o Comité Português para a COI.

Enquadrado como ação da Década das Nações Unidas das Ciências do Oceano para o Desenvolvimento Sustentável, no âmbito do Desafio 8 – Criar uma representação digital do oceano, o NODC-PT tem reforçado o seu papel como plataforma agregadora, promovendo a integração de novos parceiros institucionais, científicos e tecnológicos. Esta abordagem colaborativa tem reforçado a articulação entre pessoas e instituições, consolidando a coordenação nacional e permitindo alargar o acesso aos dados do meio marinho disponíveis, promovendo a partilha de informação e conhecimento entre diferentes comunidades.

O presente artigo destaca os desenvolvimentos mais recentes da infraestrutura, com enfoque nas estratégias de envolvimento de novos parceiros, na expansão das redes de dados e no seu contributo para uma ciência do oceano mais aberta, integrada e orientada para a sustentabilidade e a tomada de decisão informada.

Oral 12

Onset of millennial climate variability with the intensification of Northern Hemisphere glaciation

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Abstract

The Quaternary Period (the last 2.58 Ma) was characterized by the waxing and waning of large ice sheets in the Northern Hemisphere. Using sediment sequences from the Iberian Margin, we demonstrate that the expansion of Northern Hemisphere ice sheets around 2.7 Ma was accompanied by the emergence of millennial climate variability (MCV) during glacial periods. The onset of MCV at ~2.7 Ma was heralded by isolated precursor events, followed by multiple millennial climate oscillations at ~2.5 Ma. These events coincided with the deposition of icerafted detritus in the North Atlantic, suggesting a role for marine-terminating ice sheets. Once established, MCV became an intrinsic feature of Quaternary glacial climates. Our findings underscore the profound impact Northern Hemisphere glaciation had on climate variability across multiple time scales.

Oral 13

Linking oceanographic conditions to planktonic foraminifera distribution along the western Iberian Margin

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Abstract

The ecology of species controls the relationship between organisms and the environmental conditions in which they live. Marine microfossils, such as planktonic foraminifera (PF), are between the most widely used tools in paleoceanography. Their abundance and distribution in the water column are seen as “fingerprints” of the water masses that they inhabit. This allows the linkage of their assemblages preserved in the sedimentary record to past oceanographic conditions. As part of the Canary Eastern Boundary Upwelling System, the western Iberian Margin is characterized by a complex modern circulation with the Portugal Current flowing southward offshore and the warmer Azores Current northward. In spring-summer, coastal upwelling and the Portugal Coastal Current dominate the circulation inshore, while in winter the northward Iberian Poleward Current (IPC) is present.

In this study, we use the recognised relationship between modern hydrography/productivity and PF assemblages, derived from plankton net and surface sediments along the western Iberian margin, to reconstruct upper-ocean conditions during the Holocene. We combine sediment records distributed from the coast to offshore between 43°12`N and 35°53`N. The spatial and temporal coverage allows differentiation of coastal upwelling and river input from open-ocean conditions. High abundances of *Globigerina bulloides*, an upwelling related species, are found closer to the coast and identify where upwelling was more persistent over time. All coastal sites, especially in the Tejo region, show an increase in the species, *Turborotalia quinqueloba*, after 1850 CE, suggesting enhanced nutrient supply by river runoff. Temporal and geographical changes of the IPC are inferred from higher contributions of the oligotrophic tropical and subtropical species. At the northern offshore sites, on the other hand, higher subpolar and polar species percentages mark short cold events, likely associated with the known North Atlantic cold events and related circulation changes.

Oral 14

Tracking the Ecological Imprint of Desert Dust across the Atlantic: Insights from Calcifying Phytoplankton

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Abstract

Atmospheric dust deposition is a major nutrient source to the open ocean, influencing productivity and carbon cycling. Using in situ observations from the Atlantic Meridional Transect (AMT28, 50ºN-50ºS), we examined how atmosphere–ocean interactions shape the distribution of coccolithophores—a calcifying phytoplankton group central to the biological and carbonate pumps—to assess how hydrological variability and aerosol inputs regulate their composition and productivity [1–3].

The transect revealed strong meridional contrasts in species assemblages. Dynamic, nutrient-rich high-latitude and upwelling-influenced equatorial regions supported fast-blooming (placolith-bearing) taxa, while stratified subtropical gyres were dominated by oligotrophic surface (umbelliform) and deeper (floriform) assemblages, reflecting vertical niche partitioning and contrasting nutritional strategies.

Superimposed on this hydrographic structure, dust deposition emerged as an episodic but regionally important nutrient source in otherwise oligotrophic surface waters, particularly in the northern hemisphere sector. A major Saharan dust event coincided with enhanced concentrations of Chl-a, fast-blooming ballasting-efficient coccolithophores (*Emiliania huxleyi*, *Gephyrocapsa oceanica*), and N_2-fixing cyanobacteria (*Trichodesmium* spp.) in the warmest surface waters across 18–10°N, consistent with fertilization by airborne Fe and P. Satellite observations (1998–2020) also showed persistent increases in Chl-a and aerosol optical thickness in this region, supporting the influence of sustained airborne nutrient supply in this area. In contrast, a weaker dust pulse in the South Atlantic showed no

detectable species-specific response, suggesting that dust fertilization is modulated by hydrographic state and by the magnitude and persistence of dust inputs.

By linking atmospheric forcing to observed responses along a basin-scale gradient, this work provided constraints on how dust deposition and ocean stratification regulated Atlantic productivity. These results inform the interpretation of present-day and paleoceanographic records, and projections of marine carbon cycling under climate change.

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Oral 15

Variabilidade no Oceano e Ocorrência de Eventos Extremos no Sistema de Correntes Ibérico

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Resumo

Os eventos extremos no oceano, como ondas de calor e de frio marinhas, anomalias de salinidade e variações intensas de correntes, têm vindo a aumentar em frequência e intensidade a nível global. No entanto, a sua ocorrência e os mecanismos associados permanecem pouco estudados no Sistema de Correntes Ibérico (SCI).

Neste estudo identificaram-se episódios de eventos extremos de temperatura da superfície do oceano (sst - sea surface temperature) na costa portuguesa, com base em dados de satélite, provenientes do produto "Mediterranean Sea - High Resolution L4 Sea Surface Temperature Reprocessed", assim como em dados do produto de reanálise ERA5, para o período 2000-2025.

Os resultados mostram um aumento considerável na temperatura média do oceano na costa portuguesa nos últimos três anos (2023 a 2025) do período em análise, com anomalias positivas de sst superiores a 0.5 ºC durante todo este período. Foi também observado que existem ao longo do período em análise eventos com anomalias negativas superiores a 0.5 ºC, tais como o inverno de 2002/03 e 2008/09.

Neste trabalho é apresentada uma análise detalhada do evento que ocorreu no inverno de 2008/09, cuja presença de uma anomalia negativa é bem notável.

Oral 16

Integrating Observations and Modelling for Coastal Risk and Blue Economy Support in Lisbon Metropolitan Area

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Abstract

The Lisbon Metropolitan Area, the most populous region in Portugal with 2.8 million inhabitants, concentrates strategic blue economy sectors along its coastal and estuarine systems, including major ports, leisure marinas, bivalve aquaculture, tourism, industrial hubs, and internationally protected environmental areas. At the same time, the region is increasingly exposed to multiple hazards, such as coastal flooding, erosion, heat waves, and risks associated with maritime traffic. To support sustainable coastal management and strengthen the resilience of socio-economic activities, the LisOcean operational modelling system was implemented to fully represent the water continuum linking the Tagus and Sado estuaries to the adjacent coastal ocean.

The system is based on the MOHID Water modelling framework, covering the full salinity gradient from estuarine to offshore waters, including habitats ranging from intertidal zones to the Lisboa – Setúbal submarine canyon system. With a spatial resolution of 280 m, the model integrates boundary conditions from Copernicus Marine products and near-real-time river inputs from EMODnet services. To address longer-term environmental variability, a complementary seasonal forecasting component with a six-month horizon simulates hydrodynamics and water quality in the estuaries and adjacent coastal waters. This supports adaptive planning in key sectors, particularly ports, environmental agencies, and oyster aquaculture producers in the Sado estuary. Forecasts and derived services are distributed following international interoperability standards and co-developed with stakeholders to ensure usability and operational relevance.

The modelling framework is further strengthened through the integration of cost-effective monitoring technologies, citizen science initiatives, and remote sensing products, which enhance spatial coverage in under-monitored areas and support model validation. A dedicated visualization portal aggregates observations, forecasts, and models output into a one-stop-shop for coastal data and services in AML, supporting risk management, environmental monitoring, and the sustainable development of the regional blue economy.

Oral 17

Optical Earth Observation in Biological Oceanography Across Multiple Scales: From Whales to Zooplankton

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Abstract

This work explores opportunities arising from the growing availability of optical Earth Observation (EO) data for understanding biological oceanography and marine ecosystems. At the level of very-high resolution satellite imagery (VHR imagery, <1 m), despite access constraints due to commercial providers, expectations for increases in data availability arise from new missions (e.g. national constellations) and data agreements (e.g., ESA Third Party Missions). In this context, we evaluate the use of “light” very-high-resolution (~1 m) GEOSAT imagery—aligned with future Atlantic Constellation capabilities – to detect whales in Macaronesia. Within the high-resolution satellite imagery (HR imagery, 10–30 m), the Copernicus Sentinel-2 mission since 2017 now provides for the first time open-access data at 10-m resolution, enabling new coastal monitoring. Here, we use Sentinel-2 to map intertidal macroalgal communities in a cold-water biodiversity hotspot in northwest Portugal (Viana do Castelo), that hosts the southernmost European population of Ascophyllum nodosum. We also evaluate the potential of Sentinel-2 to monitor beachcast events of the invasive macroalga *Rugulopteryx okamurae* in the Azores. For the category of low-resolution imagery (LR imagery, 300 m–1 km), there are expectations of the hyperspectral observations from the NASA PACE mission, which for the first time provide highly detailed spectral information at global scales. Here, we explore these experimental products to detect surface blooms of Calanus finmarchicus in Norwegian waters. Overall, this work highlights recent trends and applications of optical EO for monitoring marine biodiversity in a changing ocean and their support for a much-needed operational biological oceanography system.

Oral 18

Salpicos da Oceanografia da Costa Azul

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Resumo

Desde o verão de 2021 que o IPMA desenvolve em colaboração com o ICNF um programa de monitorização no Parque Marinho Luiz Saldanha (PMLS) tendo em vista a caracterização do habitat pelágico. Tendo por base os dados obtidos no âmbito deste programa apresentam-se alguns aspectos da oceanografia do Parque Marinho e da região onde se insere. A análise dos dados in situ mostra que alguns padrões de variabilidade observados são bastante distintos dos padrões esperados para o "mar aberto". De entre as várias peculiaridades salientam-se algumas mais contraintuitivas como: (i) o fim da estratificação sazonal não coincidir com o arrefecimento da superfície; (ii) o registo de episódios nos quais a temperatura à superfície é mais baixa que no fundo desafiando o equilíbrio hidrostático; (iii) o registo de períodos em que a variabilidade diurna da temperatura junto ao fundo (20 m) é maior que a variabilidade à superfície (3 m), (iv) as correntes não respeitam a dinâmica de Ekman com o registo de episódios de correntes mais intensas aos 10 m que à superfície (3m) e sem relação com o vento - mais fortes com vento mais fraco. A partir da caracterização do enquadramento meteo-oceanográfico recorrendo a dados de satélite e soluções de modelos numéricos, são apresentados e discutidos os processos e as estruturas de circulação responsáveis pelos padrões identificados.

Oral 19

Is the ENACW changing its thermohaline properties?

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Abstract

CTD data collected during the Eurofleets+_CARBO-ACID (offshore Cape Finisterre and Cape Roca), and Eurofleets+_SINES oceanographic campaigns in August and September 2022, respectively, revealed an Eastern North Atlantic Central Water (ENACW) with thermohaline properties shifted to the left of the Fiúza's (1984) ENACW reference curve for the Iberian Coastal Ocean (ICO). This differs from what was observed in the period 1955-2016 (Valente et al., 2019). Data collected in the ICO (1100 CTDs+550 Argo floats) revealed that the ENACW shift occurred mainly at the subtropical branch (with no changes at MOW and NADW levels) and took place by mid-2018. To investigate if this shift occurred only in the ICO or had a more general character, a broad area in the Northeast Atlantic was analysed, using more than 700 CTDs and approximately 1300 T/S profiles obtained with Argo floats.

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Oral 20

Towards Digital Twins to support bathing waters quality management: the case of Albufeira (Portugal)

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Abstract

Effective management of bathing water quality requires timely and accurate information on coastal dynamics and contaminant pathways. CONNECT (https://connect-portal.lnec.pt/connect/; Rodrigues et al., 2024) is a high-resolution, user-driven service that supports coastal management by integrating observations, model forecasts, and synthesized information on circulation and water quality. It combines shelf-to-estuary-to-river operational modelling of circulation, waves, biogeochemical variables, and Fecal Indicator Bacteria (FIB) with near real-time (NRT) data from in-situ monitoring networks and remote sensing observations. Automatic model-observation comparisons enhance confidence in the system.

The CONNECT coastal service was recently extended to support bathing water quality management and demonstrated in the Albufeira coastal region (south coast of Portugal). A key feature of the extended service is the on-demand simulation of passive tracers, which allows users to perform "what-if" analyses, such as tracing the dispersion of potential contamination events or identifying the origin of observed contamination plumes. These simulations support scenario exploration and risk assessment for bathing waters, providing actionable information for managers. Additionally, the application of the service in Albufeira offers a set of pre-simulated operational scenarios (e.g., temporary sewage system failures), facilitating rapid evaluation without the need for real-time computation. Specific indicators were also developed to assess bathing water quality in accordance with national and EU regulations.

The modular architecture of the coastal service enables its extension to other coastal areas, positioning CONNECT as a core tool in the development of Digital Twins for coastal environmental management. By combining high-resolution modelling, NRT observations, and interactive simulation capabilities, CONNECT strengthens decision-making for bathing water quality, supporting EU directives such as the Bathing Water Directive, as well as broader blue economy and environmental protection objectives.

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Oral 21

Foraminiferal microhabitats and test geochemistry around shallow gas fields in the Ría of Vigo (NW Spain)

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Abstract

The Galician rías are coastal systems characterized by the influence of seasonal upwelling processes, high biological productivity, and strong hydrodynamics gradients. These conditions favor the accumulation of organic-rich sediments and the development of complex pore-water geochemical microenvironments, as well as the occurrence of shallow methane accumulations in certain areas. However, the role of methane-sediment interactions on benthic foraminiferal test geochemistry in the seafloor of the Galician rías is still unexplored.

In this study, we investigate foraminiferal microhabitat distribution together with stable carbon ($\delta^{13}C$) and oxygen ($\delta^{18}O$) isotope compositions in the infaunal species *Bulimina gibba*, based on three subtidal sediment cores collected near shallow gas fields in the Ría of Vigo. Foraminiferal assemblages in these recent sediments are dominated by infaunal taxa (range 64.6-81.9%), whereas $\delta^{13}C$ values vary from -8.05±0.16 to -0.79±0.09‰, with the most depleted signatures occurring in discrete centimeter-scale intervals. Isotopic vertical profiles suggest that most of the dissolved inorganic carbon reflect background conditions characterized by organic matter remineralization, while in specific intervals inorganic carbon incorporated into foraminiferal tests might be influenced by methane-derived sources.

Future studies comprising a multi-species approach together with higher-resolution geochemical and sedimentological analyses, will help to better constrain the influence of methane dynamics on benthic foraminiferal assemblages and test geochemistry in these coastal environments.

Acknowledgements
Jon Gardoki received a postdoctoral fellowship from the University of the Basque Country EHU (POSTUPV25/71).

Oral 22

Cytotoxicity of Fluoxetine in Hemocytes of Marine Bivalves *Crassostrea brasiliana* and *Mytella charruana*: a 24-Hour In Vitro Assessment

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Abstract

Fluoxetine (FLX), a widely used selective serotonin reuptake inhibitor (SSRI), is a persistent environmental contaminant detected in coastal and estuarine waters worldwide. Despite its recognized ecotoxicological relevance, it's in vitro effects on bivalve immune cells remain poorly characterized. This study evaluated the cytotoxic potential of FLX (0.01–100 ng/L) on hemocytes of two ecologically relevant bivalve species from coastal Brazil, the oyster *Crassostrea brasiliana* and the mussel *Mytella charruana* following a 24-hour exposure at 25°C. Cell viability was assessed by the Presto Blue HS assay (resazurin-to-resorufin conversion), while nuclear density was quantified by Hoechst fluorescence. A Kruskal–Wallis test followed by Dunn's post-hoc test with Bonferroni correction was applied for inter-group comparisons. Neither species showed statistically significant alterations in metabolic activity (Presto Blue) or nuclear density (Hoechst) relative to solvent controls across the tested concentration range ($p > 0.05$ in all pairwise comparisons with the control). The normalized metabolic index (resorufin/cell density ratio) was similarly stable across treatments. Several pairwise comparisons between non-zero concentrations in mussel Hoechst data reached statistical significance ($p < 0.05$), though without a dose-dependent pattern. These results suggest that environmentally relevant concentrations of FLX do not elicit acute cytotoxicity in marine bivalve hemocytes under the conditions tested, contributing baseline data for future mixture and chronic exposure studies.

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Oral 23

Análise da Variação Sazonal da Turbidez na Ria de Aveiro: Combinação de Dados *in situ* com Dados de Satélite Sentinel-2

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Resumo

Compreender a turbidez em sistemas costeiros é fundamental para garantir uma gestão sustentável destes ecossistemas, cada vez mais pressionados por fatores naturais e atividades humanas. Este trabalho tem como objetivo analisar a distribuição da turbidez na Ria de Aveiro, combinando dados *in situ* com dados obtidos a partir de satélite da missão Sentinel-2. Ao longo de 2024 e 2025, foram realizadas campanhas de amostragem sazonais em dois canais da Ria de Aveiro para recolha de dados de turbidez e profundidade de Secchi, sendo este analisados de forma integrada com as condições meteo-oceanográficas locais. Complementarmente, foi efetuada uma amostragem síncrona com a passagem do Sentinel-2 (28 de maio de 2025), visando o desenvolvimento de um algoritmo preditivo de turbidez a partir da refletância derivada pelas imagens de satélite.

Os resultados mostraram uma relação inversa da turbidez com a profundidade de Secchi e evidenciaram variações sazonais associadas às condições meteo-oceanográficas, com maiores valores de turbidez nas zonas interiores e em períodos de maior descarga fluvial, vento mais intenso e marés vivas, e menores valores em condições mais calmas e de menor caudal. O modelo preditivo demonstrou um elevado desempenho na estimativa da turbidez a partir dos dados espetrais (R^2=0,822; $RMSE$= 1,77 NTU), permitindo a criação de um mapa da distribuição espacial da turbidez para a data da campanha, que revelou valores mais baixos na entrada da Ria de Aveiro e turbidez crescente em direção ao interior da laguna, em concordância com os padrões observados *in situ*. Este estudo evidencia o potencial da deteção remota por satélite na monitorização da qualidade da água em ambientes lagunares e reforça a importância de calibrar algoritmos de turbidez às características locais.

Oral 24

FVON
Uma Rede de Observação Oceânica com Embarcações de Pesca

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Resumo

A observação oceânica é essencial para compreender processos marinhos, melhorar previsões ambientais e apoiar a gestão sustentável dos recursos. Contudo, persistem lacunas significativas de dados, sobretudo em zonas costeiras e de plataforma continental. A frota pesqueira global, com milhões de embarcações, constitui uma oportunidade única para expandir a recolha de dados in situ. A Rede de Observação Oceânica com Embarcações de Pesca (FVON-Fishing Vessel Ocean Observing Network) promove a integração de sensores oceanográficos em embarcações de pesca, permitindo a recolha contínua de dados durante operações normais. Muitos equipamentos de pesca percorrem a coluna de água, funcionando como plataformas de observação de custo-efectivo e elevada cobertura espacial. Os dados recolhidos complementam redes de observação existentes, aumentando a cobertura em regiões subamostradas e melhorando modelos oceanográficos e previsões. Exemplos internacionais evidenciam benefícios concretos: melhoria da previsão de furacões nas Bahamas, apoio à avaliação de stocks e previsões operacionais nos Estados Unidos, assimilação de dados em modelos costeiros no Japão e monitorização de alterações na distribuição de espécies no México. Estes avanços contribuem para maior segurança marítima, eficiência operacional e resiliência das comunidades costeiras. Esta abordagem reforça a ligação entre ciência e o sector pesqueiro, gerando benefícios mútuos, tais como dados essenciais para investigação e gestão e, informação útil para a tomada de decisão dos pescadores. A FVON visa padronizar metodologias, garantir a qualidade e interoperabilidade dos dados (princípios FAIR), expandir variáveis observadas e integrar estas observações no sistema global (GOOS). Apesar de desafios como a heterogeneidade das frotas e a gestão de dados, o crescimento de programas regionais demonstra a viabilidade desta abordagem. Conclui-se que a utilização de embarcações de pesca como plataformas de observação é uma solução inovadora, de custo-efectivo e inclusiva para colmatar lacunas de dados oceânicos e reforçar a adaptação às alterações climáticas.

Oral 25

Impacto das Condições Oceanográficas na Dispersão e Sobrevivência de Ovos e Larvas de Sardinha

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Resumo

Ao contrário de outras regiões de afloramento costeiro, onde espécies pelágicas alternam na dominância do ecossistema, a margem ocidental ibérica tem sido historicamente dominada pela sardinha, uma espécie-chave ecológica e um dos principais recursos pesqueiros da região. Desde o início dos programas de monitorização acústica, no final da década de 1980, têm-se observado fortes variações no recrutamento e biomassa da sardinha, frequentemente associadas à variabilidade ambiental e às condições oceanográficas que afetam os estágios iniciais de vida.

Este trabalho tem como objetivo avaliar o impacto das condições oceânicas na sobrevivência de ovos e larvas de sardinha, recorrendo a modelação numérica acoplada. Para tal utilizaram-se simulações do modelo oceânico CROCO para forçar um modelo de dispersão Lagrangiano (Parcels) acoplado a um modelo baseado no indivíduo (IBM) da sardinha, permitindo simular trajetórias, evolução, crescimento e mortalidade, em resposta às condições oceânicas.

Foram analisadas diferentes épocas de desova da sardinha, representativas de condições oceanográficas distintas e anómalas (2008 2009; 2015 2016; 2016 2017). Resultados preliminares evidenciam diferenças nos padrões de dispersão larvar e nas condições de sobrevivência entre anos.

Este estudo contribui para compreender os mecanismos físicos e biológicos que regulam a dinâmica populacional da sardinha ibérica e para melhorar a previsão dos impactos da variabilidade ambiental em ecossistemas de afloramento.

Oral 26

Mediterranean Outflow Water at anomalously shallow depths along the Portuguese continental margin: observations, dynamics and interannual recurrence

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Abstract

Mediterranean Outflow Water (MOW) is classically described as an intermediate-depth water mass spreading northward along the Iberian margin at 600–1200 m. Here we report high-resolution observations from the IbMa-CSV (Iberian Margin – Cape St. Vincent) EMSO-ERIC fixed observatory revealing an anomalous high-salinity lens with unambiguous Mediterranean signature at depths as shallow as 80–130 m on the southwestern Portuguese continental shelf break. Continuous Wirewalker autonomous profiler data (0–150 m, 2 Hz) and a co-located Sentinel V100 300 kHz ADCP document a coherent thermohaline anomaly during June 2022 maximum salinity of 36.43 psu (+0.25 psu anomaly), temperature excess of +0.5–0.9°C, and dissolved oxygen depletion of −20 to −28 µmol kg^{-1} persisting for approximately 10–15 days. θ–S analysis places the anomalous water mass at 20–35% MOW admixture. Velocity time-series from the Sentinel ADCP (51 bins, 34–184 m, hourly, EWCT range −1.3 to +1.8 m s^{-1}) resolved a coherent cyclonic structure with a diagnostic mid-June velocity reversal at 80–150 m depth, consistent with the passage of a shallow Mediterranean Water eddy. Crucially, independent Wirewalker observations from May–October 2025 reveal recurrent, weaker thermohaline anomalies (ΔS_max = +0.21 psu, two distinct pulses on 30–31 May and 5 June 2025) with identical Mediterranean water mass signature, and no MOW signal during July–October 2025. The two-year dataset establishes May–June as the preferential seasonal window for shallow MOW intrusion at this observatory, with large interannual variability in intrusion intensity. Three interacting mechanisms are proposed: (1) topographic steering by the abrupt bathymetric gradient at Cape St. Vincent; (2) northward transport by the seasonally intensified Iberian Poleward Current; and (3) eddy-induced isopycnal doming by the cyclonic structure.

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Oral 27

Influência do soerguimento do Istmo do Panamá na sedimentação do Mar do Caribe

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Resumo

O Plioceno foi um período crucial na história da Terra, marcado por vários eventos de grande magnitude que contribuíram para a configuração das condições climáticas atuais. Um dos episódios mais importantes foi o soerguimento do Istmo do Panamá, resultante de movimentos tectónicos que levaram ao encerramento da ligação entre o Oceano Pacífico e o Mar das Caraíbas. Esta interrupção da circulação, com grande importância à escala global, teve diversas consequências importantes, nomeadamente alterações nas propriedades físico-químicas de ambos os oceanos, o intercâmbio de espécies entre a América do Sul e a América do Norte, a intensificação da circulação meridional do oceano Atlântico (AMOC) e, segundo alguns autores, a possível contribuição para a formação de gelo permanente no Hemisfério Norte. Este estudo tem como principal objetivo entender a história da sedimentação marinha no Mar das Caraíbas durante o soerguimento do Istmo do Panamá (entre 1,8 e 6 milhões de anos). Para tal, foram analisados dados texturais, mineralógicos e geoquímicos obtidos a partir de amostras do testemunho 999A do *International Ocean Discovery Program* (IODP), recolhido na Bacia Colombiana, no Mar das Caraíbas. Os dados revelam uma forte correlação com os ciclos orbitais, demonstrando que os ciclos de Milankovitch tiveram um papel importante nos padrões de sedimentação do Mar das Caraíbas no Plioceno inferior. Porém, com a limitação da comunicação entre as Caraíbas e o Pacífico, ocorrida há cerca de 4 milhões de anos, o impacto dos ciclos orbitais na sedimentação no Mar das Caraíbas reduziu significativamente, devido ao deslocamento da Zona de Convergência Intertropical para norte e ao aquecimento do Atlântico Norte. No início do Pleistoceno e com os ciclos glaciais estabelecidos há cerca de 2,58 milhões de

anos, o sinal dos ciclos orbitais voltou a intensificar-se, influenciando novamente a sedimentação, principalmente devido ao sistema de monções da América do Sul e da sua influência nos padrões de precipitação nas bacias hidrográficas andinas e amazónicas. A análise desta interação complexa evidencia o papel determinante de fatores tectónicos, paleoclimáticos e paleoceanográficos na configuração do ambiente atual.

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Oral 28

Effect of Floating Offshore Wind Turbines on the Atmospheric and Oceanic Environment in the Western Iberian Margin

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Abstract

This study evaluates the potential impacts of floating offshore wind farms (OWFs) on atmosphere–ocean interactions along the western Iberian margin. It compares two five-year (2009–2013) dynamical downscaling simulations conducted with the Weather Research and Forecasting (WRF) regional model: one incorporating a wind farm parameterization (WFP) scheme and another without it. This approach allows for a direct assessment of turbine-induced modifications to local wind patterns and upwelling-related ocean circulation.

Annual mean reductions in 10 m wind speed exceeded 14.8% within the wind farm areas with the highest number of turbines. These reductions are associated with wakes extending over 125 km downwind, predominantly oriented southward. Summer stands out with the strongest wind reductions and longest wake extents.

The near-surface wind wakes induce horizontal gradients in wind stress, which in turn generate zones of surface-water divergence and convergence, driving vertical motions in the ocean. Turbine-induced upwelling develops on the offshore side of the farms and downwelling on the onshore side, forming dipoles that can extend over 100 km, also mainly oriented southward. Integration along zonal transects crossing the OWFs indicates that a weakening of upwelling, arising from the combined influence of Ekman pumping and coastal upwelling (Ekman transport), is the most recurrent outcome throughout the year, particularly during summer. This reduction in upwelling is expected to have an impact on nutrient concentrations and primary productivity in the region. These findings highlight the importance of considering atmosphere–ocean responses when assessing the environmental impacts of offshore wind energy development along eastern boundary upwelling systems.

Oral 29

Modelling pelagic eggs and larval dispersal on the NW Portuguese shelf during winter conditions

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Abstract

Many marine organisms in coastal and shelf environments undergo a pelagic egg and larval phase, which often represents their primary opportunity for dispersal and connectivity among geographically distant populations. In recent years, numerical modeling of early life stages has become a key approach for investigating population interactions and exchange processes. These coupled biophysical models integrate stochastic representations of biological processes with ocean circulation dynamics, enabling the simulation of larval transport pathways under realistic environmental conditions. Typically, such models adopt a Lagrangian particle-tracking framework, wherein large ensembles of virtual particles are advected through three-dimensional, time-evolving velocity fields derived from hydrodynamic models (e.g [1]). This study applies a coupled biophysical modeling framework to investigate larval dispersal patterns along the northwestern Portuguese coast, a region recognized as one of the main spawning areas for species like Sardine pilchardus, with peak spawning occurring between October and April (e.g., [2]). A biophysical modeling system was implemented by coupling hydrodynamic outputs from the CROCO model with the Connectivity Modeling System (CMS, [1]) to simulate realistic dispersal scenarios. CMS operates independently of the underlying hydrodynamic model, running offline using stored velocity fields, which in this application were obtained from CROCO simulations. In particular, we examined the dispersal of eggs and larvae under different winter environmental conditions, including both typical and anomalous scenarios. The results reveal that variability in shelf circulation strongly influences dispersal pathways and potential survival pa□erns, highlighting the critical role of physical oceanographic processes in shaping larval transport and connectivity.

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Oral 30

Water quality, nutrient dynamics, and ecotoxicological assessment of the Itanhaém Estuary, southeastern Brazil: a multi-campaign seasonal approach

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Abstract

The Itanhaém Estuary, located on the southern coast of São Paulo State (Brazil), drains a basin encompassing Atlantic Rainforest remnants and an urbanised lower reach subject to domestic sewage inputs from the municipal wastewater treatment plant (WTP). This study integrates physicochemical characterisation, dissolved nutrient profiling, and acute ecotoxicological bioassays with the cladoceran across three seasonal campaigns (June 2024–February 2025) at eight stations spanning a freshwater–estuarine longitudinal gradient. Water temperature ranged from 19.9 °C (austral winter, S1) to 29.6 °C (austral summer, S3); pH was consistently weakly acidic throughout the basin (5.66–6.80), consistent with humic Atlantic Forest drainage; dissolved oxygen saturation was markedly suppressed in the transition campaign S2 (26–44%) relative to S1 and S3 (79–101%). Salinity confirmed a clear longitudinal gradient, peaking at 16 at the estuarine station (P8) in S1 and suppressed to ≤2 ppt throughout during the wet-season campaign S3. Nitrate was the dominant inorganic nitrogen species (uniform 10 mg L^{-1} background, spiking to 80 mg L^{-1} at P8 in S1); phosphate was anomalously elevated at headwater stations P1 (2.00 mg L^{-1}) and P2 (1.00 mg L^{-1}) in S2. In 48-h acute immobilisation bioassays, P1 surface (S2) exhibited exceptional toxicity (81.0 ± 26.9% immobilisation; Mann-Whitney $U = 0$, $p = 0.036$), and P4 middle and bottom depths (S3) showed statistically significant elevated immobilisation (57.1% and 47.6%; $p < 0.04$). Despite its Protected Area designation, the Itanhaém Estuary undergoes episodic acute toxic events of unidentified chemical origin, demanding targeted chemical screening and adaptive management reform.

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Oral 31

The EMSO ERIC Iberian Margin Regional Facility: Infrastructure Development and Scientific Scope

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Abstract

The Iberian Margin Regional Facility (IMRF) is one of the European Multidisciplinary Seafloor and water column Observatory European Research Infrastructure Consortium (EMSO ERIC) observatories and has been progressively developed since 2020 under the EMSO-Portugal initiative — a national research consortium of 15 institutions committed to sustained, multidisciplinary ocean observation across the Atlantic.

A first pilot Eulerian observatory was deployed between May and October 2021, ten nautical miles south of Cape St. Vicente (SW Portugal) at the 200 m isobath, on the shelf break at the western limit of the Gulf of Cádiz. The station (IbMa-CSV) sampled the upper 150 m of the water column using two autonomous moorings: a wave-powered vertical profiler moving at an average rate of 4.5 profiles per hour, and a classic subsurface upward facing current profiler. Measured variables include temperature, salinity, total chlorophyll, dissolved Oxygen, and turbidity. Subsurface current velocity and direction were recorded hourly via a 300 kHz ADCP. Between May and October 2022, a second twin-deployment followed, resulting in a quality-controlled, high-resolution physical and biogeochemical dataset, openly available in SEANOE repository.

Building on this experience, after a 3-year hiatus, the IbMa-CSV station was redeployed in May 2025, now upgraded with two additional subsurface moorings: a hydrophone “array”, enabling the acquisition of acoustic data critical for the characterization of ocean soundscapes, mainly focused on monitor and quantify ship noise levels, and cetaceans detection and location in the area; and a near-bottom EGIM, deployed over the São Vicente Canyon at approximately 1000 m depth, targeting a year-long monitorization of the Mediterranean Outflow Water (MOW), capturing multiscale MOW variability — including meddy-driven thermohaline anomalies — and their potential role in the Atlantic Meridional Overturning Circulation (AMOC) dynamics.

Together, these deployments establish the IMRF as a growing node for long-term observation of a dynamically complex margin, linking the upper-ocean with intermediate-depth circulation processes.

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Oral 32

A Setback or a Stepping Stone? JUNO Insights from a Wave-Propelled USV Transect

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Abstract

Unmanned surface vehicles (USVs) are increasingly used for sustained ocean observation, enabling persistent in situ data collection while reducing operational costs and manpower. Within the JUNO – Robotic Exploration of Atlantic Waters project, we report outcomes from a preliminary coastal transect conducted with the wave-propelled autonomous surface vehicle AutoNaut Caravel off the Portuguese coast.

The transect produced a coherent set of ocean observations spanning physical and biogeochemical properties. Core hydrographic variables included temperature and salinity, complemented by biogeochemical proxies such as turbidity, chlorophyll fluorescence, coloured dissolved organic matter (CDOM), and dissolved oxygen. These measurements were collected along a coastal gradient relevant to dynamic processes such as upwelling, providing a field-validated example of how wave-propelled platforms can contribute multi-parameter, spatially extensive observations.

A central contribution of this work is the description of the data-to-product pipeline implemented for the mission. We designed a structured organization of data and metadata aligned with oceanographic best practices and translated it into a processing workflow that generates a final, self-describing netCDF product. To the best of our knowledge, this effort represents the first publicly released multi-parameter USV transect dataset from Portuguese coastal waters, with distribution planned via EMODnet and Atlantic Sense to support re-use in scientific applications and intercomparison studies.

Finally, building on lessons learned during this trial mission, we note that a renewed long-range attempt from Porto to the Azores is planned following maintenance and upgrades as part of mission preparations. This continuity, from trial deployment to curated open-data products, aims to strengthen operational readiness and expand the availability of high-quality USV observations to the community.

Poster 1

Climate Variability in the SW Iberian Margin during Middle to Late Pleistocene (IODP Site 1587)

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Abstract

The Iberian Margin provides an exceptional sedimentary record for high-resolution reconstructions of past climatic and oceanographic changes. Previous studies show a strong link between regional variability and global climate at orbital timescales. In this study, we reconstruct sea surface temperatures (SST) and ocean productivity (P) during Middle-Late Pleistocene interglacial periods, focusing on Marine Isotopic Stages (MIS) 7 and 5. MIS 5 is considered one of the closest analogues to the present interglacial (MIS 1 - Holocene) due to the similar insolation signals, while, MIS 7 remains comparatively understudied due to a different orbital configuration. Investigating both interglacial periods provides insight into how marine environments respond to different climate forcings. To this end, planktic foraminiferal assemblages from core U1587 (IODP 397 expedition) were analyzed. Twenty-five species were identified, and seasonal SST and ocean productivity were reconstructed using the Modern Analogue Technique (MAT). Climatic water-column changes were analyzed using $\delta^{18}O$ and $\delta^{13}C$ measurements in benthic (*Cibicidoides wuellerstorfi)* and planktic (*Globigerinoides ruber* and *Neogloboquadrina incompta)* species. Preliminary summer SST results show temperatures of 15 - 19°C for MIS 7 and 15 - 21 °C during MIS 5, within the present regional average (~20 °C). The record shows stable periods alternating with abrupt drops of 10°C. These decreases are associated with high abundances of *Neogloboquadrina pachyderma* and heavier planktic and benthic $\delta^{18}O$ values, suggesting incursions of subpolar waters, a southward shift of the subpolar front, and iceberg presence off SW Portugal. Productivity during both interglacials was lower than the present-day mean (80 gC/m2/yr), averaging 54.9 ±16 gC/m2/yr (MIS 7), and 54.5±16 gC/m2/yr (MIS 5). Together with foraminifera assemblage analysis, these results indicate a transitional zone between oligotrophic offshore waters and nutrient-rich filaments derived from a productive coastal region, modulated by the main ocean currents. SST and ocean productivity show a strong orbital signal at both millennial and orbital timescales, linked to precession (~21 ka) and obliquity (~41 ka) cycles.

Encontro de Oceanografia Sesimbra 2026

Poster 2

Distribution of recent wildfire particles in the Iberian Margin through pyrogenic compounds

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Abstract

Wildfires in the Iberian Peninsula, increasingly worsened by climate change, pose a major environmental challenge because of their effects on land, air, and water systems. They greatly contribute to global greenhouse gas emissions and are closely linked to heatwaves and droughts in southern Europe [1]. Besides causing forest loss and air disturbances, wildfires also impact water environments through the deposition of pyrogenic particles, surface runoff, and changes in nutrient flows [2, 3].

Pyrogenic compounds, including polycyclic aromatic hydrocarbons and monosaccharide anhydrides, provide robust proxies for reconstructing the deposition and dispersal of wildfire-derived material [4, 5]. Within the framework of the WIMPRO project, this multiproxy study integrates chemical analyses with remote sensing techniques to track wildfire plumes and their environmental footprint. This approach aims to improve calibration with in situ observations and to assess wildfire impacts on primary production using satellite imagery, numerical modelling, and environmental samples (e.g. ash, burnt vegetation, water, and sediments) collected from areas affected by wildfires and subsequent plume particle deposition along the Western Iberian Margin.

This study focuses on severe wildfire events in central and northern Portugal in September 2024 that generated persistent plumes transported oceanward by easterly winds over several days. We compare the spatial distribution of pyrogenic compounds in surface sediment samples from the Portuguese continental shelf, evaluating differences between areas likely influenced by recent wildfire activity and those less affected.

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Poster 3

Análise Comparativa dos Registos dos Marégrafos e Altimetria por Satélites na Costa de Angola

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Resumo

A monitorização do nível do mar é essencial para a compreensão da variabilidade oceânica e dos impactos das mudanças climáticas nas zonas costeiras. Neste estudo, apresenta-se uma análise comparativa entre registos de marégrafos e dados de altimetria por satélite ao longo da costa de Angola, com o objetivo de avaliar a consistência, complementaridade e diferenças entre estas duas fontes de observação.

Os dados de altimetria por satélite, provenientes de produtos multi-missão do Copernicus Marine Service, foram utilizados na forma de anomalias do nível do mar (Sea Level Anomalies – SLA), incorporando previamente as principais correções geofísicas. Por sua vez, os registos maregráficos, que medem o nível do mar relativo ao referencial terrestre local, foram sujeitos a procedimentos de controlo de qualidade, remoção de valores extremos, correção do movimento vertical do terreno (VLM) e conversão para anomalias, de modo a garantir a comparabilidade com os dados altimétricos.

A análise baseou-se em técnicas de séries temporais, incluindo a decomposição das componentes sazonal, tendência e residual, bem como em análises de correlação e Análise de Componentes Principais (PCA), permitindo identificar padrões dominantes de variabilidade temporal e espacial. Os resultados evidenciam uma boa concordância entre as duas fontes de dados em escalas sazonais e interanuais, embora discrepâncias locais possam ocorrer devido a efeitos costeiros, limitações da altimetria em zonas próximas da costa e incertezas associadas ao VLM. Adicionalmente, a comparação revela que os marégrafos captam com maior detalhe a variabilidade de alta frequência, enquanto a altimetria por satélite fornece uma visão mais abrangente da variabilidade regional do nível do mar. As tendências observadas indicam um aumento consistente do nível do mar ao longo do período analisado, em concordância com os padrões globais.

Este estudo demonstra a importância da integração entre medições in situ e observações por satélite para uma caracterização mais robusta do nível do mar na costa angolana, contribuindo para aplicações em estudos climáticos, gestão costeira e avaliação de riscos associados à subida do nível do mar.

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Poster 4

Development of a Web-Based GIS Decision Support System for Mapping and Management of Pelagic Fisheries in Angola

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Abstract

Effective fisheries management depends on tools that can integrate and visualise both biological and environmental data. In Angola, pelagic fisheries are economically and ecologically important, yet accessible spatial tools to support decision-making remain limited. This study presents an ongoing effort to develop a web-based Geographic Information System (WebGIS) for mapping and analysing the distribution of key pelagic fish species along the Angolan coast.

The platform is being designed to integrate fisheries data collected between 2000 and 2024 from scientific surveys, including information on species composition, biomass, and georeferenced fishing stations. Environmental variables such as sea surface temperature and dissolved oxygen will be incorporated to explore their influence on species distribution. Data processing and spatial analysis are being conducted using QGIS, while a spatial database is being implemented using PostgreSQL with the PostGIS extension.

The WebGIS application aims to provide an interactive interface where users can visualise spatial data, explore different thematic layers, and perform basic queries related to species and environmental conditions. The system is expected to be accessible through a web platform, facilitating its use by researchers and decision-makers.

This work is currently in progress and aims to demonstrate how GIS and web-based tools can support fisheries monitoring and management in data-limited regions. The expected outcome is a practical and scalable decision-support tool that contributes to improved spatial understanding and sustainable management of pelagic fisheries in Angola.

Poster 5

Modelação numérica da salinidade na zona costeira, como definir o forçamento fluvial?

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Resumo

Um dos desafios na modelação numérica da salinidade na zona costeira é a definição do forçamento fluvial. Para além das dificuldades na obtenção de caudais realistas, dada a escassez de observações diretas nos diferentes rios, também importa avaliar o impacto dos valores de temperatura e salinidade prescritos na foz de cada rio. Neste trabalho apresentam-se os resultados de um estudo de sensibilidade com base em três simulações de alta resolução realizadas com o modelo CROCO (IBv3.0), considerando diferentes valores de salinidade dos rios junto à foz, para o período de 2019 a 2024.

Os resultados das três simulações foram comparados com os registos contínuos de superfície de temperatura (SST) e salinidade (SSS) obtidas com termosalinógrafos (TSG) durante as campanhas de monitorização de recursos pelágicos do IPMA (DEPM e PELAGO) ao longo da costa portuguesa. Adicionalmente, foram utilizados campos de SST e SSS da reanálise *Iberian Biscay-Irish* (IBI)[1], assim como dados de SST de satélite, nomeadamente o *Multiscale Ultrahigh Resolution* (MUR)[2] e o *Mediterranean Sea Ultra High Resolution* (MED-UHR)[3], para avaliar a consistência entre as diferentes metodologias de observação e as simulações.

Para todas as campanhas, os dados de modelo e de satélite foram extraídos nos pontos espaciais e temporais mais próximos das medições TSG e processados às escalas espaciais adequadas, tendo sido avaliados com base em métricas estatísticas (viés, coeficiente de correlação, raiz do erro quadrático médio, erro absoluto médio e skill score). Os resultados mostram que, embora a SST seja geralmente bem reproduzida pelo modelo IBI, a SSS apresenta discrepâncias mais significativas, com tendência a subestimar a salinidade nas zonas mais costeiras. Relativamente às simulações do modelo CROCO, estas evidenciam que a prescrição na salinidade fluvial tem um impacto significativo na representação das plumas estuarinas e na variabilidade da salinidade costeira, demonstrando diferenças claras entre os cenários testados.

Estes resultados reforçam a importância do forçamento fluvial prescrito na salinidade costeira, nomeadamente na representação das plumas estuarinas e nos gradientes junto à costa.

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Poster 6

Trend analysis of bottom environmental variables off W Iberia using numerical model solutions

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Abstract

To assess environment changes on marine benthic habitats, trends in bottom temperature (T), dissolved oxygen (O2) and pH over the last decades were estimated using numerical model solutions provided by the Copernicus Marine Service (CMEMS), namely the Atlantic-Iberian Biscay Irish (IBI) Ocean Physics Reanalysis and BioGeoChemistry non assimilative Hindcast, and the Global Ocean (GLO) Physics Reanalysis and Biogeochemistry Hindcast, together with the solutions from the IBIv2.0 regional model developed at IDL/FCUL.

Monthly data cubes (latitude, longitude, depth) for the West Iberia region (34.5 °N-44.0 °N, 14 °W-7 °W) covering the period from 1993 to 2024 on IBI and GLO models, and from 2002 to 2020 on all three models, were processed to extract the values of the deepest depth level to create bottom layers for the three variables (T, O2, pH). The trend maps for the three variables and corresponding p-value, were computed using the Mann-Kendall (MK) trend test, over the 32-year period from IBI/GLO models, and 19-year period for temperature in all models.

The results using the higher resolution models (IBI, IBIv2.0) and the coarser global ocean models (GLO) were compared to check for the consistency in the trend maps. The results show that, despite the resemblance in the spatial patterns from the two model solutions available on CMEMS, there are some notable exceptions: (i) stronger trends in the lower resolution model (GLO), (ii) opposite signal trends in dissolved oxygen in the NE region, north of 40.5 °N, at depths below 2000m between the coast and the Galician Bank (~42.5 °N, 11.75 °W), and (iii) opposite signals in temperature trends in the SE region along the slope (between the 1000m and 2000m isobaths, southward of Nazaré canyon ~39.6 °N).

The results of the present study suggest that the use of numerical mode solutions to analyze trends in variables near the bottom, which are the only data source for climate change–related studies over the data-poor deep habitats, should be based on a comparative and exploratory approach across different models, in order to capture trends that are consistent and robust.

Poster 7

Modelação numérica da dispersão e da retenção de microplásticos na Ria de Arousa

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Resumo

A presença de microplásticos nos ecossistemas marinhos constitui um desafio crescente para a sustentabilidade ambiental, particularmente em zonas costeiras com intensa atividade socioeconómica. Este estudo analisa a propagação de microplásticos na Ria de Arousa, um sistema costeiro de elevada relevância ecológica e socioeconómica no noroeste da Península Ibérica, com o objetivo de compreender os padrões de dispersão, retenção e variabilidade sazonal associados à hidrodinâmica local e ao efeito do vento. Foram consideradas seis Estações de Tratamento de Águas Residuais como fontes pontuais de emissão, totalizando 500 000 partículas distribuídas proporcionalmente entre as unidades localizadas na Ria de Arousa. As simulações foram realizadas com recurso ao modelo hidrodinâmico e de transporte de partículas Delft3D para dois períodos representativos, verão e inverno, com duração de 15 dias cada. Numa primeira fase, os cenários foram executados sem considerar a ação direta do vento sobre as partículas; posteriormente, este forçamento atmosférico foi integrado num segundo conjunto de simulações.

A análise dos resultados, por meio de mapas de acumulação costeira, permitiu comparar os padrões de distribuição entre os cenários e as estações do ano. Na ausência de ação direta do vento sobre as partículas, a dispersão superficial apresenta comportamentos semelhantes no verão e no inverno, evidenciando o papel dominante da hidrodinâmica local. A inclusão do vento introduz alterações significativas na distribuição das partículas, reforçando a sua influência determinante na dinâmica superficial.

Dada a importância da aquicultura de bivalves na região, foram integradas as coordenadas das zonas de produção, permitindo quantificar a percentagem de partículas acumuladas em cada polígono correspondente aos diferentes viveiros. Estes resultados constituem uma base relevante para a avaliação de riscos ambientais e para o apoio à gestão sustentável da Ria de Arousa.

Poster 8

O Programa Argo em Portugal: Contributo do IPMA para a Observação do Oceano na ZEE Portuguesa

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Resumo

Portugal está a reforçar o seu envolvimento no programa Argo no âmbito de uma estratégia nacional orientada para o aumento das capacidades de observação do oceano e para a contribuição ativa na rede global Argo. O Instituto Português do Mar e da Atmosfera (IPMA) está a estabelecer as bases para uma participação sustentada através da iniciativa ARGO.PT.

Este programa assenta em colaborações anteriores com parceiros como a Irlanda, França e Alemanha, que incluíram a implementação de flutuadores Argo na Zona Económica Exclusiva (ZEE) portuguesa. Dando continuidade a este trabalho, o IPMA adquiriu seis flutuadores perfiladores: quatro Argo Core ARVOR-I, um Argo Core ARVOR-DO-I equipado com sensor de oxigénio dissolvido, e um flutuador biogeoquímico completo (BGC) Argo PROVOR CTS4, dotado de sensores para pH, oxigénio dissolvido, nitrato, clorofila a, partículas em suspensão e irradiância descendente.

Foram lançados quatro flutuadores ARGO em 2025 e pretende-se lançar mais dois, em 2026, na ZEE portuguesa, com especial enfoque em regiões influenciadas pela Água Mediterrânica, uma massa de água fundamental na estrutura termohalina e biogeoquímica do Atlântico Nordeste. Em particular, os dados de alta resolução, recolhidos até profundidades da ordem dos 2000 m, permitem aprofundar o conhecimento sobre as correntes e a dispersão da Água Mediterrânica, a sua variabilidade termohalina e os processos biogeoquímicos associados.

Esta iniciativa contribui para os esforços nacionais e europeus no desenvolvimento de sistemas sustentados de monitorização in situ, com impacto no apoio a políticas marinhas, serviços climáticos e investigação científica. Integrado no Euro-Argo e alinhado com o Atlantic Observatory, o ARGO.PT reforça o papel de Portugal na oceanografia operacional e na cooperação científica internacional.

Poster 9

Resolving coastal mesoscale and sub mesoscale structures south of Cape São Vicente using SWOT altimetry

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Abstract

Mesoscale ocean dynamics play a key role in coastal circulation and vertical transport, yet conventional altimetry struggles to resolve sub-100 km structures (Adcroft & Hallberg, n.d.). The Surface Water and Ocean Topography (SWOT) mission provides high-resolution, wide-swath sea surface height observations, enabling improved detection of mesoscale and smaller-scale variability in coastal regions (Smith, 2024). The enhanced spatial resolution, reduced coastal data loss, and increased temporal sampling provide a more detailed view of upper-ocean processes compared to traditional sea level anomaly (SLA) products.

A recurrent cyclonic eddy, with a clear signal in chlorophyll-a (CHL-a) and sea surface temperature (SST), is observed south of Cape São Vicente (CSV), suggesting an overshooting upwelling jet flowing equatorward along the west coast of Iberia.

Multiple SWOT passes from an upwelling event on 24 May 2024, acquired within 24 hours (passes 460, 475, 480), were combined to further analyse this structure. The merged fields, together with derived geostrophic velocities, reveal a secondary anticyclonic eddy to the west, forming a cyclonic–anticyclonic dipole with a mushroom-like pattern. The cyclonic eddy is associated with upwelling and enhanced biological activity, consistent with CHL-a and SST signatures, whereas the anticyclonic eddy is primarily expressed in sea surface height anomalies and geostrophic velocities.

This work provides new insights into the structure and dynamics of coastal eddy systems and their potential link to the Iberian upwelling regime. Ongoing work in this project focusses on analysing the recurrence of this dipole structure and further characterising its dynamical properties.

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Poster 10

Plankton Dynamics Under Ocean Alkalinity Enhancement

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Abstract

The ocean is a major carbon sink, absorbing ~30% of anthropogenic CO_2 through the solubility, biological and carbonate pumps. However, warming, stratification and shifts in plankton communities threaten this capacity, underscoring the need to better understand ocean carbon sequestration [1,2]. Marine carbon dioxide removal (mCDR) approaches, such as ocean alkalinity enhancement (OAE), enhance CO_2 uptake and mitigate acidification by increasing seawater alkalinity, yet its ecological impacts remain poorly constrained [3].

Within the OAE Pelagic Impact Intercomparison Project (OAEPIIP)—the first globally coordinated effort to address this question [4]—we investigated plankton responses to OAE in coastal Atlantic waters (Cascais Bay, Portugal). Over 20 days, nine 55 L microcosms simulated spring conditions under controlled laboratory conditions: three Controls, three Unequilibrated (immediate alkalinity addition), and three Equilibrated (CO_2-rebalanced after alkalinity enhancement) treatments).

Across all studied conditions, plankton dynamics followed a consistent sequence: early chlorophyll-a peaks (Days 2–3), followed by a 3–4 day delayed increase in particulate

organic carbon (POC). Particulate organic nitrogen (PON) increased during bloom–POC development, while increasing C:N ratios under nitrate depletion indicated progressive N limitation. Nutrient depletion drove a shift from microphytoplankton toward smaller phytoplankton (particularly *Synechococcus*).

OAE did not prevent bloom occurrence but influenced its expression. Controls exhibited stronger and more persistent Chl-a and POC peaks, while Equilibrated treatments had slightly delayed, reduced blooms with a notable shift toward smaller phytoplankton. Unequilibrated treatments showed weaker, delayed blooms and stronger post-bloom declines.

Overall, OAE induced only minor taxonomic shifts without major restructuring, while temporal progression dominated microbial community dynamics across tanks, suggesting short-term resilience of marine microbial communities. Ongoing analyses, including microscopy, eDNA and biogeochemical proxies will be essential to better constrain ecosystem-level responses to OAE.

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Poster 11

Exploring Natural Carbon Sequestration in Marine Serpentinite Mud Volcanoes through Mineral Carbonation

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Abstract

Mineral carbonation comprises natural reactions between carbon dioxide (CO_2) and metal-bearing minerals, forming stable carbonates. As a key component of the global carbon cycle, it has contributed to long-term climate stability. However, rising anthropogenic CO_2 emissions have disrupted this balance, exceeding the capacity of natural processes. Achieving net-zero now requires additional strategies such as Carbon Capture and Storage (CCS) and Carbon Dioxide Removal (CDR). Among these, mineral carbonation is gaining attention as a sustainable solution due to its ability to store CO_2 in stable mineral phases over geological timescales. While laboratory studies have advanced understanding of these reactions, investigations in natural systems remain limited.

The Mariana forearc provides a natural setting to study mineral carbonation, where authigenic carbonates precipitate within serpentinized muds of active mud volcanoes. Samples from three serpentinite mud volcanoes (Yinazao, Asùt Tesoru, and Fantangisña), collected during IODP Expedition 366, were analysed to determine C, O, and Ca isotopic compositions. The carbonates consist mainly of rhombohedral calcite and aragonite needles and spherulites, predominantly in the upper core sections. At Yinazao, aragonite from the summit shows $\delta^{13}C \approx 0‰$, $\delta^{44}/^{40}Ca \approx 0‰$, and $\delta^{18}O \approx 5‰$, whereas flank calcite displays higher $\delta^{13}C$ (~2.9‰) and $\delta^{44}/^{40}Ca$ (~1.4‰), and lighter $\delta^{18}O$ (~1.7‰). Similar isotopic signatures were observed in samples from Asùt Tesoru and Fantangisña.

These results highlight mud volcanoes as valuable natural laboratories for studying mineral carbonation. They indicate that seawater is the primary carbon source, with carbonate precipitation driven by interaction between seawater and highly alkaline fluids generated by serpentinization. This process underscores the relevance of mineral carbonation as a viable pathway for CO_2 sequestration. Understanding its mechanisms in natural systems is essential for improving the efficiency and scalability of CCS and CDR technologies.

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Poster 12

SOMOSATLÂNTICO: Interoperabilidade entre a SOMOSATLÂNTICO e as plataformas de dados nacionais NODC-PT, Dados.gov e SNIG

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Abstract

A plataforma de dados SOMOSATLÂNTICO, afirma-se como a infraestrutura estratégica para a gestão e integração de dados geoespaciais marinhos do IPMA. Pretende agregar e disponibilizar todos os dados recolhidos pela instituição tanto no âmbito de processos de monitorização como de investigação.

A crescente necessidade de acesso integrado, aberto e interoperável a dados marinhos e geoespaciais constitui um dos principais desafios para a governação sustentável do oceano e para a promoção da sua literacia. Neste contexto, a iniciativa SOMOSATLÂNTICO afirma-se como um instrumento agregador, orientado para a aproximação entre ciência, sociedade e políticas públicas, potenciando o uso e a valorização da informação oceânica.

A SOMOSATLÂNTICO permite a interoperabilidade com as três infraestruturas nacionais de referência: o Centro Nacional de Dados Oceanográficos (NODC-PT), o portal nacional de dados abertos (dados.gov) e o Sistema Nacional de Informação Geográfica (SNIG). A integração destas plataformas é analisada à luz dos princípios FAIR (Findable, Accessible, Interoperable, Reusable), normas internacionais de dados, e mecanismos de partilha baseados em serviços web e metadados normalizados.

Metodologicamente, são exploradas abordagens de harmonização semântica, alinhamento de modelos de dados e implementação de serviços interoperáveis que permitem a descoberta, acesso e reutilização de informação proveniente de diferentes domínios. Os resultados evidenciam ganhos ao nível da eficiência no acesso à informação, da redução de redundâncias e do reforço da coerência entre sistemas.

Conclui-se que a interoperabilidade entre plataformas constitui um fator crítico para a construção de um ecossistema digital do oceano mais integrado e orientado para o utilizador, potenciando a tomada de decisão informada, a transparência e o envolvimento da sociedade na valorização do Atlântico.

Poster 13

Wind-tide interactions drive microplastic export and retention in the Ria de Vigo (NW Spain)

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Abstract

Microplastic pollution has become a major environmental concern in coastal and estuarine ecosystems, where hydrodynamic processes strongly influence particle transport, retention, and export. In these environments, tides, wind forcing, and water-column stratification interact to determine the fate of microplastics, particularly those originating from land-based sources such as wastewater treatment plants (WWTPs). This study investigates the hydrodynamic mechanisms governing the dispersion of buoyant microplastic particles released from the main WWTP of the Ria de Vigo (northwestern Spain).

To this end, a set of numerical simulations was performed using the Delft3D modelling system under different wind and tidal scenarios, including upwelling- and downwelling-favourable conditions, as well as neap and spring tides. The results show that floating microplastics are rapidly exported from the estuary, with most particles leaving the system within the first 24 h after release, highlighting the dominant role of hydrodynamic forcing on particle residence time.

Export is maximized under upwelling-favourable winds combined with neap tide conditions, which promote efficient offshore transport of surface particles toward the adjacent continental shelf. In contrast, downwelling conditions favour particle retention within the estuary. Spring tides, despite generating stronger currents, enhance short-term near-field retention due to increased lateral redistribution and reduced transport efficiency near the margins. Additionally, vertical stratification plays a key role: stronger stratification enhances surface advection, whereas weaker stratification increases vertical mixing and promotes retention.

These findings demonstrate that wind forcing, tidal phase, and stratification jointly control the fate of WWTP-derived microplastics, providing a scientific basis for improving wastewater management and supporting mitigation strategies in estuarine and coastal systems. Overall, the results highlight the dominant role of estuarine hydrodynamics in determining the fate of WWTP-derived microplastics and provide useful knowledge for improving discharge management and supporting mitigation strategies in estuarine and coastal systems.

Poster 14

Reconstrução oceanográfica da Margem SW Portuguesa durante a Crise de Salinidade do Messiniano: temperatura, produtividade e biodiversidade a partir de foraminíferos

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Resumo

A corrente intermédia de água quente e salgada do Mediterrâneo no Atlântico (*Mediterranean Outflow Water* – MOW) tem atualmente um papel crucial na circulação oceânica: 1) regula o clima ao transportar calor para as latitudes mais altas; 2) mantém o equilíbrio salino do Atlântico Norte, contribuindo para a Circulação Meridional do Atlântico (AMOC) e para a formação das águas densas e profundas (Sierro et al., 2020). Durante a Crise de Salinidade do Messiniano (CSM: 5,96 a 5,33 Ma), o fecho do Estreito de Gibraltar reduziu ou interrompeu a troca de água entre o Mar Mediterrâneo e o Oceano Atlântico, causando alterações significativas na oceanografia, no clima e na biodiversidade da região. Se o impacto da CSM no Mediterrâneo é bem conhecido, no Oceano Atlântico permanece pouco explorado. Nesse sentido, este estudo pretende reconstruir as condições de temperatura, produtividade e biodiversidade ao largo da Margem SW Portuguesa, durante a redução/ausência da MOW no intervalo 5,660–5,600 Ma. Assim, foram realizadas análises de abundância de foraminíferos, de granulometria e de Carbono Orgânico (TOC) em amostras de sedimento marinho colhidas no Site U1587, da Exp. 397 do IODP. Foram identificadas 32 espécies de foraminíferos planctónicos, 16 das quais associadas a águas quentes, 13 a águas temperadas e três a águas frias. A diversidade determinada pelo índice de Shannon (H) variou entre 1,8 e 2,6 (moderada a alta), sendo esta maior no intervalo 5,653–5,625 Ma. A associação de águas temperadas (>50%) domina todo o registo, atingindo valores de 70% aos 5,648 Ma e no intervalo 5,621–5,618 Ma, sendo *Globigerinita glutinata* a espécie mais abundante, com uma contribuição de 41%. As associações frias e quentes não acompanham a curva da insolação; no entanto, a maior percentagem de silte e de TOC coincide com a insolação máxima. Estes períodos de maior input terrígeno poderão estar relacionados com maior precipitação, descarga de rios e erosão da plataforma. O número de foraminíferos por grama não reflete a curva do TOC, sugerindo que os máximos de produtividade inferidos por este proxy não estão a ser refletidos por estes microrganismos.

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Poster 15

Cross-sectional Structure of Estuarine Currents: the Case of Espinheiro Channel (Ria de Aveiro)

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Abstract

The interaction between tidal forcing, freshwater inflow, and local geomorphological features controls the hydrodynamics of coastal lagoons. Understanding the cross-sectional structure of local currents and tidal asymmetry is essential to assess sediment transport, pollutant dispersion, and water quality processes, particularly in environmentally sensitive and anthropogenically impacted areas. This study presents field measurements of current velocity and direction in the Espinheiro Channel of the Ria de Aveiro lagoon (Portugal), under contrasting tidal and hydrological conditions. The main objective was to characterize the structure and patterns of local currents, quantify flow asymmetry, and assess the impact of tidal forcing and freshwater discharge on circulation, while providing data to support hydrodynamic modeling applications. Three monitoring campaigns were conducted over complete tidal cycles in September 2024, and February and March 2025. The September and March campaigns captured extreme tidal amplitudes, while the February campaign followed a period of significant rainfall. Current velocity and direction were measured on a cross-sectional transect using an Acoustic Doppler Current Profiler (ADCP) from Teledyne Marine. Results reveal lateral and vertical variability in the current intensity. Maximum flood velocities occurred near the northern margin, while near-bed velocities were consistently lower than surface and middle column velocities. In contrast, the current direction remained relatively uniform across the section and throughout the water column during most tidal phases. A tidal asymmetry was observed, modulated by both tidal amplitude and freshwater input. While high tidal amplitudes led to increased absolute current velocities, normalized results showed that ebb currents were significantly enhanced under fluvial influence. In particular, the ratio between ebb and flood velocities increased from approximately 75% under late summer conditions to 110% following winter rainfall. Overall, the results show that currents in the Espinheiro Channel are controlled not only by tidal forcing but also respond markedly to freshwater inputs.

Poster 16

How much carbon is buried beneath Portuguese ocean waters?

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Abstract

The increase in anthropogenic CO_2 emissions is utterly impacting Earth systems, particularly the ocean. Over the last decades, those apparent effects urged the scientific community to better quantify carbon cycle processes and identify effective mitigation strategies. In this context, the concept of Blue Carbon - defined by the IPCC as "all biologically driven carbon fluxes and storage in marine systems that are amenable to management" [1] - has gained prominence. While traditionally focused on vegetated coastal ecosystems such as salt marshes, mangroves, and seagrass beds, the concept is lately widening to include open-ocean environments, such as upwelling areas, and marine sediments.

Seafloor sediments represent the primary long-term marine organic carbon (OC) sink, storing carbon on centennial to Eon (10^6 years) timescales. Recent estimates suggest that up to 98% of marine OC in UK waters is held within the top 10 cm of seabed sediments, largely due to their extensive spatial coverage [2]. Globally, marine sediments are estimated to store over 2300 Pg C within the upper meter, with abyssal areas accounting for nearly 80% of all this OC stock [3]. However, sedimentary OC distribution is highly variable, reflecting regional differences in productivity, export efficiency, benthic activity, sediment characteristics and dynamics, highlighting the need for regionally resolved assessments.

Here, we present preliminary results of the first comprehensive assessment of OC accumulation rates and stocks in seafloor sediments along the margin and abyssal plains of continental Portugal. This study integrates datasets from multiple research projects and published records, covering environments from the abyssal domain to the continental shelf, including areas influenced by the seasonal upwelling system. Combining sedimentological and geochemical data, we evaluate the spatial variability of carbon storage and burial.

Beyond its scientific contribution, this work delivers essential knowledge to inform marine spatial planning, climate change mitigation strategies, and policy decisions aimed at preserving ocean carbon sinks and supporting sustainable ocean management.

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Poster 17

The Future of Atlantic Wave Climate in Europe: A High-Resolution Database Based on CMIP6 Projections

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Abstract

Accurate regional wave climate projections are essential for coastal adaptation, marine renewable energy planning, and the design of resilient maritime infrastructure. However, existing datasets remain constrained by the coarse resolution of global climate models and the limited availability of CMIP6-based regional wave projections. This study addresses these gaps by developing EAWAVES-CLIM, a high-resolution wave climate database for the entire European Atlantic coast, covering a historical baseline (1985–2014) and near-future conditions (2030–2059) under the SSP2-4.5 and SSP5-8.5 scenarios.

The dataset was produced through a multi-stage modeling framework combining the WRF atmospheric model, forced with CMIP6 wind fields derived from an ensemble of 18 global climate models for dynamical downscaling, followed by WAVEWATCH III at 0.5° resolution for North Atlantic basin wave simulation, and SWAN at 0.125° for nearshore propagation at high spatial resolution. The SWAN model explicitly resolves shallow-water processes, including refraction, diffraction, depth-induced breaking, and nonlinear triad and quadruplet interactions.

Model performance was evaluated with buoy observations from Spain, Portugal, and the United Kingdom, as well as ERA5 reanalysis. Significant wave height exhibited overlap percentages typically above 85–95%, showing strong agreement with observations. Validation against ERA5 further demonstrated high spatial agreement across the Atlantic domain.

The results comprise a dual-component database of (1) gridded integral wave parameters (Hs, Tp, Dir, Dp, spreading) at 0.125° resolution, and (2) two-dimensional directional wave spectra at 1,031 nearshore points spaced 10 km apart and located approximately 50 km from the coast. The spectral dataset enables direct initialization of new site-specific SWAN simulations without rerunning computationally expensive basin-wide models. All outputs follow CF 1.8 conventions, are provided in NetCDF 4 format, and are openly accessible through the CEDA repository, substantially lowering the computational barrier to studying climate-driven changes in coastal wave dynamics.

Poster 18

Projected changes in the seasonal timing of SST and surface chlorophyll-*a* maxima along the Portuguese margin

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Abstract

Climate change may alter not only the magnitude of surface ocean properties, but also their seasonal timing. This study explores projected changes in the seasonal timing of maximum sea surface temperature (SST) and surface chlorophyll-a (CHL-a) concentration along the Portuguese margin using daily outputs from the MPI-ESM1-2-HR Earth System Model. A historical period (1985–2014) was compared with a late-century future period (2070–2100) under the high-emission SSP5-8.5 scenario. For each year and grid cell, the annual maximum timing was defined as the central day of the 15-day moving window with the highest mean value. Historical and future mean timing were estimated using circular statistics, and timing consistency was assessed through circular concentration. Projected changes were quantified as future–historical circular timing shifts, expressed in days, and summarized for coastal waters within 100 km of the coastline and offshore waters beyond 100 km. During the historical period, SST maxima occurred mainly in late summer, reflecting seasonal heat accumulation. In contrast, CHL-a maxima occurred earlier, mainly between late winter and spring, and differed between coastal sectors, likely associated with regional variability in nutrient availability, mixing and coastal upwelling dynamics. SST timing was generally highly consistent, indicating that annual maxima occur at a similar time each year. CHL-a timing was less consistent, particularly along the western coast, suggesting stronger sensitivity to biological and coastal processes. Future changes in SST timing were generally modest, although localized delays were identified along parts of the northwestern Portuguese coast. CHL-a showed stronger and more spatially heterogeneous timing shifts, with earlier offshore maxima and delayed coastal maxima. The coastal/offshore comparison further indicated a wider range of projected timing changes for CHL-a than for SST. Overall, the results suggest that CHL-a has a stronger and more spatially heterogeneous phenological response than SST, highlighting the greater sensitivity of biological seasonality to future coastal-ocean changes along the Portuguese margin.

Poster 19

O afloramento costeiro na região do Cabo de São Vicente sob a lente de um perfilador autónomo

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Resumo

O afloramento costeiro na região do Cabo de São Vicente (CSV) constitui um dos processos dominantes da circulação e da dinâmica biogeoquímica da margem ocidental Ibérica [1]. Contudo, observações oceanográficas episódicas, discretas, limitam a caracterização da variabilidade temporal destes fenómenos. Neste contexto, o presente estudo avalia o potencial da aquisição contínua de dados por um perfilador vertical de alta resolução movido pela energia das ondas (DMO Wirewalker), fundeado a 10 milhas náuticas a sul do CSV, na estação IbMa-CSV, para a monitorização dos 150 m superficiais da coluna de água e dos processos oceanográficos associados, durante uma semana após o seu fundeamento, em outubro de 2025.

Os resultados evidenciam um sinal claro de afloramento, caracterizado pela advecção vertical de massas de água mais frias desde níveis profundos até à superfície. No pico do evento, observou-se um arrefecimento da coluna de água (~17 ºC), seguido pelo desenvolvimento de um máximo subsuperficial de clorofila-a entre os 10 e os 20 m, com concentrações até 3,5 mg m^{-3}. As amostras de nutrientes recolhidas complementarmente num perfil de CTD obtido em campanha do IPMA a bordo do NRP D. Carlos I, revelaram a presença de uma nutriclina bem definida, com aumento das concentrações abaixo da camada de mistura e valores máximos aos 150 m. As baixas concentrações de nutrientes na camada superficial (0–30 m) corroboram o consumo fitoplanctónico, refletido no máximo de clorofila observado. Esta assinatura biogeoquímica, típica de eventos de afloramento na região [2,3], refletiu-se-também por valores de supersaturação de oxigénio (>100%) na camada superficial. No período subsequente, registou-se aquecimento superficial (~19 ºC), início da estratificação térmica e um gradiente vertical de oxigénio menos pronunciado, indicando uma diminuição da produção primária.

A comparação com perfis sinóticos de CTD adquiridos in situ durante a campanha do IPMA, revelou forte correlação (r > 0,90) para temperatura e salinidade. A integração destes resultados demonstra o elevado valor da observação autónoma e contínua na captura de dinâmicas transientes e no estudo do acoplamento físico-químico-biológico em zonas de

elevada produtividade primária, associadas a fenómenos recorrentes de afloramento costeiros na margem sul da Península Ibérica.

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Poster 20

Sea Surface Temperature Variability During the Mid-Piacenzian Warm Period: Implications for Mediterranean Hydroclimate

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Resumo

Sea surface temperature (SST) exerts a fundamental control on the hydrological cycle by regulating air–sea interactions, atmospheric circulation, and moisture transport, thereby shaping the frequency and intensity of hydroclimate extremes. Understanding how SSTs responded during past warm climate states is essential to place current and future climate change into a long-term perspective and to reduce uncertainties in climate projections. The mid-Piacenzian warm period (mPWP; 3.3–3.0 Ma) represents the most recent interval of sustained global warmth with atmospheric CO_2 concentrations and global temperatures comparable to those expected in the coming decades, making it a key natural analogue for ongoing anthropogenic warming. The HotClim project aims to reconstruct SST variability during the mPWP and to explore its role in driving regional hydroclimate dynamics in a region highly vulnerable to climate-related risks such as droughts, wildfires, and precipitation extremes. HotClim is based on a multiproxy study of deep-sea sediments from IODP Site U1385 (Iberian Margin), recovered during IODP Expedition 397, with a primary focus on marine biomarker-derived SST reconstructions. These SST records are directly compared with terrestrial indicators of environmental change, including pollen and microcharcoal, analysed on the same samples, allowing an internally consistent land–sea assessment without chronological ambiguity. By targeting key mPWP intervals, including the transition from the cold MIS M2 into peak warmth and the KM5c interglacial, the project will quantify the magnitude, variability, and pacing of SST changes and evaluate their coupling with hydroclimate variability over the Mediterranean. The resulting high-resolution SST reconstructions will provide a robust benchmark for evaluating climate model performance under warmer-than-present conditions and will contribute to a better understanding of the mechanisms linking ocean surface conditions to hydroclimate

variability. By focusing on how SST responded to sustained global warmth, HotClim will contribute to a better understanding of the processes shaping hydroclimate variability and associated risks in a warming world, offering valuable insights for future climate projections and adaptation strategies.

Poster 21

WHISTLE: AUV Observations Supporting an Integrated Transboundary Coastal Forecast Service

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Abstract

Operational coastal models often face limitations in spatial and temporal resolution and in representing riverine and nearshore processes, particularly in transboundary settings. The WHISTLE project addresses these challenges by fostering cross-border collaboration between Portugal and Galicia and by integrating Copernicus Marine Service data with local monitoring systems through a service platform to deliver more comprehensive and accurate assessments of environmental conditions. The project targets areas affected by freshwater inputs and supports two use cases: improving response to accidental marine pollution in Galicia and supporting water-quality management in Portugal, including the Parque Natural do Litoral Norte. In both cases, improved model applications are to be validated through dedicated monitoring campaigns.

Here, we describe a WHISTLE monitoring mission conducted off the coast of Porto to collect in situ observations relevant to model assessment. The campaign deployed two autonomous underwater vehicles (AUVs) equipped with CTD sensors for measuring salinity, temperature, and depth. Monitoring covered the coastal region influenced by the Douro, Ave, and Cávado rivers. After deployment, the vehicles were supervised remotely from shore. They followed the same route with a 4–6-hour separation, enabling detection of short-period variability in temperature and other relevant environmental parameters.

To maximize reuse and operational uptake, the collected observations are being consolidated and processed into self-describing netCDF products to support open dissemination and interoperability. In particular, these products are being prepared for publication through EMODnet and for visualization and access through AtlanticSENSE, a geospatial platform designed for environmental monitoring and climate-resilience applications.

By linking targeted AUV-based monitoring with WHISTLE's cross-border service vision, integrating Copernicus Marine products with local observations, this approach supports improved coastal environmental assessment and decision support for water-quality management and maritime emergency response.

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Poster 22

Speed-Aware Path Planning for Wave-Propelled USVs

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Abstract

Wave-propelled unmanned surface vehicles (USVs) are increasingly used for sustained ocean observation, enabling persistent data collection while reducing operational costs and manpower. Within the JUNO – Robotic Exploration of Atlantic Waters project, we report results from a wave-propelled autonomous surface vehicle deployment conducted off the Portuguese coast. Wave-propelled platforms are particularly compelling because they convert wave-induced motion—when available, complemented by wind and solar inputs—into forward thrust, enabling extended deployments with limited maintenance when compared to motor-propelled USVs that are constrained by onboard energy storage.

This strong dependence on environmental forcing also motivates quantitative analyses of the conditions that maximise vehicle speed. Here, we analyse navigation and metocean data from an approximately 10-day deployment and derive a quadratic regression model that predicts vehicle speed as a function of significant wave height under the wind and current conditions observed during the trial. This lightweight mapping provides a practical way to translate wave conditions into expected platform progress, supporting feasibility assessments for long-duration missions with low-speed platforms.

To further support operational planning, we couple wave-conditioned speed estimation with a path-planning framework for wave-powered USVs operating in time-varying ocean flows. The method takes as input global ocean current forecasts from the Copernicus Marine Service (CMS) over a defined spatial and temporal domain to compute a value function, from which optimal trajectories to a given destination can be readily extracted. Using CMS 10-day forecasts, we compute value functions on a grid of ~20 million points in about 15 minutes on a standard PC, enabling repeated replanning in a moving-horizon scheme as forecasts update.

By integrating wave-based speed prediction with forecast-informed routing, this work provides a practical workflow for planning long-duration USV missions in realistic ocean conditions, where currents, waves, and winds can strongly modulate progress.

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Poster 23

A plataforma SOMOSATLÂNTICO como ferramenta estratégica para a Monitorização e Sustentabilidade do Oceano Atlântico

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Resumo

A complexidade dos desafios oceânicos contemporâneos, desde as alterações climáticas até à exploração sustentável dos recursos, exige uma infraestrutura de dados interoperável e acessível. No âmbito da observação oceânica, o Instituto Português do Mar e da Atmosfera (IPMA, I.P.) assume um papel central, como guardião de um vasto repositório de dados do meio marinho. A manutenção de uma observação sistemática, regular e de longo prazo constitui um alicerce indispensável para a monitorização sendo a única via para a identificação precisa de "padrões e tendências em diversas escalas espaço-temporais."[1]

A plataforma SOMOSATLANTICO foi concebida com o objetivo de concentração e difusão de dados oceanográficos do IPMA e de parceiros da bacia Atlântica, numa interface única e intuitiva. Paralelamente, a SOMOSATLANTICO ambiciona a abrangência de outras áreas do saber, potenciando sinergias transversais na investigação. Ao democratizar o acesso à informação e promover a literacia do oceano, a plataforma assume um papel estratégico na gestão do capital natural marinho. Esta versatilidade materializa-se em diversas frentes de atuação tais como, mas não só, a transição energética no âmbito do apoio direto ao projeto PRR Eólicas, demonstrando a eficácia da plataforma na operacionalização de projectos, na gestão e conservação como ferramenta essencial no Ordenamento do Espaço Marítimo, implementação da Diretiva Quadro da Estratégia Marinha (DQEM), monitorização de Áreas Marinhas Protegidas (AMPs), na Ciência Participativa através da promoção de iniciativas de ciência-cidadã, aproximando a comunidade científica da sociedade civil, no apoio à decisão como suporte técnico especializado para mecanismos de observação da Conta dos Oceanos, permitindo uma gestão económica e ambiental fundamentada em dados científicos.

Os resultados sugerem que a centralização da informação não só potencia a investigação científica inovadora, como também robustece os sistemas de aviso prévio. Em suma, a plataforma configura-se como um instrumento importante para a literacia oceânica, alinhando se com as metas de sustentabilidade para 2030 promovidas pela Década do Oceano da ONU (2021-2030).

Referências:
https://somosatlantico.ipma.pt/ (acedido em 04/2026)

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Poster 24

Shedding light on the enigmatic neustonic zooplankton of the Madeira Tore seamounts through integrative taxonomy

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Abstract

Seamounts are biodiversity hotspots and areas of enhanced productivity due to the interaction of physical processes and topographic features. In the northeastern Atlantic, the Madeira-Tore seamount complex harbors distinct local communities, vulnerable to impacts such as bottom trawl fisheries and potential seabed mining. The region is being evaluated by the Portuguese government for designation as a Marine Protected Area, in line with the EU Biodiversity Strategy for 2030. This context highlights the growing need to improve our understanding of the local biodiversity and the influence of ocean circulation on the biological communities. Zooplankton is a critical part of the marine food web and, for the region, the present knowledge on these communities is limited and based on data from sporadic cruises [1,2]. Zooplankton inhabiting the neuston layer, the ocean-atmosphere interface, are subjected to harsh conditions and their biodiversity remains poorly understood. To address these knowledge gaps, integrative taxonomic approaches, combining morphological observations with DNA barcoding, were applied to zooplankton specimens collected in the neuston layer during a 2022 oceanographic survey in the region. Molecular techniques are crucial tools in overcoming the limitations of classical taxonomy, especially for less known communities, elucidating species identification and genetic relationships [3]. This work focused on obtaining detailed morphological descriptions for selected specimens of Polychaeta, fish and decapod larvae, and Amphipoda, generating DNA barcode sequences for inclusion in global reference databases, clarifying historical taxonomic records, and documenting biodiversity within a poorly explored zooplankton community. The main goals were to verify whether integrative taxonomy can reveal overlooked or misidentified species in offshore communities, and ultimately advance our understanding of offshore species in the dynamic and understudied ocean–atmosphere interface. The work will support broader biodiversity assessments and inform conservation planning efforts.

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