LIVRO DE RESUMOS

PATROCÍNIOS:

IPMA Instituto Português do Mar e da Atmosfera · Marinha Aquário Vasco da Gama · emso PORTUGAL · Politécnico de Leiria · Marinha Grande · Companhia Agrícola dos Gombarrais · Mário Ruivo · Filarmónica de Monte Redondo · cristal HOTEIS

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APOCEAN

Constituída em 2013 por reformulação da antiga Associação Portuguesa de Paleoceanografia, a **Associação Portuguesa de Oceanografia** (APOCEAN) é uma sociedade científica cujos principais objetivos são:

• O intercâmbio científico através de encontros e workshops;
• Diagnosticar e encontrar soluções para os problemas comuns a quem investiga o oceano;
• Promover a interdisciplinaridade juntando cientistas de várias áreas;
• Apoiar a internacionalização da oceanografia portuguesa, interagindo com associações similares de outros países e com organismos internacionais;
• Apoiar a divulgação para o público da investigação praticada em Portugal;
• Contribuir para uma melhor formação em oceanografia junto das Universidades;
• Divulgar a importância social e económica do estudo dos oceanos;
• Promover uma visão atual, integrada e cientificamente fundamentada da oceanografia;
• Participar na definição de políticas de investigação dos oceanos;
• Contribuir para a representação portuguesa em organismos internacionais de investigação e exploração dos oceanos.

A associação está representada em instituições, Laboratórios e Unidades de Investigação com atividade no domínio da Oceanografia ou em campos de investigação ligados ao oceano.

Este ano a APOCEAN promove o Encontro Nacional de Oceanografia, nos dias **6 e 7 de Junho** em **Vieira de Leiria**.

Esperamos por si!

APOCEAN
encontrooceanografia@gmail.com

PROGRAMA

6 de Junho

9:30 - 11h Receção e registo

11 - 11:10h Sessão de abertura

11:10 - 11:50h **PALESTRA CONVIDADA**

André Oliveira, CoLAB +Atlantic
+ATLANTIC: uma abordagem multidisciplinar ao desenvolvimento de Digital Twins como ferramentas de ciência e suporte à decisão

11:50 - 12:02h **Ana Machado**, S. Plecha, Á. Peliz, S. Garrido
Modeling sardine larvae dispersion and survival on the Iberian Current System

12:02 - 12:14h **Sandra Plecha**, A.M. Teles-Machado, Á. Peliz
Temperature and Salt extremes in the Iberian Basin

12:14 - 12:26h **Teresa Rosa**, Á. Peliz, A. M. Piecho-Santos, A. Teles-Machado, S. Plecha
Seasonal ocean variability within the NW Portuguese shelf

12:26 - 12:38h **Erwan Garel**, L. de Oliveira Júnior, D. Abecasis
The association between Meagre ("Corvina") migration direction and subtidal currents along the south Portugal coast

12:38 - 12:50h **Jaime Y. Suarez-Ibarra**, T.M. Freire, F. Scheiner, K.B. Costa, K. Holcová, F.A.L. Toledo, M.F.G. Weinkauf, M.A.G. Pivel
Late Quaternary south Brazilian continental margin: a possible analog for future anthropogenic climate projections?

12:50 - 13:02h **Tanya Silveira**, M. Carapuço, M. Miranda
We are Atlantic: IPMA's platform for the ocean

Até 14:30h ALMOÇO

14:30 - 14:45h **PALESTRA HIGHLIGHT**

Renato Mendes, CoLAB +Atlantic
JUNO - Robotic exploration of Atlantic waters

14:45 - 14:57h **Luisa Lamas,** I. Martins, J. Vitorino, C. Barrera
Ocean dynamics characterization in the East Central North Atlantic from a sustained multiplatform observing-system approach

14:57 - 15:09h **Mafalda Carapuço**, T. Silveira, Z. Stroynowski, C. Sousa, M. Miranda
Fostering ocean observation in Portugal: the EMSO-PT Initiative

15:09 - 15:21h **Rita F.T. Pires**, Á. Peliz, A. dos Santos
A biophysical exercise on the transport of decapod larvae through the Strait of Gibraltar

15:21 - 15:33h **Susana M. Silva**, Á. Peliz
Vertical structure of Mesoscale Turbulence in the Azores Current System

15:33 - 15:45h **Pedro Nunes**, P.B. Oliveira, R. Nolasco, J. Dubert
Evidências da separação do afloramento na costa NW de Portugal

15:45 - 15:57h **Amélie Simon**, S.M. Plecha, A. Russo, A. Teles-Machado, M.G. Donat, P.-A. Auger, R.M. Trigo
Hot and Cold Marine Extreme Events in the Mediterranean over the last four decades

15:57 - 16:27h ***PITCH* (2 min)***

1. **Dulce Oliveira et al.** Indian monsoon and vegetation dynamics: lessons from two contrasting glacial-interglacial cycles of the Middle Pleistocene
2. **Dulce Oliveira et al.** Unraveling hydroclimate variations during MIS 11 in the Indian core monsoon zone
3. **Giulia Molina et al.** Morphometry of Calcidiscus leptoporus yield insights into palaeoecological preferences in the southwestern Atlantic during the last 135 kyr

4. **Mafalda Freitas et al.** Natural Mineral Carbonation: Insights from Serpentinite Mud Volcanism
5. **Lelia Matos et al.** Testing cold-water coral chromium isotopes as a new paleoredox proxy
6. **Adélia Camarinha et al.** Estudo da variação espacial da turbidez no Estuário do Tejo com imagens Sentinel-2
7. **João Alves et al.** Avaliação do recurso de energia da maré no Estuário do Tejo
8. **Ana F. Ribeiro et al.** Circulação e processos de transporte durante um evento extremo de descarga fluvial no Estuário do Tejo
9. **João M. Dias et al.** Modelação hidrodinâmica operacional no contexto do combate à poluição marinha
10. **Ana Picado et al.** Impacto da poluição emitida pelo transporte marítimo: o caso de estudo da Ria de Aveiro
11. **Tiago Martinho et al.** Variabilidade oceanográfica na costa portuguesa: implicações na abundância em algumas espécies de pescado
12. **Margarida S. Lopes et al.** Relation between Arte Xávega and Environmental Factors: Espinho's study case
13. **Pedro Martins et al.** Estudo sobre a cobertura espacial e temporal da rede Argo no Atlântico Nordeste
14. **Jorge M. Magalhães et al.** Interactions and variability in Internal Waves off Cabo Mondego (Portugal)
15. **Adriana M. Santos-Ferreira et al.** The generation of Internal Solitary Waves by buoyant gravity currents released from Tropical Instability Waves in the Pacific Ocean: satellite observations and modelling

16:27 - 16:47h *COFFEE BREAK*

Até 17:32h **SESSÃO DE POSTERS ***

17:32 - 17:44h **Anabela Oliveira**, J. Rogeiro, M. Rodrigues, A.B. Fortunato, M. Rocha, Jesus, A. Azevedo
OPENCoastS+: an EOSC-powered service for on-demand prediction of coastal water quality

17:44 - 17:56h **Beatriz Biguino**, C. Antunes, H. Pereira, A. Picado, J.M. Dias, C. Borges, C. Palma, I. Haigh, A.C. Brito
Trend assessment of water temperature in the Sado Estuary (Portugal) and its adjacent coastal ocean

17:56 - 18:08h **Marlene Pinheiro**, A. Oliveira, S. Barros, N. Alves, J. Raimundo, M. Caetano, J. Coimbra, T. Neuparth, M.M. Santos
Suspended sediments affect the model species *Mytilus galloprovincialis* at the molecular, biochemical, and functional level under hyperbaric conditions

18:08 - 18:20h **Alexandra Cravo**, A. Rosa, J. Jacob, C. Correia
Dissolved oxygen dynamics in Ria Formosa Lagoon (South Portugal) - A real time monitoring station observatory

18:20 - 18:32h A. Freitas, **Mariana Bernardino**, C. Guedes Soares
Influência da Oscilação do Ártico no clima de ondas no Atlântico Norte até ao fim do séc. XXI

18:32 - 18:44h **Susana Barbosa**, C. Almeida, N. Dias, G. Silva, E. Silva
Observations of the marine boundary layer in the North Atlantic from measurements onboard the NRP Sagres sail ship

18:44 - 18:56h **Francisco Silveira**, C.L. Lopes, J.P. Pinheiro, H. Pereira, J.M. Dias
Influence of Rising Sea Levels on a Mesotidal Lagoon: Ecological and Socioeconomic Impacts under Present and Future Scenarios

19 - 20h *Free time*

20h JANTAR SOCIAL

7 de Junho

9 - 9:12h **Alexandra Rosa**, C. Cardoso, R. Vieira, R. Faria, A.R. Oliveira, G. Navarro, R.M.A. Caldeira
Impact of flash flood events on the coastal waters around Madeira Island: the 'Land Mass Effect'

9:12 - 9:24h **Cátia Correia**, A. Sierra, T. Ortega, J. Forja, J. Jacob, A. Cravo
Ria Formosa: Fonte ou sumidouro de gases de estufa?

9:24 - 9:36h **Álvaro Peliz**, S. Plecha, R. Sanchez
Transient upper slope flows on the Gulf of Cadiz: a case study of November 2012

9:36 - 9:48h **Luciano de Oliveira Júnior**, P. Relvas, E. Garel
The surface water circulation at the northern margin of the Gulf of Cadiz

9:48 - 10:28h **PALESTRA CONVIDADA**

Jerry F. McManus, Columbia University
Reconstructing past changes in Earth's climate and deep-ocean circulation from deep-sea sediments

10:28 - 10:40h **PRÉMIO APOCEAN**

10:40 - 11h *COFFEE BREAK* + FOTO DE GRUPO

11 - 13h **ASSEMBLEIA APOCEAN**

13 - 14:30h ALMOÇO

14:30 - 14:45h **PALESTRA HIGHLIGHT**

Andreia Rebotim, IPMA/CCMAR
"Once Upon a Time… a scientific fairy tale": Using fictional stories to educate about earth, climate and ocean sciences

14:45 - 14:57h **Ana Lopes**, M. Alonso-García, E. Salgueiro, C.N. Rodriguez-Díaz, L. Alonso-Azibeiro, H. Kuhnert, T. Rodrigues, M. Padilha, W. Soares, A.H.L. Voelker, F. Abrantes
Early Pleistocene bottom water conditions at the SW Iberian margin

14:57 - 15:09h **Clara Ribeiro**, A. Ribeiro, J.M. Dias
Avaliação do Potencial da Energia das Ondas na Costa Noroeste da Península Ibérica

15:09 - 16:20h ***PITCH* (2 min) + SESSÃO DE POSTERS**

16. **Aline Mega et al.** Sea surface temperature and productivity variability reconstruction at the Portuguese margin during the Holocene
17. **Marta Salvado et al.** Variações Oceanográficas ao largo da Margem Ocidental Portuguesa durante o Último Milénio
18. **Andreia Rebotim et al.** ExploRarE: Exploring the potential of REEs as productivity indicators in planktonic foraminifera along western Iberian Margin
19. **Emília Salgueiro et al.** Rare earth elements/Ca ratios of planktonic foraminifera, a potential proxy for water column nutrients? The NW Iberia case study
20. **Teresa Rodrigues et al.** "Shackleton site" unveils persistent millennial climate variability through the Pleistocene in the Iberian Margin
21. **Alexandra Cravo et al.** Importância das condições hidrodinâmicas no estado trófico da Ria Formosa
22. **Francisco Pereira et al.** Impact of Morphologic Changes on the Ria de Aveiro Lagoon Hydrodynamic and Salinity Patterns: A Modelling Study
23. **Bruna Faria et al.** Sea outfall turbid plume monitoring offshore Aveiro – a preliminary high-spatial-resolution satellite imagery study

24. **Afonso Sá et al.** Ripples: Increasing human supervision over operational assets for a persistent and efficient ocean observation
25. **Francisco Silva et al.** Distribution of Internal Waves in the Northeast Atlantic: An Ocean Color Remote Sensing Analysis
26. **Spallou Ferreira et al.** Upwelling tendencies along West and South Portuguese Coasts
27. **Lívia Cordeiro et al.** Impact of climate warming in the coastal upwelling system and primary production off Portugal: a study linking classical and emergent proxies – ICW3P
28. **Humberto Pereira et al.** 3D modelling of salt intrusion and estuarine plumes under climate change scenarios in two estuaries (NW of Portugal)
29. **Magda C. Sousa et al.** The fate of microplastics released by wastewater treatment plants in Ria de Vigo (NW Iberian Peninsula)

16:15 - 16:30h *COFFEE BREAK*

16:30 - 16:40h **INFORMAÇÃO HIGHLIGHT**

Fátima Abrantes, IPMA/CCMAR
Portugal no SCOR

16:40 - 16:52h **Vitor Magalhães**, P. Terrinha, C. Ribeiro, M. Mil-Homens, M. Caetano, S. Silva, A. Rodrigues, E. Salgueiro, F. Abrantes, TAGUSGAS Cruise scientific party
Mineralogical, geochemical and magnetic signatures of shallow gas in the Tagus pro-delta, preliminary results

16:52 - 17:04h **A. Miguel Piecho-Santos**
O Programa Argo: uma perspectiva geral

17:04 - 17:16h **Teresa Carmo-Costa**, R. Bilbao, P. Ortega, A. Teles-Machado, E. Dutra
Trends, variability and predictive skill of the ocean heat content in North Atlantic: an analysis with the EC-Earth3 model

17:16 - 17:28h **Daniela Silva**, R. Menezes, A. Moreno, A. Teles-Machado, S. Garrido
Spatio-temporal variability of the distribution and abundance of sardine off the Portuguese continental coast and relationship with environmental drivers

17:28 - 17:40h **Carlos Sousa**, P. Relvas
Oceanografia operacional – instalação e recuperação de uma infraestrutura de observação oceanográfica da coluna de água

17:40 - 17:52h **Paulo B. Oliveira**, T. Ramos, P. Amorim, M.M. Angélico, P. Nunes, R. Oliveira, M.T. Lamas
TUGA ao serviço da Oceanografia

17:52 - 18h Sessão de encerramento

CONVIDADOS

André Oliveira

Chief Technology Officer,
CoLAB +Atlantic, CEiiA

André Oliveira has a degree in Aerospace Engineering from IST in Portugal, a postgraduate certificate on Space Systems analysis and design from the International Space University (ISU) and a postgraduate certificate on business leadership from IMD in Lausanne. After 2,5 years at ESA-ESTEC working on smart structures and multi-body dynamics, André spent 14 years at the TEKEVER group where he was responsible for all R&D activities in the domains of Aerospace, Defence and Security with a focus on small satellites, drones, remote sensing and soldier systems. During this period, the team under his direct management won and successfully completed over 60 R&D contracts (with 19.5M€ of direct funding) and André directly managed and coordinated 14 international projects. He's been subject matter expert at EUROCAE, RTCA and NATO since 2011 on multi-domain unmanned systems and soldier energy systems. André also supports the EC as expert evaluator for the Space theme and EDIDP and is an active member of the Commission's expert group on Policies & Programmes relevant to EU Space, Defence and Aeronautics Industry. Since 2019, André splits his time between the +ATLANTIC Collaborative Laboratory, where he is currently Chief Technology Officer with a specific emphasis on Space technologies, and CEiiA where he is business development manager for Space.

Jerry F. McManus

Professor, Columbia University,
Lamont-Doherty Earth Observatory,
Department of Earth & Environmental Sciences

Jerry McManus grew up in New York City and received a B.A, M.A., M. Phil., and Ph.D. (1997) in Earth Science from Columbia University. In the almost 25 years since he received his Ph.D., Jerry has led a global effort to understand the impact of past climate change on the world's oceans. Of exceptional quality and quantity, Jerry's research has had an enormous influence on the field of paleoceanography and his insights into the mechanisms of natural climate variability are of great relevance to the understanding of human-induced global warming.
His research as a paleoceanographer primarily uses deep-sea sediments and is focused on reconstructing natural variability in the Earth's climate and the large-scale ocean circulation, with a special focus on the role that the ocean plays in abrupt climate change. Jerry has spent nearly a year of his life at sea and is involved in research projects assessing climatic and oceanographic variability recorded in sediments from far-flung locales in every ocean basin, including the North Atlantic and Iberian margin. Jerry also has an impressive record of scientific collaboration and international leadership as well as mentorship, teaching, and student training. After ten years at Woods Hole Oceanographic Institution, he returned to Columbia University in 2008.

HIGHLIGHT

Renato Mendes

CoLAB +Atlantic / FEUP

Renato Mendes - PhD in Physics (Oceanography) and Masters in Meteorology & Physical Oceanography from the University of Aveiro. He is interested on coastal oceanography, using multi-platform data, such as observations, remote sensing, and numerical models. Recently, he has addressed the use of networked autonomous systems to survey coastal fronts in a coordinated and collaborative manner. He co-authored over 20 articles and holds a project management professional certification from the Project Management Institute (PMI). Since 2021, he is a researcher at CoLab +ATLANTIC with an alignment with the LSTS lab at FEUP, working as a facilitator in interdisciplinary teams and combining his background in oceanography with ocean robotics, exploring innovative methodologies for ocean observation. He received the FLAD Science Award Atlantic 2021.

Andreia Rebotim

Andreia Rebotim graduated in Marine Biology and Biotechnology at the Polytechnic Institute of Leiria (Portugal) in 2006, completed a Master Degree in Ocean Sciences at Oporto University (Portugal) in 2009 and finished her PhD in Natural Sciences at the Bremen University (Germany) in 2018. Her research interests focus on the ecology and geochemistry of living planktonic foraminifera, organisms commonly used as indicators of past ocean conditions. Given her belief in the need of outreach activities in particular to the younger generations, she has been collaborating in the international project Once Upon a Time, a project meant to educate about earth, climate and ocean sciences.

IPMA / CCMAR

Fátima Abrantes

IPMA / CCMAR

PhD in Geological Oceanography - Paleoceanography from the Graduate School of Oceanography - University of Rhode-Island. Works on the oceanographic and climatic conditions controlling ocean productivity, mainly in coastal upwelling areas. Authored 110 ISI scientific papers and co-edited the books Reconstructing Ocean History: A Window into the Future and The Climate of the Mediterranean Region. Initiated paleoceanography/paleoclimatology research in Portugal, launching new research areas. PI in 6 national projects and responsible for the Portuguese participation in 8 European projects. Director for the Marine Geology Department (1999 - 2011), member of the scientific and/or executive committees of International programmes and national representative in the ESF-LESC core & standing committees.

RESUMOS

Palestras Highlight

H1. JUNO - Robotic exploration of Atlantic waters

Mendes R[1,2], Loureiro N[1], Figueiredo L [1], Santos R[2], Dias P[2], Ferreira S[1,2], de Sousa JB[2]

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[2] *Laboratório de Sistemas e Tecnologias Subaquáticas (LSTS), Faculdade de Engenharia da Universidade do Porto, Porto, Portugal*

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JUNO is built around one ambitious idea: complete a solo oceanic crossing from mainland Portugal to the Azores using an autonomous surface vehicle (ASV) with remote, shore-based control and supervision. This technological challenge is primarily driven by the scientific need for more sustainable methodologies to observe the ocean with high spatial and temporal resolutions.

The JUNO ASV platform (Caravel) will be based on a green-energy wave-powered ASV equipped with several sensors at the surface. The datasets collected by Caravel will have high spatial and temporal resolutions to support substantial contributions regarding the characterization of sub-mesoscale features (<10 km) off the Portuguese shelf. In a large-scale journey, the JUNO project will enable synoptic observations of transient features, especially regarding upwelling fronts, eddies, and internal waves in the Atlantic waters. The new scientific knowledge will allow us to reveal and characterize those phenomena at the sub-mesoscale in tandem with other data sources.

Along its journey, the Caravel will be remotely supervised from an Ocean Space Center (OSC) control room located in Porto. The OSC will enable remote supervision, data ingestion, and planning by integrating ocean models and remote sensing data products. The OSC will deploy new software to endow the JUNO system with adaptive risk-minimizing sampling capabilities. The software will implement risk models and trajectory optimization algorithms for the appropriate time and spatial scales.

This endeavour will advance the systematic use of autonomous robots in marine sciences in Portugal. Thus, the project's primary goal is to develop and deploy a robotic platform for long-endurance observation. The new datasets will lay the work practice foundations for future autonomous platforms in Atlantic waters targeting interdisciplinary studies and developing new methods using multiple data sources and interconnected knowledge.

H2. "Once Upon a Time… a scientific fairy tale": Using fictional stories to educate about earth, climate and ocean sciences

Rebotim A[1,2], Oliveira D[1,2], Mega A[1,2], Borges R[4], Portilho-Ramos RC[5], Cavaleiro C[1], Mesquita I[6], Matos L[1,2], Santos C[1]

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[4] *Marum – Centre for Marine Environmental Sciences, University of Bremen, Leobener strasse 8, 28359 Bremen, Germany*
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Sharing scientific knowledge with the general public is challenging, even more when the main objective is to bring awareness about environmental aspects. Storytelling is one of the oldest ways of sharing and transmitting knowledge and values, being a central part of every society and taking place in every culture. Using storytelling as a form of dialogue between scientists and the general public is a powerful tool for society change as it provides a unique opportunity of raising consciousness and inspiring actions. 'Once Upon A Time…' is a project created by an international group of marine science PhD students and postdoctoral researchers with the aim of communicating science and promoting the dialogue between scientists and the general public via storytelling. In 2017, the first 'Once Upon a Time…' volume was published with funding from the competition 'Show your Science' (sponsored by the German science communication foundation Science in Dialogue). The 12 stories and poems in this volume address various marine science themes from marine biology, ecology, and geology to human interactions with the oceans. The volume was published as an illustrated and free e-book in German, English and Spanish. Later, it was translated to Chinese, Filipino, French, Portuguese and many more languages. In 2020, a second volume containing 11 narratives and poems was released in German, Spanish and English and is now being translated to other languages, namely Portuguese. Our Portuguese version is special! The Brazilian and Portuguese teams got together and the stories were translated in both variants of Portuguese, to mark and recognize the linguistic and cultural diversity of the Portuguese language. Reaching out to a wider audience and raising interest in our project is the next step after a book is out. However, this has been one of our biggest challenges since this is a volunteer-based project and we are used to communicating as scientists. Other future plans include the creation of audiobooks, getting the reaction on how the mixed Portuguese version is working and some feedback on the pedagogic content of the e-books. Give it a try and discover the scientific fairy tales!

Orais

O1. Modeling sardine larvae dispersion and survival on the Iberian Current System

Ana Machado[1,2], Sandra Plecha[2,3], Álvaro Peliz[2,3], Susana Garrido [1,4]

[1] *IPMA, Lisboa, Portugal*
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Management of small pelagic fish such as sardine and anchovy is confounded by the high interannual variability of recruitment (progeny derived from a spawning population surviving to adulthood) strength. It is thought that environmental conditions experienced by the early life stages (eggs and larvae) are responsible for such variability.
A set of different models were used to simulate the ocean conditions and the transport and survival of sardine early life stages in the Iberian Current System. They consist of a high-resolution simulation with the hydrodynamic model ROMS whose outputs are used as background for lagrangian simulations performed with the model Parcels coupled to an Individual Based Model of sardine eggs and larvae.
A high-resolution simulation of the Iberian Current System (IBv2.0) was prepared using the ocean model ROMS. It has a resolution of ~1.8km and 60 vertical levels, with enhanced resolution near the surface. This simulation uses a larger domain and an embedded child domain, along the larger domain open boundaries it was applied an adaptive nudging towards monthly averages of the Mercator-Ocean reanalysis GLORYS12V1. The atmospheric forcing was created using ERA5 ECMWF reanalysis.
An IBM for sardine eggs and larvae was developed based on previously published vital rates of the species in relation to key oceanographic factors, it was coupled to the Lagrangian model Parcels to compute dispersion patterns for particles deployed from the known spawning grounds.
The IBM simulates the different early life stages of sardine (egg, yolk-sac larvae, first feeding larvae), and considers the effects of temperature and food availability on growth, survival, and development throughout ontogeny. Different years, characterized by similar sardine spawning biomass and contrasting recruitment strength were simulated to identify the impact of the environmental variables on egg and larvae survival and recruitment variability.
The identification of key oceanographic processes responsible for recruitment success would enable an improved management of the species.

O2. Temperature and Salt extremes in the Iberian Basin

Plecha SM,[1,2] Teles-Machado AM,[1,3] Peliz A[1,2]

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All around the world increases in the frequency of ocean temperature and salt extremes have been observed, with severe impacts on marine ecosystems structure and on ocean circulation (Smale et al., 2019; Cheng et al., 2020).
Within this work, the occurrence of heat and salt extreme events in the Iberian Basin are identified and analyzed, based on a novel high resolution numerical simulation, for the period 2002-2018. The Regional Ocean Modeling System (ROMS) configuration consists in two nested grids, with ~1.8 km spatial resolution for the smaller domain, initial and boundary conditions from GLORYS12V1 and atmospheric forcing from ERA5 reanalysis.
Over the last decades it is observed an increase in the extreme events occurrence, both in ocean temperature and salinity. These strong anomalies in the ocean properties were identified (e.g. 2010 and 2014 years) and the atmosphere-ocean interface fluxes were inspected in order to identify the co-occurrence of events.

References:

1. Smale, D. A., Wernberg, T., Oliver, E. C., Thomsen, M., Harvey, B. P., Straub, S. C., ... & Moore, P. J. (2019). Marine heatwaves threaten global biodiversity and the provision of ecosystem services. Nature Climate Change, 9(4), 306-312.
2. Cheng, L., Trenberth, K. E., Gruber, N., Abraham, J. P., Fasullo, J. T., Li, G., Mann, M. E., Zhao, X., & Zhu, J. (2020). Improved Estimates of Changes in Upper Ocean Salinity and the Hydrological Cycle, Journal of Climate, 33(23), 10357-10381. Retrieved Apr 22, 2022, from https://journals.ametsoc.org/view/journals/clim/33/23/jcliD200366.xml

O3. Seasonal ocean variability within the NW Portuguese shelf

Rosa TL*[1], Peliz A[2], Piecho-Santos AM[1], Teles-Machado A[3], Plecha S[2]

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The NW Iberia margin, within the northern limit of the Canary Current Upwelling System, is characterized by complex interactions between ocean and atmosphere processes, responsible for the variable seasonal, slope and shelf ocean circulation. Many studies in the area describe and explain some of the main characteristics of this circulation (e.g., Peliz et al. (2005); Nolasco et al. (2013); Teles-Machado et al. (2016)), but the transition mechanisms during upwelling and coastal convergence seasons, are not yet fully understood. This study contains a description of the monthly seasonal evolution, and interannual variability of the dynamics over the NW Portuguese shelf, supported by the results of a realistic 17-year simulation (between 2002 and 2018), obtained by the numerical model ROMS. ROM'S outputs were compared with satellite, as well as with available in situ data, for some selected periods. Monthly evolution of the temperature, salinity and density fields is described, along with the mixed layer characteristics and the currents over the shelf and upper slope. The seasonal evolution of the main oceanographic features present in the system was characterized: the Iberian Poleward Current; the surface upwelling jet and; the Western Iberia Buoyant Plume. The study intends to better understand the role of these structures in the development of inshore and offshore fronts as well as in coastal inner shelf counter poleward flows. At the end of the study, it is expected the presentation of a conceptual scheme of the circulation on the continental shelf.

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O4. The association between Meagre ("Corvina") migration direction and subtidal currents along the south Portugal coast

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The meagre *Argyrosomus regius* ("Corvina", in Portuguese) is a large benthopelagic fish with high economic value, found in the Northeastern Atlantic from France to Congo, and in the Mediterranean. It inhabits coastal waters (from 15 to 150 m depth) with temperatures ranging between 13º and 28ºC. The poor knowledge of meagre's migrations (mostly based on fish landings data) has motivated the use of acoustic telemetry to infer on the species movement patterns. Based on acoustic detections from receivers placed between Cape São Vicente (CSV) and Cape Santa Maria (CSM), this work evaluates the relationship between meagre's migration pathway and current direction. In the region, tidal currents are cross-shore while subtidal flows are alongshore with balanced (eastward and westward) directions that alternate twice a week on average. Twenty-five short-term (up to 4 days) fish displacements were identified between March 2019 and October 2020, occurring mostly (80%) during the upwelling season (May-October). The migration direction was compared with the east component of velocity data from 4 ADCP moorings at one station near CSM (in 23 m water depth) and HFR data with 1.5 km resolution. The detected displacements were mostly westward as the fish were tagged near CSM (the most eastern receiver location). Most (21) of the migrations took place at periods with flow velocity > 10 cm/s, corresponding to a consistent flow direction along the coast. Remarkably, 19 of the 25 migrations (76%) were performed with strong and favorable currents. A Phi test indicated a strong positive relationship (Phi= 0.46) between current and migration directions, while the one-tailed Fisher's exact test shows that the association between westward flow and migration from CSM to CSV is true (i.e., not random) at 96%. Opposed to expectations, the observation of concomitant satellite derived SST maps shows that meagre often migrates toward colder water. The environmental drivers of fish migrations are now being investigated. We hypothesize that meagre takes advantage of warm westward flows to reach CSV where a large food stock is available due to strong upwelling activity during the few preceding days.

O5. Late Quaternary south Brazilian continental margin: a possible analog for future anthropogenic climate projections?

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Anthropogenic greenhouse-gas emissions are rapidly transforming the Earth's climate system through complex feedback mechanisms that affect the biogeochemical cycles. The rise in atmospheric CO_2 causes global warming, leading to ocean stratification and modifying ocean circulation patterns and deep-water ventilation, while the CO_2 absorbed by the oceans causes ocean acidification and promotes calcium carbonate dissolution. Additionally, anthropogenic activities are also resulting in ocean eutrophication and widespread hypoxia. In order to elucidate the roles of the different feedback mechanisms involved in the carbon cycle, it is essential to study past environmental conditions similar to those projected under anthropogenic effects. The ideal setting to study such mechanisms would be one where strong fluctuations in productivity, deep-water ventilation, and carbonate dissolution took place. Here, we propose the late Quaternary south Brazilian continental margin (SBCM) to serve as one such past analog to study biosphere responses to future anthropogenic climate projections. The suitability of the SBCM as a mensurative experiment for this scenario is supported by studies that document: i) episodes of high sea surface productivity within the marine isotope stages 2–4 that resulted from changes in the upwelling systems and/or increased terrestrial fertilization[1,2], ii) the presence of corrosive southern-sourced Antarctic bottom water masses[3] and, iii) higher decomposition rates of organic matter reducing the oxygen levels at the seafloor, which profoundly impacted benthic life and decreased the seafloor pH levels, enhancing dissolution rates of biogenic calcium carbonates[2] (i.e., planktonic Foraminifera, calcareous nannoplankton). By calling the attention of researchers to the late Quaternary SBCM, we hope that increased future efforts will take place to unveil the changes and responses of the paleoenvironmental events in the late Quaternary SBCM. We here provide a comprehensive summary of the combined effects and feedbacks affecting carbon storage under different oceanographical settings.

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O6. We are Atlantic: IPMA's platform for the ocean

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Ocean governance requires structured, coherent and effective collection and sharing of information about the ocean system. All stakeholders must be involved to ensure a sustainable use of marine resources, namely those that live off the ocean, study it, monitor it, and govern the ocean in its various dimensions, including environment, security, infrastructures, and maritime traffic.

The EEA Grants funded project "Atlantic Observatory – Data and Monitoring Infrastructure" coordinated by the Portuguese Institute for Sea and Atmosphere, I.P. (IPMA), with national partners from the archipelagos of the Azores (Regional Fund for Science and Technology) and Madeira (Regional Agency for Research, Technological Development and Innovation), is set to strengthen the operational capacity for monitoring of the Portuguese marine research community, through the acquisition of new state-of-the-art instrumentation (Argo floats, glider, and a water column profiler), as well as to provide a platform for marine data collection, management and dissemination. The project is being developed in close relation with partners from Norway and Iceland, which include the University of Bergen, the Norwegian University of Science and Technology, the Institute of Marine Research, and the Marine and Freshwater Research Institute.

The "We are Atlantic" platform is the digital infrastructure that is being developed to include a data repository, catalogue and user's interface that will provide an integrated, efficient and scalable marine observation system for the Atlantic basin. It will benefit, not only from IPMA's long history of marine research and monitoring efforts, but also from ongoing regional or global initiatives, promoting networking between stakeholders, and acting as a single point of access to data, information and services associated with the Atlantic.

O7. Ocean dynamics characterization in the East Central North Atlantic from a sustained multiplatform observing-system approach

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The ocean is a complex system dominated by multiscale dynamics that span over a large range of spatio-temporal scales. The challenge to observe the marine environment relies on the capability to cover such extent of spatial and temporal scales. Traditionally, a single platform can either provide large spatial coverage (e.g. satellite observations) or temporal coverage (e.g. fixed platforms), which limits the capability of investigating a broader spectrum of ocean processes using only one data source. More and more, the observation of the ocean has transitioned from single platform observations to network systems with complementary sensors. The widespread belief is that the synergy between different Ocean Observing platforms will result in a better characterization of the marine environment. This is especially true when considering the combination of satellite and in situ observations, which will benefit from the spatial coverage of the former and the observation in depth from the latter.

In recent years, Instituto Hidrográfico has been collaborating with PLOCAN to establish sustained glider observations across the Northeastern Atlantic. The present study shows an example of an integrated ocean observational approach to reproduce a comprehensive picture of the marine environment, using data collected by an underwater glider in two deployments (2019 and 2020) between Portugal and the Canary Islands, in combination with satellite and Argo data. The characterization of the physical parameters of the water column in the study domain is clearly relevant, particularly due to the uniqueness of the regional dynamics, provided by the presence of the Mediterranean Water and important subsurface structures, such as meddies, which were detected by the glider during both missions.

We present here an example of how to exploit the advantages of combining data from different platforms in sustained observational programs, maximizing the capacities by each individual technology-component, to study the ocean dynamics.

O8. Fostering ocean observation in Portugal: the EMSO-PT Initiative

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The pressures on the ocean and its resources will increase in the next decade owing to climate change and human activities. Our ability for sustainable management of the ocean will depend on the data collected and the information and knowledge derived from it. The study of the ocean needs sustained long-term observations and new distributed ocean observatories are required. The means to collect data are vital and ocean observatories must be acknowledged as the backbone of ocean management.

The Atlantic Ocean dimension of Portugal led to the prioritization of the European Multidisciplinary Seafloor and water column Observatory - Portugal (EMSO-PT) international scientific infrastructures' roadmap. In this work we present the EMSO-PT initiative: a research consortium joining 15 research institutions, with the aim of implementing a network of multidisciplinary underwater observatories in the Atlantic, as well as laboratories and data processing support infrastructures. EMSO-PT's priority is to generate continuous scientific data on marine environmental processes related to the interaction between the geosphere, biosphere, and hydrosphere, and to develop new sensors and platforms which will extend ocean monitoring in the near future. Monitoring variables will include biotic and abiotic variables of the ocean floor and water column, namely temperature, salinity, turbidity, acoustics, currents, and dissolved oxygen. Data will be disseminated through European Multidisciplinary Seafloor and Water Column Observatory – European Research Infrastructure Consortiums (EMSO-ERIC) channels, allowing for the integration and open access of data acquired by all partners of EMSO- ERIC, and by the research community at large.

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O9. A biophysical exercise on the transport of decapod larvae through the Strait of Gibraltar

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In the Strait of Gibraltar (SoG), the complex local topography and ocean circulation restrict the distribution, dispersal and genetic flow of several species, despite the link created between the northeastern Atlantic and the Mediterranean Sea sub-basins [1-3]. This has important consequences for the connectivity between the sub-basins at both physical and biological levels [4, 5]. The conditions driving the exchange of decapod larvae through the SoG were explored, combining oceanic and particle-tracking Lagrangian simulations with in situ spatial and vertical plankton data collected in the Gulf of Cadiz and Alboran Sea, which served as biological reference. The dispersal strategies of both shelf and slope-dwelling larvae were simulated, assessing connectivity through this extended region, including Moroccan waters. Results suggest that slope-dwelling and mesopelagic larvae are favoured when crossing the SoG from the Alboran, following the Mediterranean outflow. Shelf-dwelling and epipelagic larvae are prone to low transport into the Atlantic, given the high within-basin connectivity in the Alboran and the Atlantic inflow in the upper layers. The Alboran sub-basin received the input of particles from both the Iberian and Moroccan margins. The transport into the Atlantic was higher for passive drifts from the bottom, while actively migrating particles registered lower dispersal range and connectivity. Within the SoG, distinct pathways were identified for the centre or coastal margins. The input of Alboran particles into the Atlantic was higher for areas in close proximity with the SoG and in deeper layers. The work confirms the possibility of a two-way exchange between both sub-basins, although its effectiveness depends on the origin of the releases, the vertical migrations and larval durations.

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O10. Vertical structure of Mesoscale Turbulence in the Azores Current System

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The world's ocean eddy field has been vastly studied using not only altimetric data (e.g., Chelton et al, 2011), but also composites, where the Sea Level Anomaly (SLA) is combined with ARGO floats' data (e.g., Amores et al, 2017) to describe its vertical structure. Previous works regarding the Azores Current (AzC) turbulent vertical structure are scarce, comprising mainly in situ studies of individual eddies, as for example the works of Pingree (e.g., Pingree and Sinha, 1998; Pingree et al., 1996).

In this work, using more than 12000 ARGO profiles, a typification of data accordingly to the maximum of the steric high anomaly (SHa) depth in the water column (reflecting the maximum of the geostrophic velocity in relation to a reference pressure - 1500dbar in our case) was conducted. Five types of SHa profiles were chosen, being later analyzed in different dynamic regions in our study area. Furthermore, the concepts of Spice, which measures the change of temperature or salinity along an isopycnic surface, and Heave, where this change is quantified by isopycnic displacement (Bindoff and McDougall, 1994) were explored, to investigate how the water column (represented by climatological profiles) is influenced by the passage and/or presence of mesoscale features, such as coherent eddies, meanders, filaments, and waves (represented by ARGO profiles).

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O11. Evidências da separação do afloramento na costa NW de Portugal

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A estrutura da circulação da plataforma interna durante sucessivos eventos de afloramento na costa noroeste de Portugal em setembro de 2019 é analisada com recurso a imagens de satélite e modelos numéricos de alta resolução. Os resultados mostram um máximo de afloramento afastado da costa, que é particularmente evidente nas imagens de concentração de clorofila-a (Chl-a), caracterizado por uma faixa de baixos valores da concentração de Chl-a ao longo da batimetria. Esta faixa está alinhada com o máximo de divergência de velocidade horizontal máxima calculada a partir das soluções do modelo numérico. Tanto quanto é do conhecimento dos autores, esta é a primeira evidência observacional de uma célula de afloramento afastada da costa no noroeste de Portugal. A divergência máxima ocorre perto da isóbata de 30m, correspondendo a uma espessura da camada de Ekman de cerca de 50m de acordo com os estudos anteriores[1,2] sobre a influência da topografia na estrutura da circulação de afloramento induzido pelo vento.

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O12. Hot and Cold Marine Extreme Events in the Mediterranean over the last four decades

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Marine temperature extremes are anomalous ocean temperature events, often persisting over several weeks or longer, with potential impacts on physical and ecological processes that often encompass socio-economic implications. In recent years, a considerable effort has been directed at the development of metrics allowing an objective characterization of both marine heatwaves (MHWs) and marine cold spells (MCSs). However, the majority of these metrics do not consider explicitly the spatial extent of the events. Here, we rank and evaluate the relative importance of marine temperature extreme events thanks to a metric, called activity, that combines the number of events, duration, intensity and spatial extent. According to this definition, in the Mediterranean basin between 1982 and 2021, summer 2018 experienced slightly more MHW activity than summer 2003, documented as an exceptional extreme event. Besides, MHWs activities were higher in the last two decades while winter MCSs activities were higher in the 1980s-1990s. The highest MHWs activities occurred preferentially in the western Mediterranean while the strongest MCSs activities took place preferentially in the eastern Mediterranean. Moreover, the duration, mean intensity, and activity of the three strongest MHWs are twice as high as those of the three strongest MCSs. The long-term tendency of extreme events activity shows an accelerated increase for summer MHWs (about +150 °C.days.10^6 km²) and a linear decrease for winter MCSs in the Mediterranean (about -60 °C.days.10^6 km²) over the last four decades.

O13. OPENCoastS^{+}: an EOSC-powered service for on-demand prediction of coastal water quality

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Forecast systems support multiple applications in coastal regions. However, their widespread use was limited by implementation and maintenance costs, due to the need for specialized human resources and dedicated computational resources for predictions' timely delivery.
The development of the OPENCoastS service (Oliveira et al., 2020, 2021) facilitated the uptake of these tools by researchers and end-users. This web-based platform generates forecast systems in a few minutes (based on user input) and operates them daily supported by the EOSC computational resources. OPENCoastS has been used by over 500 people from 65 countries, and is an open source software for usage (https://opencoasts.ncg.ingrid.pt/) and development (https://gitlab.com/opencoasts/eosc-hub).
However, many coastal issues cannot be addressed by hydrodynamics alone. Moreover, OPENCoastS did not permit the simultaneous simulation of both 3D baroclinic and wave-currents interactions. Herein, we focus on the new OPENCoastS^{+} service, based on a fully flexible choice on all hydrodynamic combinations (2D or 3D baroclinic; with or without wave and current interaction) and the extension to water quality predictions for fecal contamination indicators or a user-customized generic tracer.
The OPENCoastS^{+} framework is presented here in detail and demonstrated in several use cases.

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O14. Trend assessment of water temperature in the Sado Estuary (Portugal) and its adjacent coastal ocean

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The increase in water temperature has been observed globally as one of the consequences of climate change. However, this evidence varies regionally and its magnitude is expected to change according to the type of system under analysis. Particularly in estuaries, there is still uncertainty about their vulnerability to climate change, when compared, for example, with the open ocean. Estuarine systems are still underexplored, mainly due to their natural dynamic, which prevents a coherent generalized analysis, but also due to the lack of temporally extended *in situ* databases that allow a comprehensive view of each one of these systems. The Sado Estuary, the second largest estuary in Portugal, has been observed by monitoring programs during the past decades, which allowed to gather a temperature time series with regular records since 1986. Taking advantage of its relevant temporal and spatial cover, trend analysis was evaluated in order to assess the vulnerability of the Sado Estuary to potential climate change impacts. The trends assessment encompassed the removal of the seasonality and the tidal effect from the *in situ* observations, considering hourly outcomes of the water quality module of the numerical model Delft3D, previously calibrated and implemented for this estuary. A significant decreasing trend was observed at the mouth of the estuary that was not detected in its inner regions. Future steps will focus on the integration of satellite-derived sea surface temperature to assess the trends observed in Sado's coastal ocean and will allow to confirm if this estuary is showing less vulnerability to temperature changes than its adjacent region. Finally, in order to understand the origin of the observed trends, time series of air temperature, precipitation and wind direction and intensity regarding the region of Setúbal, as well as the flow of the Sado river, will also be analyzed.

O15. Suspended sediments affect the model species *Mytilus galloprovincialis* at the molecular, biochemical, and functional level under hyperbaric conditions

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An increased need for minerals and rare earth elements is diminishing land-based deposits and compelling the growing interest in deep-sea mining[1]. Deep-sea environments, despite being largely unknown, inhospitable and remote, are also exposed to anthropogenic stressors and will be affected by mining operations[2]. The release of sediment plumes is widely considered as one of the most immediate and extensive effects of deep-sea mining[3,4].

To study the potential effects of suspended sediments associated with deep-sea mining, in the model species *Mytilus galloprovincialis*, we first evaluated the effects of different sediment size classes (63-125; 125-250; 250-500∝m), in a mixture (60, 30 and 10% respectively) and increasing concentrations (1, 2 and 4g/L) at increasing pressures (1, 4 and 50 Bar) in a hyperbaric chamber for 96h and analyzed the filtration rate (FR) and oxidative stress markers [catalase (CAT), lipid peroxidation, glutathione S-transferase (GST) and superoxide dismutase (SOD)] in juvenile mussels. As the FR decreased for all tested concentrations and pressures and significant changes in the tested biomarkers were also found with concentration and pressure dependency, we then evaluated the effects of the different size classes separately. We exposed juvenile mussels to the different sediment classes individually at 1 g/L and 4 Bar. Molecular (gene expression of actin, GST alpha, SOD2, CAT, heat shock protein 60 and DNA mismatch repair protein MSH6), biochemical and functional endpoints were analyzed. The FR decreased significantly for all treatments with a more pronounced effect in the smaller sizes. Significant changes were also found for all biomarkers tested and gene expression was downregulated for CAT and actin.

These findings show that small particles cause adverse effects and that, due to their high distribution and suspension potentials[5], particular attention should be given to their release and resuspension, in the seabed and water column, resulting from mining practices. These findings will contribute to establish guidelines and protocols to mitigate the negative impacts of deep-sea mining in sensitive habitats.

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O16. Dissolved oxygen dynamics in Ria Formosa Lagoon (South Portugal) A real time monitoring station observatory

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Dissolved oxygen (DO) is considered one of the most important environmental variables of water quality. This work aimed to provide, for the first time, insights regarding DO dynamics on a representative site of the productive Ria Formosa coastal lagoon, south Europe, using a real time monitoring station observatory (acquiring data every 15 min) deployed for a period of two and a half years. This comprehensive data set represents an added value contributing to a better understanding of the DO variability throughout analyzing semidiurnal, daily, fortnightly tidal cycles (spring tide *versus* neap tide), seasonal and interannual periods. This observational station was able to capture distinct temporal signatures, including episodic upwelling and meteorological events advancing the knowledge about the functioning of Ria Formosa. DO was highly variable presenting an evident seasonal distribution with the maximum concentration in spring and the minimum in summer night periods. Critical values<5 mg/L were recorded only in 3% of the global data set with negligible hypoxia events, showing infrequent DO stressful conditions in the study area. In addition, the disclosure of its diel dynamics over long periods, provided by this data set, allows to determine the impact of biological activity upon the DO variability and related ecosystem metabolism behavior (autotrophic *versus* heterotrophic), through the metric estimation of Net Ecosystem Metabolism (NEM). NEM in the study area revealed to be slightly heterotrophic along one year of observation, reflecting the median percentage of DO saturation (93%). The acquired data set is highly valuable and can contribute to Ria Formosa management and protection, which is imperative for building knowledge-based societies.

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O17. Influência da Oscilação do Ártico no clima de ondas no Atlântico Norte até ao fim do século XXI

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Este trabalho começa por analisar alterações no índice de Oscilação do Ártico (AO) até o final do século XXI e sua relação com as condições metoceânicas presentes e futuras, no Atlântico Norte. É analisada a distribuição sazonal das mudanças do índice AO e obtida uma linha de regressão de valores anuais. A correlação de Pearson é calculada entre o índice AO e os parâmetros de vento e onda. Observa-se que para o clima futuro, os eventos de AO negativos tornam-se mais fracos, no entanto mais frequentes e acontecimentos de índice positivo permanecem estáveis em intensidade, mas sua frequência é reduzida. No final do século XXI, a correlação entre altura significativa, período de pico e vento zonal permanece a mesma do que a obtida para o clima atual: correlação positiva (negativa) norte (sul) de 50^{o}N. Os resultados indicam ainda num clima futuro, a correlação entre os resultados obtidos pelo modelo Wave Watch III forçada pelas projeções da EC-Earth (EC-Earth/WW3) no cenário de altas emissões (RCP 8.5), e o índice AO permanecerá semelhante à correlação observada no clima atual.

O18. Observations of the marine boundary layer in the North Atlantic from measurements onboard the NRP Sagres sail ship

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The marine boundary layer, the part of the atmosphere influenced by the ocean below, plays a crucial role in the Earth's climate, as it is the locus of largest changes in heat and moisture, and of extensive low-level clouds determining the Earth's radiative balance. The current knowledge on marine boundary layer processes is still very incomplete, partly due to the lack of observations over the ocean, as oceanic measurements tend to be focused on ocean properties rather than on the atmosphere above. Project SAIL (Space-Atmosphere-Ocean Interactions in the marine boundary Layer) aimed to improve understanding on the marine boundary layer through a monitoring campaign onboard the tall ship NRP Sagres. The campaign focused on the measurement of the Earth's atmospheric electric field, a key parameter of the Earth system, as well as of solar and cosmic radiation, environmental radioactivity and atmospheric ionization. In addition to the atmospheric measurements, a in-house-customized tow-fish was used for concurrent underwater monitoring of the ocean state including water temperature, conductivity, dissolved oxygen, pH, turbidity and spectral radiance. All the observations, in air as well as underwater, were linked to the same rigorous temporal reference frame and precise positioning through kinematic GNSS measurements. This contribution addresses the data collected during the SAIL campaign, focusing on the oceanographic measurements and its links to the state of the atmosphere above.

O19. Influence of Rising Sea Levels on a Mesotidal Lagoon: Ecological and Socioeconomic Impacts under Present and Future Scenarios

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Coastal floods are currently a strong threat to socioeconomic activities established on the margins of lagoons and estuaries, as well as to their ecological equilibrium, a situation that is expected to become even more worrying in the future in a climate change context. The Ria de Aveiro lagoon, located on the northwest coast of Portugal, is an example of a low-lying coastal system threatened by the rising sea levels. The growing concerns with these regions stem from the climate-induced mean sea level (MSL) rise, as well as the amplification of the impacts of storm surge events, which are predicted to increase in the future due to higher mean sea levels. Therefore, this study aims to evaluate the influence of MSL rise on the inundation of Ria de Aveiro and to assess the changes in inundation patterns resulting from frequent storm surges (2-year return period) from the present to the future, assessing their ecological and socioeconomic impacts. For this, a numerical model (Delft3D), previously calibrated and validated, was used to simulate the lagoon hydrodynamics under different scenarios combining MSL rise and frequent storm surge events. The numerical results demonstrated that MSL rise can change the vertical zonation and threaten the local habitats, with relevant consequences for local species. Supratidal areas may be the ones suffering greatest changes (in area) with 19.9 km^2 changing to intertidal and 1.0 km^2 changing directly to subtidal. Moreover, 19.4 km^2 of the intertidal area should change to subtidal, maintaining the total intertidal area relatively constant. The increase in MSL expected for the end of the century could make the lagoon more susceptible to the effect of frequent storm surges, harming mostly agricultural areas, and causing great losses for this sector and for many communities who depend on it. These extreme events can also affect artificialized areas and, in some cases, endanger lives.

O20. Impact of flash flood events on the coastal waters around Madeira Island: the 'Land Mass Effect'

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The Island Mass Effect has been primarily attributed to nutrient enhancement of waters surrounding oceanic islands due to physical processes (Hasegawa, 2019), whereas the role of land runoff has seldom been considered (Messié et al., 2020). Land runoff can be particularly relevant in mountainous islands, highly susceptible to torrential rainfall that rapidly leads to flash floods. Madeira Island is historically known for its flash flood events, when steep streams transport high volumes of water and terrigenous material downstream (Fragoso et al., 2012). A 22-year analysis of satellite data revealed that a recent catastrophic flash flood (February 2010) was responsible for the most significant concentration of non-algal Suspended Particulate Matter (SPM) and Chlorophyll-a (Chla) at the coast. In this context, our study aims to understand the impact of the February 2010 flash flood events on coastal waters. Two specific events are investigated in detail (2 and 20 February 2010), which coincided with northeasterly and southwesterly winds, respectively. Given the lack of in-situ data documenting these events, a coupled air-sea-land numerical framework was used, including hydrological modeling. The dynamics of the modeled river plumes induced by flash floods were strongly influenced by the wind regimes subsequently affecting coastal circulation. During northeasterly winds, coastal confinement of the buoyant river plume persisted on the island's north coast, preventing offshore transport of SPM. This mechanism may have contributed to favorable conditions for phytoplankton growth, as captured by satellite-derived Chla in the northeastern coastal waters. On the island's south coast, strong ocean currents generated in the eastern island flank promoted strong vertical mixing. During southwesterly winds, coastal confinement of the plume with strong vertical density gradient was observed on the south side. The switch to eastward winds spread the south river plume offshore, forming a filament of high Chla extending 70 km offshore. Our framework demonstrates a novel methodology to investigate ocean productivity around remote islands with sparse or absent field observations.

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O21. Ria Formosa: Fonte ou sumidouro de gases de estufa?

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As lagoas costeiras são ambientes produtivos muito procurados pelo Homem, o que intrinsecamente significa que sofrem pressões antropogénicas. Assim, recebem através de várias entradas quantidades importantes de matéria orgânica e nutrientes. Uma das fontes mais importantes pode ser a descarga de efluentes de estações de tratamento de águas residuais, que podem aumentar, também, a produção de gases de efeito de estufa (quer de carbono, dióxido de carbono - CO_2 e metano - CH_4 e de azoto, óxido nitroso - N_2O). Em Portugal, uma das lagoas costeiras mais produtivas situa-se na costa sul e denomina-se Ria Formosa. Esta lagoa costeira recebe efluentes tratados das principais Estações de Tratamento de Águas Residuais (ETAR), das cidades mais populosas que existem na sua envolvência (Faro, Olhão e Tavira). De forma a avaliar o impacto dos gases de estufa na Ria Formosa e investigar se este sistema funciona como fonte ou sumidouro destes gases foram amostradas 3 estações de amostragem ao longo de um gradiente de dispersão dos efluentes das 4 principais ETAR (numa zona interior, junto do ponto de descarga, com condições hidrodinâmicas mais baixas, a uma distância intermédia do ponto de descarga (500-750 m) e nos canais principais, onde as condições hidrodinâmicas são mais fortes, devido às trocas intensas que ocorrem com o oceano). Aí foram medidas a pressão parcial de CO_2, (pCO_2) e a concentração de CH_4 e N_2O, em duas amostragens realizadas em condições típicas de elevada produtividade primária, i.e., na primavera (março de 2020) e final de verão (outubro de 2020), em baixa-mar, situação em que o efeito das descargas dos efluentes é mais evidente. A pCO_2 foi calculada a partir do pH e da Alcalinidade total (medida por titulação potenciométrica) e a concentração de CH_4 e N_2O foi medida por cromatografia gasosa. De forma geral, os valores mais elevados dos gases de efeito de estufa foram encontrados no final do verão, nas áreas mais interiores, onde a pressão antropogénica é mais forte. Os fluxos água-atmosfera foram positivos, o que nos indica que a Ria Formosa nas situações amostradas funcionou como fonte destes gases para a atmosfera.

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O22. Transient upper slope flows on the Gulf of Cadiz: a case study of November 2012

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The mean upper slope circulation in the Gulf of Cadiz (GoC: Cape of S. Vicente to the Strait of Gibraltar) is reasonably established as a quasi-steady year round equatorward flow. In November 2012, an event traced by a dramatic sediment plume from Guadalquivir captured by MODIS TERRA and AQUA satellites, enabled the characterization of a poleward flow. The analysis of wind data for the same period indicates that the flow was not directly driven by any wind event in particular. The analysis of additional data for the same period, including in situ observations and other satellite imagery, allowed to trace the event back a few weeks, and downstream at least as far as Cape S. Maria. The event was correlated with a positive SLA pattern building up from Southern Morroco latitudes.

The analysis of the SLA anomalies along the Marroco-Western Iberia arc indicates that similar anomalies occur mostly in autumn. The multi-year time-series of surface currents of the Gulf of Cadiz Buoy indicate a quasi-steady southeastward (equatorward) current with rare sustained reversals. However, it is observed that these reversals are mostly autumn events. We discuss the event in detail, as well as the hypothesis of recurring similar events on the Autumn transition and its connection to poleward propagating remotely forced events.

O23. The surface water circulation at the northern margin of the Gulf of Cadiz

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The surface water circulation at the northern margin of the Gulf of Cadiz, at the southern extremity of the Iberian upwelling system, has been described based on few current observations. In the present study, an updated scheme of the main circulation patterns is proposed based on long term (2016 to 2020) hourly subtidal surface currents from high frequency radar measurements and ADCP time-series from multiple moorings at about 20 m depth. Statistical analyses (mean, standard deviation, eccentricity and empirical orthogonal functions) are applied to the dataset and results are discussed considering ERA5 reanalysis wind. The main circulation pattern along the continental shelf slope (at depths greater than 200 m) consists of an equatorward current, best developed in summer when north-westerlies dominate, in particular at the most exposed western region. Flow reversals to poleward are observed for wind events with east component > 10 $m.s^{-1}$, approximately. This flow has been previously described as related to upwelling dynamics, but other mechanisms rather than upwelling must contribute to this slope current to explain its seasonal persistence. Shelf currents are mainly alongshore with balanced directions. They tend to be continuous all along the coast, except for weak (< 0.1 $m.s^{-1}$, broadly) poleward flows. In winter, coastal poleward flows often extend over the entire margin and are mainly wind-driven, while in summer they often consist of coastal counter currents (CCCs) with poleward direction opposed to the one of the slope current. The CCCs are associated with significant cyclonic recirculation at West, where a transient eddy that connects the shelf and slope circulation, is shortly observed for weak wind stress conditions. This recirculation develops after periods of strong north-westerlies, supporting that CCCs result from the unbalance of a regional along-shore pressure gradient. Theoretical considerations support that this cyclonic circulation arises to compensate the baroclinic pressure field produced by the uprising of isopycnic near Cape São Vicente as a direct effect of wind stress curl.

O24. Early Pleistocene bottom water conditions at the SW Iberian margin

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The Pliocene-Pleistocene transition is marked by a decrease in the atmospheric CO_2 content, progressive cooling, and expansion of the Northern Hemisphere ice sheets. Consequently, glacial-interglacial cyclicities emerged. Despite the importance of this event, its causes are still not fully understood and little knowledge exists on the behaviour of the Mediterranean Outflow Water (MOW) during this period. The MOW is an important component of the Earth's climate system because it carries warm and saline water into the Atlantic's intermediate depths and modifies the strength of the Atlantic Meridional Overturning Circulation.

In order to better understand the behaviour of the MOW during the first glacial-interglacial cycles of the Pleistocene, benthic foraminifer assemblages have been studied from IODP Site U1391 (37°21.5'N; 9°24.6'W, 1085 m water depth), recovered during the IODP Expedition 339 at the Southwest Iberian margin. We reconstructed changes in bottom water oxygenation and carbon export and their relation to MOW oscillations across Marine Isotope Stages (MIS) 103 to 82. We calculated the Shannon diversity index, abundance of epifaunal and infaunal taxa, and performed Principal Component Analysis (PCA) on the benthic foraminifer assemblages.

PCA yields three components that explain up to 58% of the total variance. The first component is exclusively defined by *U. auberiana* and reflects changes in the export of sea surface productivity resultant from the upwelling. The second component is constituted by *G. subglobosa* and *B. mexicana*, with positive and negative correlation, respectively, and is associated with bottom water ventilation. This component indicates vertical migrations of MOW. Finally, the third component is composed by *U. peregrina*, *B. mexicana* and *G. orbicularis* with positive correlation and *M. barleeanum* with negative correlation, and reflects the expansion of the nitrate reduction zone. The combination of the three components allows us to define three intervals in which the seafloor environment alternated between eutrophic and mesotrophic conditions, and five intervals in which the bottom waters alternated between MOW and NADW influence.

O25. Avaliação do Potencial da Energia das Ondas na Costa Noroeste da Península Ibéria

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A energia das ondas é um recurso renovável e ilimitado abundante em todo o planeta, no entanto, a quantidade de energia pode variar dependendo da localização, reconhecendo-se que Portugal apresenta condições naturais muito favoráveis para a sua extração. O principal objetivo deste trabalho consiste em avaliar e comparar a eficiência de três conversores de energia das ondas (WECs) (Pelamis, Wave Dragon e AquaBuOY) na costa noroeste da Península Ibérica, para o período histórico de 1979 a 2005 e o futuro próximo de 2026 a 2045, com destaque para três locais, a zona piloto de São Pedro de Moel, Viana do Castelo e Aguçadoura. Para atingir este objetivo, foram usados dados climáticos para o período histórico e futuro próximo obtidos através do SWAN sob o cenário de efeito de estufa RCP 8.5. Usando estes dados climáticos foi, posteriormente, calculado e representado graficamente a potência elétrica média, a largura de captura, o fator de carga e o recurso energético das ondas. Os resultados mostram que o recurso energético das ondas e a potência elétrica média dos três WECs diminuirão no futuro próximo. O fator de carga para o Pelamis permanecerá praticamente inalterado, exceto acima dos 41.5°N, onde diminuirá ligeiramente. Para o AquaBuOY, este parâmetro diminuirá em toda a área de estudo e para o Wave Dragon apresentará variações ao longo de toda a costa, com valores mais elevados entre os 41°N e os 42°N. O aumento mais significativo da largura de captura para o Pelamis ocorre aos 40.5°N, diminuindo para norte entre ambos os períodos. Para o AquaBuOY, as alterações são semelhantes em toda a região costeira, com uma exceção para latitudes superiores a 42°N, onde a diferença entre os períodos analisados aumenta. Para o Wave Dragon verifica-se um aumento ao longo da parte central e norte da costa e um pequeno aumento abaixo do Cabo da Roca. Viana do Castelo e Aguçadoura apresentam um recurso energético das ondas mais elevado, beneficiando a captação de energia pelos WECs, enquanto em São Pedro de Moel o seu valor é mais baixo. No entanto, Viana do Castelo e a Aguçadoura sofrerão mudanças consideráveis no futuro próximo, onde se prevê um recurso energético mais baixo.

O26. Mineralogical, geochemical and magnetic signatures of shallow gas in the Tagus pro-delta, preliminary results

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In the framework of the TAGUSGAS project, shallow gas-bearing sediments were mapped with high-resolution seismic over an area of 33 km^2 in the NW part of the Tagus pro-delta, at water depths ranging between 20 and 80 m [1]. This shallow gas area occurs adjacent to a recent landslide deposit and the interplay between the triggering of sediments instability and the shallow gas formation, migration and escape is being investigated in the TAGUSGAS project.
From 23 to 26 March 2020 the Tagusgas cruise was carried out onboard the RV Gago Coutinho, allowing the recollection of sediment samples from the Tagus pro-delta with multi-corer, box-corer and gravity corer. 8 gravity cores were analysed at the EMSO-GOLD laboratory for non-destructive petrophysical properties with a Geotek standard multi-sensor core logger MSCL-S and for elemental chemical composition with an Avaatech X-Ray Fluorescence (XRF) Core Scanner. Here, preliminary results of the analysis are investigated to characterize the mineralogical, geochemical and magnetic signatures of the shallow gas in the top 3 meters of the sedimentary columns. All cores are characterized by anoxic sediments almost up to the seafloor, indicative of high organic matter content and probable active methanogenesis. All cores XRF elemental variability of Al-K-Ti-Fe-Cr-V-Zn-P and Al-Si-Ca relationship, indicate a relatively constant detrital input. Lead, Cu and Zn down-core variability points to a clear anthropogenic enrichment towards the Present that are associated with the industrial development occurred in the Tagus estuary started at the second half of the 19th which continued throughout the 20th century. Sediments grain size, mineralogy and detrital elemental variability seem to be controlled mainly by the river discharge hydraulic sorting. This suggests a common detrital provenance and a wide propagation of the Tagus pro-delta sediment plume, supporting a homogeneous and constant modern sedimentation pattern on the entire studied area. Therefore, most probably the factors controlling the presence of shallow gas are routed within the sedimentary column, deeper than the top 3 m of sediments.

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O27. O Programa Argo: uma perspectiva geral

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O Programa Argo é verdadeiramente o único programa global de observação do oceano, sendo uma componente importante do Sistema Global de Observação do Oceano (GOOS-Global Ocean Observing System) e do Sistema Global de Observação Climática (GCOS-Global Climate Observing System) e, fornecendo dados quase em tempo real para serviços meteorológicos e oceanográficos, bem como dados de alta qualidade para a investigação climática. Foi iniciado há mais de duas décadas, mantendo uma matriz global de cerca de 4000 flutuadores que fornecem observações contínuas de temperatura e salinidade do oceano, desde a superfície até 2000m de profundidade. Nesta comunicação iremos apresentar o actual programa nuclear, bem como novos desenvolvimentos com o objectivo de estender a capacidade de observar maiores profundidades (≥ 4000m) e medir parâmetros biogeoquímicos (e.g., oxigénio, nitrato, clorofila a, pH e propriedades ópticas da água). No futuro pretende-se manter uma rede de pelo menos 4000 flutuadores, sendo 1000 com sensores biogeoquímicos e 1000 atingindo profundidades abissais. Por fim, apresentam-se algumas aplicações usando os flutuadores Argo (e.g., batimetria e estudo da Água Mediterrânica).

O28. Trends, variability and predictive skill of the ocean heat content in North Atlantic: an analysis with the EC-Earth3 model

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This study investigates linear trends, variability and predictive skill of the upper ocean heat content (OHC) in the North Atlantic basin. This is a region where strong decadal variability superimposes the externally forced trends, introducing important differences in the local warming rates and leading in the case of the Central Subpolar North Atlantic to an overall long-term cooling. Our analysis aims to better understand these regional differences, by investigating how internal and forced variability contribute to local trends, exploring also their role on the local prediction skill. The analysis combines the study of three oceans reanalyzes to document the uncertainties related to observations with two sets of CMIP6 experiments performed with the global coupled climate model EC-Earth3: a historical ensemble to characterize the forced signals, and a retrospective decadal prediction system to additionally characterize the contributions from internal climate variability. Our results show that internal variability is essential to understand the spatial pattern of North Atlantic OHC trends, contributing decisively to the local trends and providing high levels of predictive skill in the Eastern Subpolar North Atlantic and the Irminger and Iceland Seas, and to a lesser extent in the Labrador Sea. Skills and trends in other areas like the Subtropical North Atlantic, or the Gulf Stream Extension are mostly externally forced. Large observational and modeling uncertainties affect the trends and interannual variability in the Central Subpolar North Atlantic, the only region exhibiting a cooling during the study period, uncertainties that might explain the very poor local predictive skill.

O29. Spatio-temporal variability of the distribution and abundance of sardine off the Portuguese continental coast and relationship with environmental drivers

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Scientific tools capable of identifying species distribution patterns are important as they contribute to improve knowledge of causes of species fluctuations which can contribute to improve management. This study aims to estimate the spatio-temporal distribution of sardine (*Sardina pilchardus*, Walbaum 1792) in western and southern Iberian waters, relating the spatio-temporal variability of the biomass indicator with environmental conditions.
Acoustic data was obtained during Portuguese spring acoustic surveys (PELAGO) conducted by the Portuguese Institute for Sea and Atmosphere (IPMA) from 2000 to 2020 (gap in 2012). Daily environmental data was obtained for the region and time of study, particularly satellite derived sea surface temperature, chlorophyll-a concentration, bathymetry, and intensity and direction of surface ocean currents.
Species Distribution Models were used to relate sardine presence/absence and biomass with environmental conditions, aiming at predicting its distribution in unobserved locations and for the unobserved year of 2012. A hurdle Bayesian model was used such that species biomass is given by the product of two processes, occurrence and biomass under occurrence. In addition to considering the spatio-temporal structure, the impact of the environmental conditions with a time lag on biomass indicator is evaluated using a kernel gaussian function. Data from the west and south coasts are studied separately due to the large differences of the coast shape and the prevailing oceanographic conditions.
For the south coast, all covariates are shown to be important. Shallow locations favour both occurrence (especially between 22 and 46m of depth) and biomass (between 22 and 56m). Calmer locations (intensity between 0.08 and 0.11m/s) also favour the occurrence, while intensity presents different effects on the biomass depending on the direction of ocean currents. Strong currents towards the north influence negatively the biomass, but positively towards the south and even more favourable when they move towards the east. The biomass is also higher for colder waters (between 14.4 and 15.3ºC) and where the chlorophyll-a varies between 10 and 25mg/m^3.

O30. Oceanografia operacional – instalação e recuperação de uma infraestrutura de observação oceanográfica da coluna de água

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O oceano aberto é por defeito um ambiente particularmente hostil a qualquer estrutura fixa, o que se traduz num desafio, desenhar um sistema de observação euleriano. É necessário conjugar um grande número de elementos e procedimentos de forma a garantir a operacionalidade do sistema de observação, e, em simultâneo, manter uma relação de custo-benefício favorável. Manuais de boas práticas[1] e artigos de experiências[2] são recursos de grande importância para o sucesso deste tipo de sistemas, cujos benefícios para a sociedade abrangem um grande número de tópicos[3]. No entanto, a experiência no terreno é de certa forma insubstituível, traduzindo a especificidade regional das condições meteo-oceanográficas, bem como a disponibilidade de meios operacionais e recursos materiais. Esta experiência é a que permite uma correta adequação aos objetivos de observação, reduzindo significativamente custos onde possível, sem comprometer a segurança do sistema nem a qualidade dos dados. Critérios utilizados na escolha de equipamentos (científicos e técnicos), na sua configuração e integração, na avaliação de resistência da amarração, têm de ser habilmente combinados com manutenção periódica, calibração de sensores, logística de instalação e recuperação do equipamento, e ainda com a gestão dos dados produzidos.

No âmbito projeto European Multidisciplinary Seafloor and water column Observatory – Portugal (EMSO-PT)[4], o Centro de Ciências do Mar do Algarve (CCMAR) desenhou uma infraestrutura pioneira em Portugal, capaz de observar os primeiros 150 m da coluna de água de forma contínua e a grande resolução, recolhendo informação essencial sobre temperatura, condutividade, turbidez, clorofila total, oxigénio dissolvido, e correntes oceânicas. O presente trabalho relata a experiência adquirida na fase piloto de instalação e recuperação do sistema de observação euleriano desenhado pelo CCMAR, operacional entre maio e outubro de 2021 e localizada a 10 milhas a sul de Sagres na batimétrica dos 200 m. Pretende-se partilhar com a comunidade oceanográfica os desafios encontrados e as recomendações a considerar que possam ser úteis na implementação de sistemas de observação eulerianos.

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O31. TUGA ao serviço da Oceanografia

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TUGA é o nome que os alunos da Escola Básica (EB) do Castelo escolheram para o barquinho PT da frota do Projecto iFADO[1]. Inseridos no programa Educational Passages[2] estes barquinhos funcionam como um "atractor" da atenção de miúdos e graúdos, que logo perguntam: - O que é? Para que serve? A partir daí é "só" aproveitar para falar dos oceanos e tudo o que com eles se relaciona - a imaginação é o limite, como considerar que o nome escolhido de forma quase instantânea pelos alunos é, também, acrónimo para "Todos Unidos no Grande Azul". Nesta comunicação conta-se a história do TUGA que chegou a Lisboa vindo das Canárias em dezembro de 2019 e fez as suas primeiras navegações na Baía de Sesimbra na companhia dos alunos da escola de vela do Clube Naval de Sesimbra. Foi pintado e batizado pelos alunos da EB do Castelo que o viram navegar quando o lançaram a partir da barca "Amor ao Ofício", e iniciou a sua viagem Atlântica a partir de Sagres, lançado a partir do navio de investigação Vizconde de Eza a 17 de Março de 2022.

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Posters

P1. Indian monsoon and vegetation dynamics: lessons from two contrasting glacial-interglacial cycles of the Middle Pleistocene

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Global warming is one of the most pressing problems for global sustainability of ecosystems and societies. It urgently calls for improved understanding of climate shifts, in particular those affecting areas highly sensitive to global change, such as the monsoon regions populated by two thirds of the world's population. The Indian monsoon is the strongest subsystem of the Asian monsoon, being one of Earth's most dynamic expressions of land-ocean-atmosphere interactions. Alarmingly, the impact of global warming on tropical hydrology in the coming decades remains unclear. A precise characterization of the mechanisms driving monsoon natural variability is therefore of paramount importance to improve worldwide monsoon forecast, and, in turn, maximize the benefits of monsoon rainfall and reduce the impact of its extreme events.

The FCT exploratory project INDRA[1] "Indian monsoon and vegetation dynamics: lessons from two contrasting glacial-interglacial cycles of the Middle Pleistocene" represents a cutting-edge synergy between top-quality paleoclimate observations and wisely designed climate model experiments to explore the monsoon natural variability over the geological times. INDRA aims to reconstruct vegetation and climate changes in Central India during specific contrasting glacial-interglacial cycles with diverse baseline climatic conditions, namely the Marine Isotope Stage (MIS) 15-16 (630-564 thousand years ago (ka)) and MIS 11-12 (434-382 ka). This multiproxy study will use deep-sea sediments from IODP Site U1446 to generate high-fidelity monsoon proxy data, allowing the comparison of pollen-based vegetation dynamics with marine environmental changes and climate model experiments. The integration of proxy-based and model reconstructions will produce an important scientific contribution with strong societal impact by generating the first model-data comparison for two key glacial-interglacial cycles of the Pleistocene in Central India.

To achieve the proposed goals, this innovative project will gather a multidisciplinary and international team of paleoclimatologists (5 countries) with diverse expertise including palynology, tropical vegetation, paleoceanography and climate modelling.

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P2. Unraveling hydroclimate variations during MIS 11 in the Indian core monsoon zone

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The Indian Summer Monsoon (ISM) is among the Earth's most extreme hydrological regimes, delivering freshwater to billions of people and the diverse flora and fauna inhabiting the region. It brings up to 90% of the annual rainfall into the Core Monsoon Zone (CMZ) in central India, where the ISM has its most representative expression. Alarmingly, the uncertainty in ISM precipitation projections is still highly due to the complexity of simulating its various interconnections. High-fidelity ISM proxy records of past interglacials, periods of reduced ice volume as the Holocene, are thus critical to address long-standing questions regarding the role of the primary forcings (insolation, ice volume and CO_2) in driving ISM natural variability.
Here we focus, for the first time, on the Indian monsoon-induced vegetation change during interglacial MIS 11 (425-374 ka), an important analogue of our current interglacial, the Holocene, and future climate due to its orbital similarities with the Holocene, higher than present sea-level related to the collapse of Greenland and West Antarctica ice sheets and its greenhouse gas-driven climate warming. Based on pollen analysis at Site U1446 strategically retrieved from the CMZ, atmospheric-driven vegetation changes are directly compared with oceanic profiles from the same site (e.g., alkenone-based SST records) to better understand the relations between ISM and associated vegetation changes in the CMZ of India and surface water circulation in the Bay of Bengal. This approach ensures a robust land-sea comparison that circumvents chronological uncertainties, and provides a prime land-sea archive to gain insights into the nature of ISM variability and its effects on ecosystems at the CMZ.

P3. Morphometry of *Calcidiscus leptoporus* yield insights into palaeoecological preferences in the southwestern Atlantic during the last 135 kyr

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Coccolithophores constitute one of the main primary producers in the open ocean and play an important role in the organic carbon and carbonate pump. The use of coccolithophores assemblages is common in paleoceanographic studies, but the results can be limited due to the dissolution of their coccoliths in the water column and sediment. To minimize such limitations, we performed a morphometric study of a dissolution resistant species, *Calcidiscus leptoporus*, and assessed its paleoecological interpretation during the last 135 kyr in the South Atlantic. This species presents differences in morphology and size, generally divided into three morphotypes (small, intermediate and large). In order to understand the morphotypes dynamics, this work aims to compare the morphometric data with productivity and sea surface temperature data. Measurements of 50 coccoliths were carried out in 42 samples of sediment core collected from the southeastern Brazilian continental slope. Relative abundances show maximum values of the large morphotype during Marine Isotope Stage (MIS) 5e and 4, while the small morphotype exhibited lower values during the same period. In contrast, intermediate sized *C. leptoporus* dominated the studied time interval, exhibiting a wide tolerance to different environmental conditions. Statistical analyses are being done to test and confirm the small morphotype is correlated with productivity, showing a preference for warmer and nutrient-enriched waters. Moreover, the large morphotype reveals affinity with nutrients availability and cold waters. During MIS 4 dissolution, which probably contributed to the decrease of smaller and more sensitive species such as *Emiliania huxleyi*, might have also influenced the small *C. leptoporus* relative abundances and thus allowed higher abundances of dissolution resistant specimens like its large morphotype and *Florisphaera profunda*. It is necessary to perform more morphometric analyses in sediment cores from the southwestern Atlantic, as well as in modern plankton samples, to obtain more reliable information and confirm specific regional ecological tolerances, as potential information for paleoceanographic reconstructions.

P4. Natural Mineral Carbonation: Insights from Serpentinite Mud Volcanism

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The rate of ocean CO_2 uptake has continued to increase in the recent two decades in response to the rising concentration of atmospheric CO_2, causing ocean warming, acidification, and oxygen loss. The great challenges for the next decades are to reduce CO_2 emissions and to search for efficient and safe methods of carbon capture and storage.

Mineral carbonation is a very promising option of carbon storage capable of decreasing tons of anthropogenic atmospheric CO_2 emissions per year and, subsequently, mitigates the climate change. In the Marianas forearc, an active non-accretionary convergent margin located at the intra oceanic subduction zone where the Pacific plate subducts the Filipinas plate, mineral carbonation occurs naturally as authigenic carbonates, precipitated in the serpentinite muds from large seamounts and mud volcanoes.

To characterize the physical and chemical conditions that promote carbon mineralization, this work investigates the formation of these authigenic carbonates at the Marianas serpentinite mud volcanoes, by estimating the geochemical conditions that favour the precipitation of the authigenic carbonates.

To accomplish that, samples from Yinazao, Asut Tesoru and Fantangisnã serpentinite mud volcanoes were studied and characterized. These mud volcanoes are located at different distances from the Mariana's trench with different stages of metamorphism, reflecting different compositions in the expelled fluids. The authigenic carbonates are found in serpentinite dominated sediment samples, predominantly within the core's top meters.

In this work we correlate the abundance and the distribution of the carbonated occurrences with the core depth and this data is subsequently correlated with the pore water geochemistry data. These correlations will allow us to estimate de geochemical conditions that favour the authigenic carbonate precipitation is these three serpentinite mud volcanoes.

P5. Testing cold-water coral chromium isotopes as a new paleoredox proxy

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As a consequence of climate change, ocean oxygen levels have been decreasing for the past 50 years, and ocean models suggest they will continue to decrease into the future [1]. This decrease greatly impacts the ocean's intermediate depths (200-1500m), especially oxygen deficient zones (ODZs). In order to better understand the processes that control the oxygenation of the ocean, we need to have long records, which can only be obtained from geological archives such as sediments and cold-water corals. Chromium and Cr isotopes are sensitive to ocean oxygenation levels, particularly near ODZs. We are undertaking the first tests of the fidelity of cold-water corals as recorders of intermediate-water Cr and Cr isotope ratios to evaluate their use as a proxy for paleoredox state of seawater.

Here we report preliminary results of Cr and Cr isotopes (δ^{53}Cr) from specimens of *Lophelia pertusa*, a species increasingly used for paleo-environmental reconstructions. Three test samples were collected from the Florida Strait (a modern coral) and the Iberian margin (a glacial-aged and a modern coral). The samples were chemically cleaned prior to analysis to remove contamination from ferromanganese oxides and detrital silicates. Initial analytical results revealed that small-sized samples (~0.5 g) negatively affect the quality of the analysis, requiring the re-analysis using larger samples (~2.5 g). As suspected, we found very low Cr/Ca ratios on these cleaned coral samples (compared to previous reports for unclean samples) at a sub-ppm coral Cr concentration (0.01-0.03 ppm). The LGM coral sample had a δ^{53}Cr of -0.42 +/- 0.11‰. Considering the *L. pertusa* species, the use of larger coral samples of around 2-5 g corresponds approximately to coral branches of 2-10 cm in length, depending on the skeletons' thickness. With an average linear growth ranging between 5-35 mm yr^{-1}, such analytical conditions would still allow reconstructions at an approximate resolution of 1 to 20-year (with higher resolution for older, thicker coral specimens). However, efforts are still underway to improve our analytical method and validate cold-water coral δ^{53}Cr as a paleoredox proxy.

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P6. Estudo da variação espacial da turbidez no Estuário do Tejo com imagens Sentinel-2

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Estuários são zonas de interface naturais entre os rios e o mar, constituindo assim uma zona de mistura entre a água doce e salgada. São sistemas complexos onde matéria e energia são trocadas entre ecossistemas marinhos e terrestres. São caracterizados por processos físicos intensos, interações biológicas e químicas, levando assim a que ocorram gradientes espaciais e temporais significativos de propriedades da água. O estuário do Tejo é um ambiente aquático de transição entre o rio Tejo e o oceano Atlântico. Constituí um estuário de planície costeira localizado numa zona densamente habitada e, por isso, sujeito a um grande stress humano e natural, estando localizado na área Metropolitana de Lisboa. É um dos maiores estuários da Europa Ocidental e o maior de Portugal, tendo assim um grande interesse económico e turístico para o país. Este stress natural e humano induz mudanças em propriedades da água, como a turbidez, o que afecta a sua qualidade, tendo impacto na sua dinâmica biogeoquímica. Assim, de modo a avaliar os padrões espaciais e temporais de turbidez, clorofiladas e atenuação da, foram usadas imagens de satélite (Sentinel-2) para descrever os padrões espaciais no estuário. As imagens de nível 1, são captadas pelo Sentinel-2 e processadas, posteriormente, através do software Acolite. Através da análise das imagens de satélite foram elaboradas matrizes e séries temporais de turbidez, clorofila e coeficiente de atenuação de luz na água, para que se pudesse avaliar a sua variabilidade de uma forma completa. Foi possível identificar zonas de elevada turbidez em regiões próximas (ou de influência) das embocaduras dos rios Tejo e Sorraia, coincidindo com regiões onde existe uma produção considerável de clorofila, provavelmente devido ao efeito de descarga de nutrientes no estuário. Os resultados resultaram de uma primeira abordagem ao problema, sendo possível a otimização da análise recorrendo à aplicação de modelos de ondas para caracterizar o efeito de ressuspensão de sedimentos na zona de mistura do estuário.

P7. Avaliação do recurso de energia da maré no Estuário do Tejo

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Os oceanos têm cada vez mais um papel de grande relevo na sociedade, tornando-se hoje um ponto chave de desenvolvimento e investigação. Adicionalmente, o crescimento populacional requer um aumento crescente do uso de recursos, como a energia, sendo cada vez mais importante a geração de energia de forma limpa e renovável, que substitua os meios convencionais de produção baseada em hidrocarbonetos. Neste âmbito, o interesse na exploração da energia da maré tem vindo a aumentar, particularmente em zonas de transição, fortemente condicionados pela propagação da maré[1]. Neste contexto, definiu-se como objetivo deste trabalho avaliar o potencial anual da maré no estuário do Tejo, um dos maiores estuários da Europa[2], quantificando a produção anual de energia através de dados de velocidade da corrente e densidade da água, determinados por modelação numérica. A metodologia implementada consistiu na implementação e exploração do modelo Delft3D, tendo sido realizada uma simulação anual da hidrodinâmica local, considerando o transporte de sal e calor de forma a possibilitar a variação da densidade. Foram avaliadas a velocidade da corrente e o potencial energético para todo o estuário, em situação de maré viva e de maré morta, permitindo identificar as 4 regiões com maior potencial de produção de energia. Posteriormente foi avaliada a velocidade e o potencial energético ao longo de um ano para as 4 regiões previamente identificadas, seguindo-se o cálculo da produção anual de energia considerando a instalação de um tipo de turbina específica adequada às condições locais. Os resultados revelam diferenças significativas nos valores de velocidade e potencial energético entre os diferentes ciclos de maré, com os valores mais altos durante a maré viva, superiores a 2 m/s e 4000 W/m^2, respetivamente. A região adjacente a Oeiras apresenta os valores de potencial energético mais elevados (4000-5000 W/m^2). A instalação da turbina Evopod 1 (Cp =28% e η=90%)[3], junto à estação de Oeiras, produzirá anualmente 1.0×10^3 KWh/m^2, correspondente a cerca de 0.01% do consumo energético anual da iluminação de rua no município.

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P8. Circulação e processos de transporte durante um evento extremo de descarga fluvial no Estuário do Tejo

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No inverno de 2013, a região de Lisboa, que incluí o estuário do Tejo esteve sob influência de ventos intensos de sul e elevado caudal fluvial, os quais alteraram a hidrodinâmica do estuário e hidrografia do estuário. Esta alteração levou a processos de estratificação e deestratificação que alteram o transporte de propriedades no estuário. Este período foi usado para avaliar variações de salinidade e de temperatura devido a condições extremas de caudal fluvial bem como avaliar o impacto de potenciais alterações futuras na temperatura do ar e na subida do nível do mar (SNM). Para tal, utilizou-se o modelo numérico Delft3D, tendo sido estabelecidos 6 cenários idealizados, considerando os resultados do relatório do CMIP6. Antes do evento, o estuário do Tejo apresentava valores de temperatura da água consistentes com a época do ano. A zona de mistura do estuário exibia condições uma coluna de água misturada enquanto que a região marinha mostrava alguma estratificação. Durante o evento, o estuário esteve com valores de salinidade abaixo do habitual e a região de mistura foi transferida em direção à embocadura do estuário, diminuindo a temperatura da água do estuário em relação às condições que antecederam o evento. 9 dias mais tarde, alguns efeitos do evento permaneciam na região interior do estuário. A SNM tem impactos mais visíveis do que o aumento da temperatura do ar, nos padrões de salinidade e da estratificação. A resposta da temperatura da água está diretamente relacionada com o aumento da temperatura do ar. Nos primeiros 20 km desde a foz do rio Tejo, as três variáveis em estudo não mudaram os seus valores, devido à influência da descarga fluvial extrema. A partir dos 20 km, verificou-se o aumento da salinidade, temperatura da água e mistura da coluna de água. A embocadura e as regiões menos profundas serão mais propensas a alterações do que as regiões a montante. A implementação deste tipo de modelos contribui para a compreensão da hidrodinâmica do estuário do Tejo e a região costeira adjacente, assim como para o impacto dos cenários de alterações futuras previstas na salinidade, temperatura da água e estratificação.

P9. Modelação hidrodinâmica operacional no contexto do combate à poluição marinha

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Atualmente, em Portugal, assiste-se a uma estagnação no número de casos de incidentes de poluição marinha intervencionados desde 2010, porém, há um aumento significativo do número de casos reportados desde 2013. Os incidentes que regularmente são de menor escala, são caracterizados por uma variabilidade espacial que requer das autoridades nacionais um multiplicar de recursos para a necessária verificação. Desta forma, há uma necessidade crescente de recorrer a novas tecnologias para auxiliar na execução desta tarefa, sobretudo através do recurso a veículos autónomos, devido ao seu baixo custo de operação e maior eficiência. Neste contexto, o projeto RaMP propõe o desenvolvimento e capacitação de veículos autónomos submarinos para operações de prevenção, monitorização, fiscalização e resposta a eventos de poluição marinha. Em atuação conjunta com as atuais ferramentas de modelação numérica, pretende-se contribuir para minimizar os custos inerentes às operações referidas, aumentar a sua rapidez e facilitar a identificação das fontes poluidoras. A otimização da trajetória dos veículos autónomos submarinos requer a utilização de dados gerados por modelos operacionais, que fornecem a infra-estrutura de apoio à tomada de decisão pelas autoridades, bem como informações relevantes sobre a dinâmica estuarina. Com este objetivo, foi desenvolvido um modelo operacional hidrodinâmico tridimensional da Ria de Aveiro, baseado no DelfT3D model suite, visando a previsão em tempo real da elevação da superfície livre e da distribuição horizontal e vertical da velocidade da corrente. O modelo desenvolvido tem oito camadas verticais, com uma resolução variável entre 1200 metros (junto à fronteira oceânica) e 40 metros (no interior da laguna), sendo forçado pela maré, caudal fluvial e vento. O modelo foi calibrado através da comparação dos seus resultados com observações da elevação da superfície livre, revelando uma elevada precisão. O modelo foi operacionalizado para simular diariamente de forma autónoma a hidrodinâmica da Ria de Aveiro, com previsões com um horizonte temporal até 4 dias, utilizadas para otimização das rotas de veículos autónomos submarinos.

P10. Impacto da poluição emitida pelo transporte marítimo: o caso de estudo da Ria de Aveiro

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O transporte marítimo é responsável por uma série de diferentes pressões que afetam o ambiente marinho, a qualidade do ar e o bem-estar humano. Relativamente ao ambiente marinho, estas pressões estão relacionadas com descargas diretas para o mar de águas poluídas (resultantes de atividades humanas a bordo e de dispositivos de controlo da poluição atmosférica) ou tintas anti incrustantes. Assim, prevê-se que as massas de água costeiras e interiores sofram deterioração substancial da qualidade da água, tais como acidificação ou eutrofização, bem como elevados níveis de metais e hidrocarbonetos aromáticos policíclicos (HAPs). Neste sentido, este trabalho pretende investigar o impacto das emissões poluentes resultantes do transporte marítimo nas zonas costeiras, usando a Ria de Aveiro como caso de estudo. Esta laguna alberga uma importante zona portuária, é altamente produtiva, e acolhe uma grande diversidade de habitats e diversas unidades de aquacultura, pelo que a poluição deste ambiente resultante do transporte marítimo representa uma ameaça para os serviços do ecossistema e para a sua biodiversidade.

A metodologia seguida consiste na implementação e exploração do modelo numérico Delft3D para a região em estudo, visando simular com precisão a sua hidrodinâmica e o transporte de traçadores passivos. Neste estudo é efetuada uma análise preliminar, através da simulação da trajetória de traçadores passivos através do recurso ao módulo PART do modelo Delft3D, com o objetivo de identificar eventuais regiões preferenciais de acumulação de poluentes, tendo em conta as emissões dos navios e os processos de transporte oceânico. A estratégia seguida consiste em libertar partículas ao largo nas regiões de maior tráfego e nas zonas portuárias, e acompanhar ao longo do tempo a sua trajetória. De um modo geral, os resultados preliminares sugerem que zonas mais a montante da Ria de Aveiro onde o tempo de residência é maior atuam como sumidouros e, portanto, são zonas mais suscetíveis à poluição pelas substâncias emitidas pelos navios.

P11. Variabilidade oceanográfica na costa portuguesa: implicações na abundância em algumas espécies de pescado

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A monitorização de stocks de pesca e o esforço de pesca constituem tópicos atuais referidos na literatura. A variação da abundância de pescado é frequentemente relacionada com condições meteo-oceanográficas do oceano como a temperatura da água e a distribuição de fitoplâncton ou a intensidade e direcção do vento. Mudanças na biodiversidade marinha são muitas vezes associadas a actividades humanas de pesca, que contribuem para a diminuição de stocks em oceanos costeiros. Assim, a avaliação de como as condições meteo-oceanográfica podem afectar a abundância de pescado é um tópico actual e de interesse para a comunidade científica. O objetivo deste trabalho é estudar a variação de parâmetros meteo-oceanográficos para a costa portuguesa e obter uma relação com a abundância de pescado, tendo como referência as quantidades de peixe que chega às lotas.

Este trabalho usa dados meteo-oceanográficos obtidos na plataforma Copernicus e dados de esforço de pesca fornecidos pela Direcção Geral de Recursos Naturais (DGRM). O período em análise é compreendido entre fevereiro de 2019 e dezembro de 2020. Em termos espaciais, a temperatura da superfície do mar apresenta uma variabilidade sazonal com valores mais elevados no Verão, sendo que a concentração de fitoplâncton apresenta valores mais elevados nos meses de abril a setembro. Resultado consistente com um aumento da influência de ventos de norte, que transportam águas de camadas mais profundas, mais frias e ricas em nutrientes para a costa Portuguesa. A distribuição sazonal de espécies por região, mostra que a região centro foi a região com maior número de descargas. O carapau (*Trachurus trachurus*) e a sardinha (*Sardina pilchardus*) com um peso total de 5490 toneladas foram as espécies mais capturadas com 51% e 40% respectivamente do total das descargas. A salinidade e a temperatura da superfície do mar são entre os parâmetros avaliados os que apresentam uma maior correlação com a abundância das espécies. Este estudo ao permitir identificar fatores responsáveis pelas mudanças na abundância e distribuição espacial dos stocks de peixes explorados poderá contribuir para implementar sistemas de gestão mais eficazes.

P12. Relation between *Arte Xávega* and Environmental Factors: Espinho's study case

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Fisheries all over the world remain an important economic, social, and cultural resource. Portugal has a long relied on fishing as a major means of subsistence with the exploitation of fisheries resources being traditionally dominated by small-scale coastal and estuarine fisheries. Many coastal communities depend almost exclusively on fisheries and related activities, where local, artisanal fisheries remain socially and economically important. Located in the north of Portugal, Espinho is a small fishing village, established thanks to "Arte Xávega", a traditional fishing art known as beach seine fishery. The main target species of this fishery are small pelagic fish. In Portugal, there are several studies on the catches and discards of the beach seine fishery but few that explore the relationship between catches of beach seine and environmental conditions.

Within this work, we have studied the correlation between landings and environmental data over a period of 9 years in Espinho area. Landing data (from 2010 to 2020) was obtained through DGRM, and Environmental data (i.e., Sea Surface Temperature, Salinity, Chlorophyll-a) were retrieved from *Copernicus* website. Discards of this fishery were also monitored weekly between June and September 2021 to characterize the rejected species since no similar studies were done in the area until now.

During the 11 years studied, a total of 57 species were caught, from which only 4 appeared in all years (i.e., *Trachurus trachurus*, *Scomber japonicus*, *Sardina pilchardus*, *Loligo vulgaris*). The years 2016 and 2017 reported the highest catches numbers. Of all the factors tested, temperature was the only one significantly correlated with the landing data. A total of 36 species were discarded during the monitoring study, from which 58% had commercial value but did not present the minimum legal catch sizes to be sold.

This study, with information on how environmental factors can influence the abundance of catches of beach seine species will contribute to understand patterns and will provide information for turning this type of fisheries more efficient

P13. Estudo sobre a cobertura espacial e temporal da rede Argo no Atlântico Nordeste

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A reconhecida necessidade de aumentar o conhecimento científico sobre o oceano tem vindo a potenciar o investimento no desenvolvimento e instalação de plataformas autónomas de observação que permitam monitorizar e melhor compreender os fenómenos oceanográficos. As novas tecnologias (fontes de energia, meios de comunicação e capacidade de armazenamento de dados) e instrumentos de medição de parâmetros oceanográficos (novos e mais sofisticados sensores) vieram aumentar consideravelmente a cobertura espacial e temporal destas plataformas. Os flutuadores Argo são instrumentos autónomos e derivantes que medem um conjunto de parâmetros (e.g., temperatura, salinidade, oxigénio dissolvido) ao longo da coluna de água - entre a superfície e profundidades de, pelo menos, 2000 metros - em ciclos de 10 dias, e constituem uma rede global de observação em operação desde 1998 (Wong et al., 2020). Neste trabalho descreve se a cobertura espacial e temporal de medições oceanográficas feitas a partir destas plataformas móveis no Atlântico Nordeste, na área de mar de responsabilidade nacional (Portugal Continental, Açores e Madeira) designada de METAREA II, compreendida entre 45°N e 30°N em latitude e 6°W e 40°W em longitude. Obtiveram-se os dados disponíveis desde 1998 até 2021 distinguindo-se no presente estudo os diferentes tipos de flutuadores Argo – core e biogeoquímicos. Com base nos dados obtidos foi feita a comparação entre a densidade de flutuadores Argo na área em estudo e o objetivo definido pelo programa Argo (Roemmich et al., 2019) de 1 flutuador por cada célula de 3° por 3°. Verificou-se que a rede de flutuadores Argo na área de estudo, apesar de muito relevante na geração de dados, informação e conhecimento científico, apresenta densidade inferior aos objetivos propostos. Os resultados obtidos constituem uma contribuição para a identificação das áreas sub-observadas e onde poderá ser necessário reforçar a monitorização tendo como referência o objetivo inicial do programa Argo.

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P14. Interactions and variability in Internal Waves off Cabo Mondego (Portugal)

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Satellite images show that (Internal Solitary Waves) ISWs are frequently found to propagate off Cabo Mondego [1,2], where different sources intersect along the mid-shelf and originate a naturally-occurring interaction hotspot. Understating wave-wave interactions may have important implications in the broader spectrum of ocean sciences, and satellite images are shown in this study to be a first-approach tool to survey this frequent phenomenon in coastal regions. Internal Waves (IWs) are now widely acknowledged as major contributors in ocean dynamics. In this study we also use satellite images and *in situ* data to assess the variability scales and magnitudes of coastal IW systems propagating onshore off the western Portuguese shelf. The data shows significant variability in timescales of just a few days, and hence within the waves' typical propagation lifespan. A regional ocean circulation model is used together with linear theory to assess how mesoscale variability is contributing to the observed variability patterns observed in the IWs in the SAR and in situ data. According to linear theory, the IW variability is mostly owing to variable mesoscale currents, which off the Portuguese coast typically result from geostrophic flows, eddies and upwelling dynamics. IW variability owing to changes in stratification is found to amount to about half of that in background flows, but their effect can go unnoticed within the largest contributions from mesoscale currents. One extreme event is highlighted in which IWs from consecutive tidal cycles could possibly decouple from (i.e. not traceable back to) their originating tides in just a few days and hence within their typical lifespans.

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P15. The generation of Internal Solitary Waves by buoyant gravity currents released from Tropical Instability Waves in the Pacific Ocean: satellite observations and modelling

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Internal waves (IWs) in the ocean are now acknowledged as an important source of turbulence and mixing, with the largest observations having 200 m in amplitude and vertical velocities close to 0.5 m s−1, amongst the highest vertical velocities. Their origin is mostly tidal, but an increasing number of non-tidal generation mechanisms have also been observed. For instance, non-linear Internal Solitary Waves (ISWs) have been studied in some detail near rivers, which result from density currents associated to river plumes. Hence, it is expected that, in the deep ocean, density currents may also generate ISWs. In this presentation we will show first results of ISWs in the zonal band along the equator (+/- 5° in latitude) of the Pacific Ocean, which are consistent with generation by propagating buoyant gravity currents. A satellite image dataset has been assembled with the most insightful images found for the year 2020, with along-crest orientations nearly parallel to oceanic fronts associated to Tropical Instability Waves (TIWs). These ISWs are seen within reasonable distances from the fronts (typically of the order of 10 – 100km), but maybe more, sometimes crossing the equator from North to South and from South to North. In total, 103 Level-1b Sentinel-3 OLCI images are selected (for both platforms A and B), revealing a ubiquitous phenomenon which thermal infrared SLSTR imagery suggests to be tightly linked to gravity currents and major equatorial fronts. Furthermore, numerical model simulations were carried out to determine whether the hypothesis of the generation of ISWs by the propagating density currents from these major fronts is realistic, in the hydrographic conditions observed in Warner et al. (2018). The modelling results show that the ISWs surface manifestations seen on satellite imagery match with the derived length scales in the model, with propagating velocities also in close agreement. Statistics of the observed ISWs based on sinergetic satellite observations are shown for the first time.

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P16. Sea surface temperature and productivity variability reconstruction at the Portuguese margin during the Holocene

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The current interglacial period, the Holocene, covering the last ~11.5 ky presents highly variable oceanographic conditions across the time, whereby regional patterns, such as in upwelling regions, are still poorly known. The Portuguese margin is at present, characterized by seasonal coastal upwelling with cold waters and high primary productivity during spring-summer. Considering that the planktonic foraminifera (PF) fauna is influenced by water temperature and food availability, this study reconstructs the Portuguese margin summer temperature and export productivity (Pexp) across the Holocene, using the PF fauna and the SIMMAX transfer function, at two sites under different oceanographic conditions (off Estremadura and off Sines). In the Holocene, an estimated average SST of 18.9 °C and Pexp of 76.1 gC/m^2/yr was registered in Estremadura site, while at Sines site the average SST was 21.2 °C and Pexp 55.2 gC/m^2/yr. Temporal variation reveals an early Holocene of warm SSTs and an increased Pexp at both sites, followed by a cold event, marked by abrupt drops in SST and Pexp at the Estremadura site, while at the Sines site the cooling was minor but the Pexp drop was greater. Two additional abrupt cold and low productivity events (8.2 ky and 5.2 ky) occurred during the warm and stable Holocene Thermal Optimum (HTO) at the Estremadura Site. These short cold events are well marked in the North Atlantic possibly caused by freshwater input from the melting Laurentide ice sheet. During these cold events, at our sites, we registered increased relative abundance of PF polar and subpolar. Without considering these short cold periods, were recorded an increase of subtropical and tropical species. During the Late Holocene, the SSTs at both sites remained constantly warm, with a high abundance of *G. bulloides* at the transition of HTO and this period. However, Pexp at the Estremadura site was relativity higher than at the Sines site probably reflecting an enhanced upwelling influence, mainly at the Estremadura site. The Estremadura site is under a stronger influence of upwelling events and riverine nutrient supply from the Tagus River.

P17. Variações Oceanográficas ao largo da Margem Ocidental Portuguesa durante o Último Milénio

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Holoceno tem sido um período dinâmico, com uma variabilidade climática secular e uma alternância de períodos quentes e frios ao longo dos últimos 11 500 anos. O mais recente intervalo frio identificado nos registos históricos e naturais (sedimentos marinhos, lacustres e fluviais), nos últimos 4000 anos, foi a *Little Ice Age* (LIA). Este intervalo, bem marcado na margem ibérica entre os sécs. XIV e XVIII, tem sido associado a temperaturas baixas, com uma grande oscilação climática, marcado por eventos extremos. Apesar de haver bastante informação sobre a variação da temperatura ao longo da LIA, há ainda muitas incertezas quanto à cronologia, padrão e magnitude espaço temporal, mecanismos físicos, e respetivos impactos no meio marinho. Com este estudo, pretende-se contribuir para um melhor conhecimento da variabilidade oceanográfica durante o último milénio, com especial atenção para as oscilações climáticas durante a LIA. Foram utilizados 3 *cores* (64-PE332 3/7; 64-PE332 4/1; PO287-6G), recolhidos ao longo de um perfil W-E cerca de 41,2°N, entre os 2000 m e os 80 m de profundidade, em locais, ao largo do Porto, com elevada taxa de sedimentação (campanhas PACEMAKER, 2011 e PALEO I, 2002). Os foraminíferos planctónicos preservados nos sedimentos, ao longo dos *cores*, foram identificados e quantificados, e as respetivas abundâncias relativas foram comparadas com os dados existentes nos mesmos cores e na área de estudo.

Resultados preliminares das abundâncias relativas durante o LIA mostram a alternância de períodos quentes e frios com o correspondente aumento e diminuição das espécies tropicais/subtropicais. No *core* mais profundo, o pico mínimo de temperatura ocorreu acerca de 1600EC, associado a um aumento em 12% da espécie polar, que poderá corresponder ao período conhecido por *Maunder Minimum*. Por outro lado, a diminuição de *Neogloboquadrina incompta* acompanhada do aumento das espécies subtropicais e *Globorotalia scitula*, pode evidenciar uma diminuição da intensidade da Portugal Current (PC), e uma maior intensificação da Iberian Polar Current (IPC), durante o inverno.

P18. ExploRarE: Exploring the potential of REEs as productivity indicators in planktonic foraminifera along western Iberian Margin

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The carbon dioxide (CO_2) emitted to the atmosphere since the Industrial Revolution led to a global, unprecedented increase of its concentration from 280 ppm to over 400 ppm [1]. The ocean has been absorbing around 30%, partly compensating the excess of atmospheric CO_2, with drastic impacts on the marine environment, including changes in productivity [2]. The Eastern Boundary Upwelling Systems (EBUS) are among the world's most productive ocean ecosystems, playing also an important role in the atmospheric CO_2 sequestration [3]. Three out of the four world EBUS are already suffering the effects of climate changes with wind intensification [1] whereas for the Canary/Iberian EBUS the consequences remain uncertain. The Iberian EBUS supports large communities that are socio-economically dependent on this system. Thus, it is critical to understand how it is responding to climate-driven changes and how it will evolve in the future. One way of addressing this question is by establishing the differences between anthropogenic and natural climate variability [1], by using productivity tracers. Though over the last 50 years, several methods have been applied to reconstruct productivity, each of them holds specific limitations. Hence, the search for more robust, high-fidelity productivity proxies is still necessary. Rare earth elements (REEs) potential as proxies to reconstruct past ocean conditions was recognized in the 80s [4], yet some related issues prevented their use as proxy until recently. REEs in planktonic foraminifera have been suggested to respond to changes in surface productivity [5]. In this project, we will investigate REEs composition in planktonic foraminifera as a potential proxy for productivity, focusing on the western Iberian Margin, as part of a highly productive EBUS that has never been investigated for this purpose. To achieve this, we will combine living and fossil planktonic foraminifera using a multi-proxy approach. This project will provide new insights on the paleoceanographic use of REEs and contribute to the development of a new productivity proxy, enabling better and more robust estimates for future climate-driven ocean conditions.

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P19. Rare earth elements/Ca ratios of planktonic foraminifera, a potential proxy for water column nutrients? The NW Iberia case study

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Rare earth elements (REEs) in planktonic foraminifera have been recognized for reflecting water mass characteristics and for their potential use as paleoceanographic proxies for sea surface biologic productivity and for water mass tracing. However, these proxies are complex and poorly understood, especially in productive coastal upwelling areas, where living planktonic foraminifera may respond to several environmental variables, and where high carbonate dissolution occurs in the sediments underlying these regions. This work reports the first data on REEs (La, Ce, Nd)/Ca ratio in planktonic foraminifera species and investigates their use as possible proxies for primary production in the upper water column off the NW Iberian upwelling system using the three most abundant species in the region (*Globigerina bulloides*, *Neogloboquadrina incompta*, *Globorotalia inflata*). The REEs/Ca of these species, of different depth habitats, seasonal abundances, and link to specific regional hydrographic conditions, were compared with the total organic carbon and traditional foraminifera productivity proxies measured on the same surface samples (Cd/Ca, Ba/Ca, δ13C, fauna). Our preliminary results show that *G. bulloides*, a species related to intense and persistent upwelling, records the highest REEs/Ca ratios studied and positive correlation to other productivity proxies, except for total organic carbon. *G. bulloides* Ce/Ca coincides with its highest relative abundance and area of more vigorous upwelling close to the coast. The La/Ca and Nd/Ca ratios from *N. incompta*, a species related to less intense upwelling conditions and less nutrients, reveal a relationship to Cd/Ca, an established nutrient proxy. While *G. inflata*, a no-upwelling species, exhibit the lowest values of REEs/Ca and no correlation with any other productivity proxies. REEs/Ca measured in different species of planktonic foraminifera seem to reflect the nutrient input by coastal upwelling and, consequently, biological primary production, corroborating the more traditional productivity proxies.

P20. "Shackleton site" unveils persistent millennial climate variability through the Pleistocene in the Iberian Margin

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The Iberian Margin is well-known as a strategic place to understand past climatic and oceanographic changes due to the rapidly accumulating sediment and comprises a high-fidelity record of millennial climate variability for the late Pleistocene. It is a very sensitive place to high and low latitude processes, and one of the few in the world where the direct correlation of marine-ice-terrestrial linkages is possible. In 2011, during the IODP 339 Site U1385 (the "Shackleton site") was drilled at a water depth of 2582 mbsl, with a total depth of 155.9 m below the seafloor in multiple holes. The oxygen isotope record confirms that Site U1385 contains a continuous record of hemipelagic sedimentation from the Holocene to 1.45 Ma (MIS 47). Published results from Site U1385 establish the great promise of the Iberian margin to yield long and reference records of millennial-scale climate change and for land–sea -ice comparisons. The Sea Surface Temperature (SST) and the major oceanographic shifts were recorded on the Iberian Margin records for the last 1 million years. This data allowed us to identify major climatic disruptions, the MBE and MPT, the increasing glaciations at MIS 22 (~900ka event), and also the high temperatures even during the so-called "luke-warm" interglacials, and extremely cold stadial events linked with the meltwater discharges into the NE Atlantic. Here we present, for the first time, the completed U1385 record of SST and water masses shifts over the last 1.45 Ma. The new data show an entire interpretation of the one major climatic transition, MPT, and helps to understand the underlying mechanisms on glacial/interglacial and, also at centennial to millennial scales. This SST record for this reference site will fulfill the puzzle to document past hydroclimate changes and their relation to global climate change. Even more important, in a few months the new IODP Expedition 397 will extend this remarkable sediment archive through the Pliocene.

P21. Importância das condições hidrodinâmicas no estado trófico da Ria Formosa

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Os sistemas costeiros, na interface entre os ecossistemas terrestres e marinhos, são ambientes normalmente produtivos, com relevância socio-económica, que providenciam numerosos serviços ecossistémicos e que, por isso, interessa preservar e proteger. Neste contexto, são muito procurados pelo Homem e, em consequência, uma das pressões antropogénicas mais importantes que aí ocorrem, e que contribuem para a alteração da sua qualidade, é a descarga de águas residuais. Contudo, a influência das condições hidrodinâmicas é determinante para explicar o seu impacto espacial e em conjugação com a situação de maré. Para avaliar a influência da dispersão das águas residuais em águas costeiras e o seu efeito sobre o estado trófico pode usar-se o índice TRIX (1), como recomendado pela Agência Europeia do Ambiente (2). Este índice integra quatro parâmetros chave de qualidade da água (clorofila *a*, oxigénio dissolvido, azoto e fósforo) e representa uma ferramenta eficaz na avaliação do estado trófico das águas marinhas costeiras, transmitindo de forma simplificada informação que pode ser usada por gestores ambientais e/ou decisores. Este trabalho pretendeu avaliar o impacto da descarga de efluentes tratados das principais ETAR da Ria Formosa durante 2018-2020, ao longo de gradientes de dispersão, em condições de maré contrastantes (baixa- e preia mar, em maré morta e maré viva). Este trabalho pretendeu ainda fazer uma análise da evolução histórica do estado trófico da Ria Formosa nos últimos 20 anos. Entre as áreas de estudo, a maior extensão do impacto das descargas foi encontrada nas áreas das ETAR de Faro, seguido da área da ETAR de Almargem em Tavira e, por fim, nas áreas das ETAR de Olhão. Estes resultados demonstram que o estado trófico não depende somente da carga dos efluentes, mas também da localização dos pontos de descarga e das condições hidrodinâmicas. Verificou-se ainda uma melhoria substancial da qualidade da água com a distância ao ponto de descarga das ETAR, em particular na estofa de enchente, dada a elevada taxa de renovação que ocorre na Ria Formosa. Ao longo dos últimos 20 anos registou-se igualmente uma melhoria da qualidade da água.

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P22. Impact of Morphologic Changes on the Ria de Aveiro Lagoon Hydrodynamic and Salinity Patterns: A Modelling Study

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Shallow coastal lagoons are extremely dynamic environments, vulnerable to small morphological modifications that can induce irreversible changes of the local hydrodynamic and salinity patterns. Thus, this work aims to assess the hydrodynamic and salinity changes induced by morphological modifications in a coastal lagoon, the Ria de Aveiro (located at the Atlantic coast of Portugal). The methodology used followed two main steps: 1) To identify the main morphological changes that occurred between 1987 and 2020; 2) To analyze the evolution and quantify the changes in the hydrodynamics and salinity patterns. This last step was done through the exploitation of a hydrodynamic model (Delft3D) implementation for past (1987) and present (2020) bathymetric scenarios. This implementation was validated against a remarkable database containing tide gauge (1987/88, 2013, 2016 and 2019), and salinity (2013/14) in situ data. From the analysis of the bathymetric data it was found that the lagoon main channels have deepened from 1987 to 2020. Regarding the model implementation developed, it revealed a good accuracy on representing the hydrodynamic and salinity patterns, with measured NRMSE values between 4 and 25% of the local water level range, and 5 to 43% of the local salinity range. The amplitude and phase of the main tidal constituent M_2, salinity, current velocity, and tidal prism values were calculated for 1987 and 2020 bathymetric scenarios, and the changes between the years referred above were quantified. Generally, tidal amplitude, tidal prism and salinity increased in the whole lagoon along the time analyzed in response to the lagoon general deepening, while the tidal phase lag decreased, with the highest changes observed on the heads of the channels. Regarding current velocities, the values increased mainly in the lagoon inlet and São Jacinto Channel. The effects of the deepening of the inlet and of the main channels were studied separately to explain the observed changes, demonstrating that, although the deepening of the inlet had contributed to the changes observed between 1987 and 2020, those were mainly due to the deepening of the lagoon main channels.

P23. Sea outfall turbid plume monitoring offshore Aveiro – a preliminary high-spatial-resolution satellite imagery study

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The coastal environment has been struggling to balance its environmental state due to anthropogenic pollution inherent to Human development. To alleviate the pressure of municipal wastewater pollution in the coastal lagoon of Ria de Aveiro, the São Jacinto maritime outfall was built in 1998, aiming to discharge water from the water treatment plants distributed around the lagoon. The water quality monitoring is essential to assess its environmental impact and remote sensing can improve monitoring strategies in this context. However, limited literature is available regarding sea outfall monitoring using remote sensing. In addition, these works were carried out a few years after the outfall became operational. In this context, this work aims to produce preliminary data about the sea outfall plume's dispersion monitoring through Copernicus Sentinel-2 mission true colour imagery and to investigate visible traces of the interaction between the sewage water mass and the Ria de Aveiro ecosystem. Results proved the high spatial resolution imagery is adequate for qualitatively monitoring the local scale event, suggesting that the outfall's plume was more evident during winter and autumn. In addition, the coastal drift current and the Ria de Aveiro's runoff can restrict the marine outfall's dispersion superficially. Finally, the water exchange between the marine outfall water mass and Ria de Aveiro can happen under specific conditions. Therefore, for future work, it is suggested to sample water to quantify the wastewater's mass biochemical parameters near the Ria de Aveiro mouth when those conditions are present. It would be advantageous to run a hind-cast simulation with the sea outfall's real operational data to compare the results obtained with the images available of the wastewater plume, then to continue monitoring the region when the true colour data faces the inherent constraints. As the correct environmental evaluation still relies on analyzing seawater constituents, sampling monitoring campaigns could be carry out only for specific scenarios when implementing the new strategies. This will lead to more cost-effective environmental monitoring.

P24. Ripples: Increasing human supervision over operational assets for a persistent and efficient ocean observation

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Ripples is a communications hub for data dissemination and situation awareness in operations at sea, including oceanographic campaigns using traditional and new robotic and autonomous observation systems. It is a web-based service that is integrated within the LSTS toolchain.

The cloud service, Ripples, is a secure, persistent, and collaborative maritime data processing & analysis service aimed at high-level decision-making and situational awareness. It complements the software toolchain for command and control by improving the awareness of operators and scientists managing assets deployed in the open sea.

This software is continuously under development to achieve the goal of being capable of Multisystem Command and Control (C2). Currently, it is also undergoing a user interface overhaul to improve situation awareness and reduce workload.

This new design of Ripples aims to aid the process involving human decision-making combined with technological and physical resources applied to different roles in ocean surveys. In order to achieve these goals, it is necessary to apply human-computer interaction and data fusion techniques to display the necessary information in an easy-to-read and concise manner, thus reducing visual clutter and increasing situational awareness.

P25. Distribution of Internal Waves in the Northeast Atlantic: An Ocean Color Remote Sensing Analysis

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Internal waves occur within the water column under stratified conditions. Their range and scale are much larger than typical surface waves and have the potential to propagate along with great distances throughout the ocean. They can impact several ocean properties and processes, for instance, in the vertical displacement of water properties, sediments transport, and primary production. This can affect higher trophic levels, such as cetacean dispersion.

The main aim of this study is to characterize the spatial and temporal distribution of internal waves in the Macaronesia and Iberian Coast regions, using remote sensing as a tool to observe and map these waves. It is established that radar imagery is the most widely used method for observing internal waves. In this study, however, color images of the ocean are analyzed due to recent technological advances that result in apparent benefits in observing this phenomenon. Specifically, the analysis of these images results in improved spatial and temporal coverage and the reduction of the sunglint effect caused on ocean color images. In this way, better identification of surface disturbances is obtained, making identifying internal waves through satellite observations of the ocean surface less challenging. The methodology followed comprised the download of Sentinel-3 OLCI daily products from 2018 and subsequent analysis and recording of internal wave observations.

When all the internal waves logs were collected, the data was transferred to a general region map under analysis. The hypothesis of applying the sunglint effect on internal waves observations was also verified, as well as cloud cover conditions.

The results revealed that the spatial distribution of internal waves is predominant in the Iberian Coast and the Azores Archipelago, with a significant concentration of occurrences in areas of peculiar bathymetry. A seasonal pattern was found regarding the temporal distribution, predominately between April and September, when sunglint parameters were more noticeable.

P26. Upwelling tendencies along West and South Portuguese Coasts

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Upwelling conditions at the Iberian Peninsula, in terms of spatial and temporal variability, have been widely studied for the west and north coasts, although few works focus on the south Atlantic coast. In this context, this work intends to assess the temporal and spatial tendencies of upwelling along the west and south Portuguese coasts, comparing their patterns. We applied two different methodologies to calculate Upwelling Indexes (UI) based on reanalysis data of wind and sea surface temperature (SST), from 1979 to 2020. UI based on wind data is the perpendicular component of Ekman transport (obtained from latitudinal and meridional components of wind), pointing offshore (UI_{ET}), while UI based on SST data is the difference between nearshore and offshore SST (UI_{SST}). Positive (negative) UI_{ET} (UI_{SST}) values indicate favorable conditions (occurrence) of upwelling events. The main findings showed that the evolution of the UI_{ET} and UI_{SST} indices has a well-defined and consistent annual cycle over the years on the west coast (oscillating from negative UI_{ET} and close to zero UI_{SST} values, in winter, to positive UI_{ET} and minimum UI_{SST} values below -2°C, in summer), while on the south coast these patterns exist with greater seasonal and interannual irregularity. The analysis of the monthly variability showed that the west coast has higher upwelling favorable conditions in July, August, and September when UI is computed through wind data and in August, September and October through SST data, showing a 1-month lag between these indices. On the south coast, these conditions also exist, but with lower intensity and less consistency. In terms of spatial variability, on the west coast, there is an increase in UI_{ET} and UI_{SST} intensities towards the south and near the main capes, while the southern coast indices show higher favorable upwelling conditions and occurrences towards Cape São Vicente. The patterns and trends highlighted in this work are in syntony with the previous works for the west coast and consolidate the existing knowledge, but further research is needed for a better understanding of the correlation between UI_{ET} and UI_{SST}.

P27. Impact of climate warming in the coastal upwelling system and primary production off Portugal: a study linking classical and emergent proxies – ICW3P

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The Iberian Margin is under the influence of wind-driven coastal upwelling and belongs to the Eastern Boundary Upwelling Systems (EBUS) [1], the most productive regions of the ocean with high importance for climate regulation and global and local fisheries [2]. IPCC estimates that all EBUS will be impacted by climate change but with strong regional differences. The inherent natural variability of EBUS, together with uncertainties in future ocean dynamics (e.g., warming and freshening) and subsequent ocean current changes, poses significant challenges in projecting the response of EBUS to climate change and coupled impacts on primary production (PP) and marine ecosystem functions and resources [3, 4]. It is urgent to reduce these uncertainties to increase the reliability of future projections and better support successful governance for the conservation of marine biodiversity and living resources. Despite efforts to characterize Iberian Margin's climate variability over the late Pleistocene and reconstruct PP based on the record of microplanktonic communities [5-7], the effects of warming on total PP are still unclear. The ICW3P Project, recently funded by FCT (2022 to 2024), aims to assess PP variability on the Portuguese continental margin, over the last millennium, through a high-resolution reconstruction combining biological, biogeochemical, and genetic proxies. The project goals are 1) to reconstruct the microplankton community structure of diatoms, dinoflagellates, coccolithophores, and planktonic foraminifera; 2) to assess the value of various lipid biomarkers as PP proxies; 3) to apply sedaDNA to reconstruct community composition and test its value as a PP proxy; and 4) to distinguish the increase of PP induced by upwelling from river-derived nutrients. Sediment records offshore Porto, Lisbon and Faro will have existing proxies' resolution [8, 9] increased and novel proxies studied by a multidisciplinary international team. The project will contribute to UN 2030 Agenda SDG goals by educating young researchers, increasing the ocean literacy of the society, and providing reliable data to advance numerical modelling of PP evolution in a warming world.

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P28. 3D modelling of salt intrusion and estuarine plumes under climate change scenarios in two estuaries (NW of Portugal)

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Climate change has significant impacts on sea-level rise, circulation and mixing patterns, and water propagation in estuaries, leading to changes in spatial and temporal gradients of saltwater intrusion and estuarine plumes. Saltwater intrusion is a key concern for estuarine environments since it influences water residence times, induces important biological modifications, and affects the provision of water for coastal communities' activities. To analyze the climatic impacts on coastal systems, numerical modelling emerges as an important tool that is capable to reproduce physical, chemical, and biological interactions. The Minho and Lima estuaries are two transitional systems, adjacent to each other and located on the Portuguese northwest coast. They are subject to the same oceanic, atmospheric and environmental conditions, but have different sizes, shapes, depths and river inputs. Thus, this study aims to use a 3D model application from the Delft3D model suite to investigate the modifications, induced by climate change, on salt intrusion and estuarine plumes dynamics in these two Portuguese estuaries. The numerical model was applied to two climatic scenarios (RCP 4.5 and RCP 8.5) during summer and winter conditions. Model results revealed typical estuarine patterns, identifying the head and mouth of the estuaries as the most affected zones by climate change. Considering the cumulative impact of the sea level rise with the river flow reduction, during the dry season, the saline intrusion increases the most in the future: in the Minho estuary it reaches 15 km at the RCP 4.5 scenario, and 17 km at the RCP 8.5 scenario, and in the Lima estuary, the saltwater extends to 18 km at the RCP 4.5 scenario, and 20 km at the RCP 8.5 scenario. The estuarine plumes, during winter conditions, are larger and wider, being predicted that in the future their dimensions will reduce during the winter period, and remain unchanged during summertime.

P29. The fate of microplastics released by wastewater treatment plants in Ria de Vigo (NW Iberian Peninsula)

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Marine plastic debris is a current global concern, considering its impacts at ecological, economic, and social scales. Most of the studies related to this subject have been focused on the global ocean scale. However, over 80% of marine plastic comes from rivers and estuaries, which act as untreated drains in coastal areas. The accumulation of plastic waste in estuaries is growing due to the increase in their use in the daily life and their inadequate treatment on wastewater plants (WWTPs). The Ria de Vigo is the southernmost coastal embayment of the Rias Baixas located on the northwest coast of the Iberian Peninsula. The Verdugo-Oitavén river is the main tributary of the Ria de Vigo, with a discharge 2.6 times higher than that of the WWTPs, and therefore may be a potential microplastics (MPPs) source to the system. Hydrodynamic and particle-tracking models were validated and used to improve the knowledge about the fate, distribution and concentration of MPPs released by WWTPs in the Ria de Vigo. The model was validated by comparing simulation results with in-situ concentrations of MPPs detected in mussels collected at different sampling stations in the estuary throughout autumn 2016. The numerical simulations accurately reproduce the distribution of the MPPs pattern in the Ria de Vigo, allowing to simulate the effect of tides during the WWTPs emission on the fate and distribution of MPPs. Results showed that the Vigo WWTP is the main driver of MPPs to the Ria de Vigo. Besides, 21% of the released MPPs reach the adjacent ocean, 24% of them remain anchored around the Cies Islands and a negligible percentage reaches the upper estuary when the emission occurs under ebb on spring tide conditions. A negligible number of released MPPs is exported to the nearby ocean, when the emission occurs under neap tide conditions. This research can provide a useful tool to support in the identification of monitoring processes and removal of debris.

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