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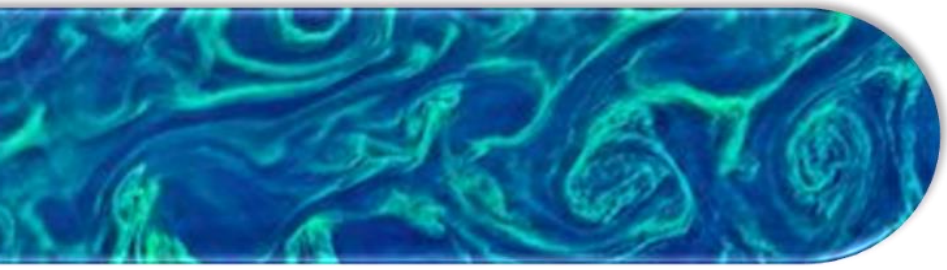
Associação Portuguesa de Oceanografia



Encontro de Oceanografia

24 e 25 de Maio 2019

Peniche

ASSOCIAÇÃO PORTUGUESA DE OCEANOGRAFIA

Constituída em 2013 por reformulação da antiga Associação Portuguesa de Paleoceanografia, a **Associação Portuguesa de Oceanografia** (APOCEAN) é uma sociedade científica cujos principais objectivos 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 geral 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 já está representada na quase totalidade de instituições, Laboratórios e Unidades de Investigação com actividade no domínio da Oceanografia ou em campos de investigação ligados ao oceano.

Este ano a APOCEAN promove o **Encontro Nacional de Oceanografia**, nos dias 24 e 25 de Maio em Peniche.

Encontro de Oceanografia 2019

Peniche

Organização

apocean – Associação Portuguesa de Oceanografia

Email: encontrooceanografia@gmail.com

Comissão Organizadora:

Lélia Matos

Luísa Lamas

Renato Mendes

Teresa Carmo Costa

Apoios:

PAXÁ WINES

http://paxawines.pt/

Alojamento e Como Chegar

Este ano o Encontro será em Peniche, a cidade mais ocidental da Europa Continental, península banhada pelo oceano Atlântico

O Hotel Mar e Sol, situado na praia de S. Pedro de Moel, e onde decorrerá o Encontro, dispõe de quartos duplos e individuais, com buffet de pequeno-almoço incluído.

O Hotel Star Inn Peniche, está localizado frente à Praia Cova da Alfarroba e a escassos metros do centro da cidade.

O alojamento proposto no registo é em regime de quarto duplo, mas caso pretenda quarto individual será aplicada uma taxa adicional de 25€. No caso de preferência por quarto duplo, e na ausência de indicação de companheiro de quarto, a organização reserva-se ao direito de distribuir os participantes pelos quartos.

De carro:

- Vindo do Porto: A1 (direção a Lisboa), saída 9 com ligação à A8 (direção a Lisboa), saída 14 com ligação ao IP6 em direção a Peniche.

- Vindo de Lisboa: A8 (direção a Leiria), saída 14 com ligação ao IP6 em direção a Peniche.

Rede Expressos: Serviços regulares de autocarros ligam todas as cidades, vilas e principais localidades de Portugal. Para informações detalhadas sobre percursos, horários e preços não deixe de consultar a Rede Nacional de Expressos em www.rede-expressos.pt.

ASSEMBLEIA GERAL DA ASSOCIAÇÃO PORTUGUESA DE OCEANOGRAFIA

Caros sócios da APOCEAN,

Nos termos do disposto no artigo décimo-primeiro dos estatutos, convoco uma Assembleia Geral da Associação Portuguesa de Oceanografia – APOCEAN, a reunir em sessão ordinária, no Hotel Star Inn Peniche, Estrada do Baleal, 2520-206 Peniche, no dia 25 de Maio de 2019, pelas 11:30 horas, com a seguinte ordem de trabalhos:

1. Apresentação, discussão e aprovação do relatório de atividades.
2. Apresentação, discussão e aprovação do relatório de contas.
3. Admissão de novos Associados.
4. Eleições aos corpos gerentes.
5. Discussão do plano de atividades para o período 2019-2020.

João Miguel Dias

O Presidente da Mesa da Assembleia Geral

Programa

Sexta-feira, 24 de Maio

10h00m – 11h00m	**Recepção**
11h00m – 11h15m	**Sessão de abertura**

Sessão I

Moderadores: Lélia Matos e Renato Mendes

Palestra Convidada

11h15m – 12h00m	Dinâmica de submesoscala: algumas considerações e perspectivas futuras da deteção remota por satélite **Da Silva JCB**, Santos-Ferreira A
12h00m – 12h15m	A first catalogue of internal waves in SAR imagery for summer 2018 and their relationship with atmospheric forcing within the framework of project HabWAVE **Pires AC**, Oliveira PB, Magalhães JM
12h15m – 12h30m	Sistemas de observação do oceano no apoio à gestão dos ecossistemas marinhos **Santos AMP**, Carvalho AJ, Guedes Soares C, OBSERVA.PT, OBSERVA.FISH teams
12h30m – 12h45m	Climatologia marinha de alta resolução na costa Ibérica no projecto CLIMENA **Bernardino M**, Guedes Soares C
12h45m – 13h00m	O Projecto TROANTE e a Componente de Oceanografia **Sousa FM**
13h00m – 14h30m	**Almoço**

Sessão II	
Moderadores: Ana Pires e Nuno Cordeiro	
14h30m – 14h45m	Evolution of Ocean Heat Content Anomalies in the North Atlantic Basin **Carmo Costa T**, Teles-Machado AM, Dutra E, Ortega P
14h45m – 15h00m	Heat, salt and the mixed layer: ventilation in the Northeastern Atlantic **Teles-Machado AM**, Carmo Costa T, Peliz A
15h00m – 15h15m	Trends of Marine HeatWaves in the Atlantic Ocean **Plecha S**, Soares PMM
15h15m – 15h30m	Field Report and Lessons-Learned: Exploring Fronts with Multiple Robots de Sousa JB, **Mendes R**, Costa MJ, Pinto J, Dias PS, Pereira J, Lima K, Ribeiro M, Lukaczyk T, Tomasino MP, Magalhães C, Belkin I, Skarpnes K, Rajan K, Lopez Castejon F, Gilabert J, Mirmalek Z, Chekalyuk A.
15h30m – 15h45m	Trajectory optimization for marine vehicles in ocean flows **Aguiar M**, de Sousa JB, Dias JM, Estrela da Silva J, Mendes R, Ribeiro AS
15h45m – 16h00m	**Pausa para Café**
Sessão III	
Moderadoras: Sandra Plecha e Teresa Rodrigues	
16h00m – 16h15m	Gestão de Dados? Para quê? **Almeida S**
16h30m – 16h45m	DQEM - uma lei a favor da Oceanografia? **Oliveira PB**
Palestra Convidada	
16h45m – 17h00m	Ocean and Coastal Information for sustainable development: Why Collaborate? **Moutinho JL**
17h00m – 17h30m	**Sessão de Discussão e Debate**
17h30m – 19h00m	**Sessão de Posters**
20h00m	**Jantar Social**

POSTERS

1. SAGA - Sistema de Apoio à Gestão PortuáriA
Almeida S, Pinto P, Madeira F, Alves M, Guerreiro R, Grosso N

2. DORIS - Developing an autonomous surface vehicle for measuring marine surfactants at the Ocean-River Interface System
Baptista I, Galante J, Mendes R, Magalhães JM, Santos B, Ferreira AS, Almeida A, de Sousa JB, da Silva JCB

3. Coccolithophore productivity at the western Iberian Margin during the middle Pleistocene (310 – 455 ka) – evidence from coccolith Sr/Ca data
Cavaleiro C, Voelker A, Stoll H, Baumann KH, Kucera M

4. Precipitation of Authigenic Calcite and Aragonite at Yinazao Serpentinite Mud Volcano
Freitas M, Magalhães V, Azevedo MR, Pinheiro L, Salgueiro E, Abrantes F

5. Quality Assessment of the ESA SST CCI product over the Eastern Atlantic using Historical in-situ Data
Lamas L, Esteves R, Azevedo E, Correia C, Reis F, Barroqueiro TP

6. Late Pliocene-Early Pleistocene changes in the Mediterranean Outflow Water at the Southwest Iberian margin: a benthic foraminifer record
Lopes A, Alonso-Garcia M, Salgueiro E, Rodriguez-Diaz CN, Kuhnert H, Groeneveld J, Rodrigues T, Soares W, Voelker A, Abrantes F

7. Increased southern-sourced water in the Florida Strait during the last glacial: a cold-water coral record
Matos L, Colin C, Frank N, Wienberg C, Hebbeln D

8. Highly variable surface-water conditions off southern Portugal during mid Pleistocene Marine Isotope Stages 20 to 24
Mega AM, Salgueiro E, Voelker AHL

9. The Iberian Peninsula in a warmer world: learning from Quaternary super-interglacials
Oliveira D, Naughton F, Desprat S, Rodrigues T, Grimalt J, Martrat B, Voelker AHL, Trigo R, Polanco-Martínez J, Hodell D, Abrantes F, Sánchez Goñi MF

10. Factors controlling the depth habitat and spatial distribution of living planktonic foraminifera in the subtropical eastern North Atlantic
Rebotim A, Voelker A, Jonkers L, Siccha M, Schulz M, Kucera M

11. “Warm Worlds” Features and lessons from Past Interglacials “warm periods” during the last 1.5 Ma
Rodrigues T, WarmWorld team members

12. Planktonic foraminifers’ δ 13 C: exploring venues to a more robust nutrient proxy
Salgueiro E, Castro CG, Zuñiga D, Rufino M, Groeneveld J, de la Granda F, Villacieros-Robineau N, Alonso-Pérez F, Voelker A, González-Álvarez R, Abrantes F

13. Changes in monsoon patterns during the Middle Pleistocene Transition: a diatom record from IODP core U1427
Ventura C, Lopes C

Sábado, 25 de Maio

Sessão IV	
Moderadores: Luísa Lamas e Jorge Magalhães	
09h00m – 09h15m	Dispersal models for deep-water Penaeid shrimp larvae: the case of Parapenaeus longirostris **Pires RFT**, Peliz A, dos Santos A
09h15m – 09h30m	Convecção Salina gerada / formada na Esteira de Água Quente de uma Ilha montanhosa **Azevedo CC**, Camargo C, Alves JMR, Caldeira R
09h30m – 09h45m	Islands as eddy transformation and generation hotspots: CaboVerde case study **Cardoso C**, Caldeira R, Relvas P, Stenger A
09h45m – 10h00m	Madeira tip jets, seu impacto no oceano **Alves JMR**, Caldeira R, Miranda PMA
10h00m – 10h15m	Soliton propagation windward of Madeira Island **Caldeira R**, Bruno M, Reis J, Gomiz-Pascual JJ, Vieira R, Navarro G
10h15m – 10h30m	The Azores Current Eddies near the Mid Atlantic Ridge **Silva SM**, Peliz A
10h30m – 10h45m	E a Contra-Corrente dos Açores, pá? **Peliz A.**
10h45m – 11h30m	**Pausa para Café**
11h30m – 13h00m	**ASSEMBLEIA GERAL APOCEAN**
13h00m – 14h30m	**Almoço**

Sessão V	
Moderadoras: Dulce Oliveira e Ana Machado	
14h30m – 14h45m	papel do estuário do Guadiana na fertilização da zona costeira adjacente, situação de Inverno 2019 **Correia C**, Torres AF, Rosa A, Cravo A, Jacob J, de Oliveira Júnior L, Garel E

14h45m – 15h00m	Papel das barras do setor oeste da Ria Formosa nas trocas de massa com a zona costeira adjacente – efeito dos mecanismos forçadores **Cravo A**, Jacob J
15h00m – 15h15m	Observations and modelling of the shelf circulation seasonal cycle near Cape Silleiro **Cordeiro N**, Barton D, Nolasco R, Dubert J
15h15m – 15h30m	Dynamics of inner shelf flow inversions at the northern margin of the Gulf of Cadiz **De Oliveira Júnior L**, Garel E, Drago T, Relvas P
15h30m – 15h45m	Regimes de transporte costeiro na margem sul da ilha da Madeira **Reis JC**, Silva G, Azevedo CC, Caldeira R
15h45m – 16h00m	Traçadores sedimentares aplicados ao estudo da dinâmica sedimentar na zona costeira **Silva PA**, Ferreira C, Bernabéu A, Romão S, Taborda R, Duarte J, Abreu T
16h00m – 16h15m	Biogeochemical buffering capacity of Ria Formosa coastal lagoon **Rosa A**, Correia C, Jacob J, Cravo A
16h15m – 16h30m	Characterization and significance of the Pockmarks field in the Estremadura Spur, Western Iberian Margin **Magalhães VH**, Duarte D, Freitas M, Terrinha P, Ribeiro C, Pinheiro LM, Cepeda C, Correia R, PES team
16h30m – 17h00m	**Pausa para Café**

Sessão VI

Moderadoras: Lélia Matos e Emília Salgueiro

17h00m – 17h15m	Validation and Quality Assessments of HF Radar Wave Characterization Measurements in the Algarve Shore **Barros FC**, Lamas L, Barroqueiro PT, Dias J
17h15m – 17h30m	Assessment of the wave spectral characteristics offshore Portugal: Leixões and Peniche as case study **Lucas C**, Bernardino M, Guedes Soares C
17h30m – 18h00m	**Sessão de Encerramento com Entrega de Prémio APOCEAN**

RESUMOS

Palestra Convidada

DINÂMICA DE SUBMESOSCALA: ALGUMAS CONSIDERAÇÕES E PERSPECTIVAS FUTURAS DA DETEÇÃO REMOTA POR SATÉLITE

José C.B. da Silva[1,2], Santos-Ferreira, Adriana[1]

[1] IPMA, Div. de Geologia e Georecursos Marinhos, Lisbon, Portugal.
[2] CCMAR, Centro de Ciências do Mar, Universidade do Algarve, Faro, Portugal.

jdasilva@fc.up.pt

Nesta apresentação serão realizadas algumas considerações sobre processes oceânicos de submesoscala e de pequena escala, de uma perspectiva combinada em sinergia entre dados de sensores remotos de nova geração e de modelação numérica avançada. Os processos de submesoscala caracterizam-se por escalas horizontais inferiores ao raio baroclínico de deformação de Rossby do modo fundamental (<10–30 km nas latitudes médias), acima das quais as correntes são mais geostróficas. A evolução desses processos acontece tipicamente em escalas de tempo de horas-dias. Por exemplo, vórtices de submesoscala podem ser interpretados como uma manifestação de turbulência num regime marginalmente controlado por vorticidade planetária e pela estratificação estável da densidade. Serão apresentadas observações por satélite com sinergia de sensores embarcados na mesma plataforma, da missão Sentinel-3.

In this presentation we will address small scale upper ocean processes from the perspective of combined satellite remote sensing and numerical modelling. Submesoscale processes/features are those that operate on horizontal scales less than the first baroclinic Rossby radius of deformation (< 10 – 30 km at mid-latitudes), around and above which the currents are more geostrophic. Their evolution and time scales are typically hours-days. For instance, submesoscale eddies can be viewed as a manifestation of turbulence in the regime of marginal control by planetary rotation and stable density stratification. Synergy observations from satellite remote sensing, from the same platform (Sentinel-3), will be presented.

Palestra Convidada

OCEAN AND COASTAL INFORMATION FOR SUSTAINABLE DEVELOPMENT: WHY COLLABORATE?

José L. Moutinho[1]

[1] AIR Centre – Atlantic International Research Centre, Praia da Vitória, Azores

jose.moutinho@aircentre.org

The Atlantic has always been a source of inspiration to mankind. It has been a barrier but also a route to connect people of very different cultures and facing diverse challenges. Today we understand better the relevance of the Atlantic for the Earth sustainability and our wealth, but we also understand that we know little about it and its status. We also understand that many of the questions that need to be answered cannot be addressed by a single country or region in the Atlantic and that a combined effort based on a holistic approach must be developed. However, no long-term platform for cooperation exists today in the Atlantic where the efforts mentioned above can take place in a truly open and participative collaboration between governments, public administration, research and academic communities and industry. The AIR Centre challenge aims to provide a such a long-term platform building on existing infrastructures, initiatives and programs; attracting the required funding and investment for action in support of the Atlantic Ocean and Region, promoting an integrative approach to space, ocean, climate, energy and data sciences and disseminating and promoting science and innovation in the Atlantic Region.

Apresentações Orais

TRAJECTORY OPTIMIZATION FOR MARINE VEHICLES IN OCEAN FLOWS

Aguiar, M.[1*], Borges de Sousa, J.[1], Dias, J.M.[3], Estrela da Silva, J.[2], Mendes, R.[3,4], and Ribeiro, A.S.[3]

[1] LSTS-FEUP, UP, Porto, Portugal
[2] ISEP, IPP, Porto, Portugal
[3] NMEC, CESAM, DFis, UA, Aveiro, Portugal
[4] CIIMAR, UP, Porto, Portugal

m.ag@fe.up.pt

The problem of generating optimal trajectories for marine vehicles has received considerable attention from the research community. In the shipping industry, ship routing algorithms are routinely employed to reduce travel times and fuel consumption. Simulations have shown that ocean currents are a major factor affecting the effectiveness of routing algorithms. In fact, fuel savings can be significantly affected by specific patterns in the flow, indicating the need for rigorous model-based analyses and algorithms.
In the case of small autonomous marine vehicles, mission times are generally shorter than those for manned vessels, but may involve navigation through geometrically complex and spatially constrained areas while under the influence of strong, dynamic current fields. Operations in areas with tidal-driven currents also motivate the development of planning methods which are able to optimize over parameters such as the deployment time and location.
We propose an interdisciplinary approach which uses high spatial-temporal resolution forecasts of the ocean current and methods from dynamic programming to find optimal trajectories for ocean vehicles under strong current fields.
Although the method is applicable to a range of mission objectives, in this presentation we focus on the problem of planning a trajectory from a deployment position to a target area that minimizes some cost function, such as the total time taken to reach the target area. The trajectories are recovered from the solution of a nonlinear partial differential equation, which is solved numerically with a discretization consistent with that of the ocean model. The discussion is illustrated with examples using data from an ocean model of the Sado estuarine region in Portugal, simulating actual operational scenarios. We also discuss the computational complexity of the approach with a view to solving trajectory optimization problems in ocean temporal and spatial scales.

GESTÃO DE DADOS! PARA QUÊ?

Almeida, Sara[1]

[1] Instituto Hidrográfico, Lisboa, Portugal

sara.almeida@hidrografico.pt

Quando se estudam as alterações climáticas, se estabelecem indicadores de risco ou se procuram definições de padrões, é imprescindível recorrer a dados históricos.
E as questões surgem: como aceder a estes dados? Quem são as instituições que possuem determinado tipo de dados? Como chegar a eles?
E nem sempre as respostas são atempadas!
A gestão de dados pretende resolver estas questões.

O programa International Oceanographic Data and Information Exhange (IODE) da Comissão Oceanográfica Intergovernamental da UNESCO, estabelecido em 1961, tem como propósito o apoio a esta problemática. No âmbito do IODE, a formação tem estado presente desde os anos 80 do século passado. Em 2005 foi criado o núcleo de Oostende - Bélgica, e mais recentemente, em 2015, fundada a OceanTeacher Global Academy, onde decorrem vários cursos dedicados à gestão dos dados marinhos.
Com foco na implementação de boas práticas, foi criado o portal https://www.oceanbestpractices.net que é um repositório de documentos onde se podem encontrar, todo o tipo de guias ou manuais, que nos são úteis na gestão de dados.

Nas últimas décadas, são vários os projetos europeus que têm contribuído para a gestão de dados oceanográficos, desde o EURONODIM (1998-2001) e o Sea-Search (2002-2005); passando pelo SeaDataNet (2006-2011), o SeaDataNet II (2011-2015) até ao SeaDataCloud presente até 2020. O objetivo tem sido contribuir para um sistema padronizado para gestão de vários tipos de dados, sendo disponibilizadas várias ferramentas que permitem a sua manipulação, processamento e controle de qualidade, garantindo a interoperabilidade entre as diferentes instituições.

MADEIRA TIP JETS, SEU IMPACTO NO OCEANO

Alves, J.M.R.[1,2], Caldeira, R.[1,2], Miranda, P.M.A.[2]

[1]Observatório Oceânico da Madeira, Agência Regional para o Desenvolvimento da Investigação Tecnologia e Inovação, Funchal, Madeira, Portugal.
[2] Instituto Dom Luiz, Faculdade de Ciências, Universidade de Lisboa, Portugal.

jose.alves@oom.arditi.pt

A ilha da Madeira localiza-se nos subtrópicos, a uma latitude onde se observam frequentemente os ventos alísios. Esta ilha devido à sua elevada orografia cria significativas perturbações, na elevada estabilidade destes ventos. Uma dessas perturbações é a dos tip jets, jatos de vento intenso que frequentemente se observam junto aos extremos Este e Oeste da ilha da Madeira, com uma intensidade média

superior a 10 m/s. Estes jatos além de fortes perturbações na atmosfera exercem também uma relevante influência na dinâmica do oceano em redor da ilha. Recorrendo à análise de dados de satélite, de estações meteorológicas e de uma simulação numérica acoplada oceano-atmosfera é feita uma descrição destes jatos onde se revela a sua extensão e se apresentam os processos físicos que levam a uma diferença de intensidade entre os 2 jatos (Este e Oeste) e à variabilidade intra-diária. Serão apresentados os impactos dos jatos nas camadas superficiais do oceano, nomeadamente no referente à estratificação e profundidade da camada de mistura e identificadas as correntes verticais geradas por anomalias do rotacional do vento, associadas aos jatos.

CONVECÇÃO SALINA GERADA / FORMADA NA ESTEIRA DE ÁGUA QUENTE DE UMA ILHA MONTANHOSA

Azevedo, C.C.[1], Camargo, C.[2], Alves, J.[1,3], Caldeira, R.M.A.[1,3]

[1]Observatório Oceânico da Madeira, Agência Regional para o Desenvolvimento da Investigação Tecnologia e Inovação, Madeira, Portugal.
[2] Instituto Dom Luiz (IDL), Faculdade de Ciências, Universidade de Lisboa, Portugal.

catia.azevedo@oom.arditi.pt

As esteiras de água quente formam-se a sotavento de ilhas montanhosas, quando o vento é fraco e a radiação solar intensa. Na ilha da Madeira, o vento é predominante do quadrante norte, com variações para nordeste nos meses

de verão. As montanhas, com cerca de 1500m, geram vórtices atmosféricos que se propagam para sul, removendo as nuvens a sotavento.

Desta feita, o vento nos flancos acelera, enquanto na esteira da ilha (zona abrigada), tornam-se mais fracos. Com uma menor cobertura nebulosa, a superfície do oceano fica exposta a uma radiação solar mais intensa. Este aumento da radiação solar provoca o aquecimento das águas superficiais, visível nas imagens de satélite, e consequentemente, o aumento as taxas de evaporação, podendo estas atingir os 6 ºC de diferença relativamente às águas oceânicas circundantes. A persistência destas condições no período de verão contribui para a formação processos de convecção.
Cerca de 700 perfis de temperatura e salinidade foram utilizados para a caracterização e quantificação da camada difusiva (25-70m) na esteira. Estas camadas difusivas desenvolvem-se quando parcelas de água quente e densa afundam, gerando células de convecção vertical, favorecendo a formação de 'salt-fingering'. O fenómeno foi observado num sector de aproximadamente 30km, na costa sudoeste da ilha da Madeira e validado pelo cálculo do ângulo de Turner e pelo rácio de estabilidade vertical (Rρ). Em regiões oceânicas expostas ao vento, como as costas sudeste e norte da ilha, este processo termodinâmico não foi tão evidente.

VALIDATION AND QUALITY ASSESSMENTS OF HF RADAR WAVE CHARACTERIZATION MEASUREMENTS IN THE ALGARVE SHORE

Barros, F.C.[1,2], Lamas, L[1,2], Barroqueiro, P.T.[1], Dias, J[2,3]

[1] Divisão de Oceanografia, Instituto Hidrográfico, Rua das Trinas 49, 1249-093, Lisboa, Portugal, Lisboa, Portugal.
[2] Departamento de Engenharia Geográfica, Geofísica e Energia, Faculdade de Ciências da Universidade de Lisboa, Campo Grande 016, 1749-016, Lisboa, Portugal.
[3] MARE-Centro de Ciências do Mar e do Ambiente, Faculdade de Ciências da Universidade de Lisboa, Campo Grande 016, 1749-016, Lisboa, Portugal.

fc50692@alunos.fc.ul.pt

High Frequency (HF) radar systems exploit the interactions between the sea-surface and high frequency radio waves (typically between 5-20MHz) to obtain near real time measurements of the sea-surface currents (top 2 meters of the water column and as far as 200km offshore depending on the working frequency) and several wave properties such as significant wave height (SWH), mean wave period and mean wave direction up to 35km offshore with resolutions ranging from 0.5km up to 3km leading to the characterization of fundamental sea conditions at any given time and location.
These characteristics make the HF radar systems essential for several tasks as: hazardous materials spills monitoring; plastics and micro-plastics drift control; coastal and harbour security management and providing information for safety in nautical navigation.
The data collected by the two Portuguese HF radar networks (Lisbon district network and Algarve network) is managed by Instituto Hidrográfico where it is processed in near real time to produce hourly maps of sea-surface currents for these two regions.
Although sea-surface current maps already represent a fully operational HF radar product a deeper understanding of HF radar wave characterization measurements is still necessary. Consequently, a methodology is being developed to validate and to assess the quality of HF radar wave measurements in the Algarve HF radar network, where HF radar wave measurements are tested against measurements performed by several offshore and coastal ODAS buoys.

HF radar systems have proven to be useful for coastal monitoring procedures and risk prevention and as their data becomes increasingly operational, an integrated network of HF radar systems along the coast will contribute significantly for the monitoring of the coastal ocean resulting in better social, environmental and economic policy decisions.

CLIMATOLOGIA MARINHA DE ALTA RESOLUÇÃO NA COSTA IBÉRICA NO PROJECTO CLIMENA

Bernardino, M[1], Guedes Soares, C.[1]

[1] CENTEC, IST, Universidade de Lisboa, Portugal.

mariana.bernardino@centec.tecnico.ulisboa.pt

Uma melhor compreensão do clima marinho no presente e de possíveis modificações no futuro é imprescindível para inúmeras actividades marinhas e costeiras, que vão desde a otimização de rotas de navios, à avaliação do risco de tempestades, ao projeto de estruturas marítimas e à avaliação dos recursos energéticos.
A alteração climática tornou-se uma questão importante na gestão costeira, já que as potenciais alterações no clima de podão ter impactos significativos sobre as costas e as atividades humanas. O projecto CLIMENA tem como principal objectivo a produção de informação climática marítima de alta resolução para as águas costeiras ibéricas, tanto no clima actual como futuro, com o intuito de avaliar as mudanças nos regimes de ventos e ondas.
O estudo do clima marítimo histórico ao longo das águas da Península Ibérica baseia-se numa combinação de downscaling atmosférico de alta resolução e "hindcasting" de ondas. O vento de superfície e o gelo marinho obtidos de uma integração RCP8.5 do sistema EC-EARTH RCP8.5 são usados como entrada para o modelo WWIII. As informações espectrais do modelo WWIII são de seguida usadas como condições fronteira para o modelo SWAN e, juntamente com o vento de alta resolução também obtido por downscalling do EC-EARTH, são produzidas informações de ondas de alta resolução para a região costeira ibérica.
Apresentam-se resultados preliminares do projecto: estatísticas descritivas dos parâmetros de onda e vento foram obtidas, utilizando diferentes escalas temporais (anuais, sazonais e mensais). Os valores de média e desvio padrão foram calculados para a altura de onda significativa (Hs), período médio (Tm02), período de pico (Tp).

SOLITON PROPAGATION WINDWARD OF MADEIRA ISLAND

Caldeira, R.[1,2], Bruno, M[3], Reis, J[1], Gomiz-Pascual, J.J.[4], Vieira, R.[1], Navarro, G[5]

[1] Agência Regional para o Desenvolvimento da Investigação Tecnologia e Inovação (ARDITI), Observatório Oceânico da Madeira (OOM), Funchal, Madeira, Portugal
[2] Instituto Dom Luiz (IDL), Faculdade de Ciências, Universidade de Lisboa, Portugal
[3] Facultad de Ciencias del Mar y Ambientales Universidad de Cádiz
[4] Escuela Superior de Ingenieria, Universidad de Cádiz, Spain
[5] Instituto de Ciencias Marinas de Andalucía (CSIC), CadizDivisão de Geologia e Georecursos Marinhos, Instituto Português do Mar e da Atmosfera.

rui.caldeira@oom.arditi.pt

In oceanic regions the interaction of tidal currents with seamounts or sills often generate internal wave (IW) activity with important biological implications. In a stratified ocean, hydraulic jumps can contribute to the vertical excursion of the pycnocline, which can

shift from the upstream to the downstream side of a sill, in synchrony with the tidal flow. Different dynamical regimes however can cause downslope (supercritical, Fr>1) and upwelling (subcritical, Fr<1) currents to form over the sill. As a result, internal solitary waves were observed shedding windward of the island. The first evidences of internal wave activity in Madeira Island, combines data from radar images, in situ campaigns and moored instruments. Spectral analysis showed 6-8h periods, for the peak IW activity, with soliton releases just after the ebb phase, during spring-tides. Cross wavelet analysis showed a strong coherence between current speed and tidal flow. High-resolution numerical modeling captures the generation and propagation processes.

ISLANDS AS EDDY TRANSFORMATION AND GENERATION HOTSPOTS: CABO VERDE CASE STUDY

Cardoso, C.[1], Caldeira, R.M.A.[1,2], Relvas, P.[3], Stenger, A.[4]

[1] ARDITI – Agência Regional para o Desenvolvimento, Inovação e Tecnologia, Funchal, Portugal.
[2] IDL – Instituto Dom Luiz, Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal.
[3] CCMAR – Centro de Ciências do Mar – Universidade do Algarve, Faro, Portugal.
[5] LMD – Laboratoire de Météorologie Dynamique, Ecole Polytechnique, Palaiseau, França.

claudio.cardoso@oom.arditi.pt

Deep-ocean islands have long been associated with the generation of oceanic eddies in their wakes. However, their interaction with incoming eddies has seldom been considered. The archipelago of Cabo Verde is an ideal location to elucidate on this, due its: high mountains and exposure to constant north-easterly trade winds; complex island disposition and shape, with channels of varying lengths and depths; and the exposure to westward-propagating eddies generated off the African coast. Special attention is given to the interaction of incoming eddies with the island's bathymetry, along with their impacts on the local generation of eddies. Island-induced wind-shear effects are also considered. In addition, some examples of the biological response to background and locally-generated eddies are discussed. This is achieved by combining remote-sensing satellite observations for wind, Sea Surface Height and Chlorophyll a surface concentrations. Results show that the interaction between incoming background eddies and the archipelago is a recurrent phenomenon, which results in eddy deflection, splitting, merging, intensification and termination (sorted by highest number of occurrences to lowest). Local island-induced disturbances are also significant, mainly due to atmospheric effects. Such processes result in the generation of island-induced eddies and in wind-mediated eddy intensification and confinement, more often observed in the leeward group. Nonetheless, it is strongly suggested that many of the locally-generated eddies are a direct product or a by-product of the interaction of background eddies with the islands. In respect to the biological realm, a locally-generated cyclonic eddy is observed to originate a pronounced phytoplankton bloom in the vicinity of the tallest island. Nonetheless, background eddies generated off the African coast are often associated with enhanced Chlorophyll a concentrations when they intersect the archipelago. Such observations challenge the idea that local biological

productivity in deep oceanic islands are exclusively driven by island-induced mechanisms.

EVOLUTION OF OCEAN HEAT CONTENT ANOMALIES IN THE NORTH ATLANTIC BASIN

Carmo Costa, T.[1], Teles Machado, A.[1], Dutra, E.[1], Ortega, P.[2]

[1] Faculdade de Ciências da Universidade de Lisboa – Instituto Dom Luiz, Lisboa, Portugal
[2] Barcelona Supercomputing Center, Barcelona, Spain

tmcosta@fc.ul.pt

During the last decade the North Atlantic Ocean subpolar gyre experienced a record-breaking cold temperature anomaly, which peaked in the winter of 2015 and is often referred as the Atlantic Cold Blob. To understand how this feature is captured in datasets, the North Atlantic Ocean heat content (OHC) anomaly field was analyzed.
The OHC trend between 1958 and the present was investigated in several state-of-the-art ocean datasets: (i) Met Office Hadley Centre EN.4.2.1 objective ocean analysis (Hadley EN4), (ii) Estimating the Circulation and Climate of the Ocean consortium version 4 release 3 (ECCO), (iii) Mercator Ocean Global Ocean Reanalysis 1⁄4º resolution (GLORYS), (iv) Ocean ReAnalysis System 4 (ORAS4), (v) Ocean ReAnalysis System 5 (ORAS5), (vi) Ocean General Circulation Model for the Earth Simulator (OFES). Preliminary results indicate that there is still some uncertainty among the ocean reanalysis, in particular in the deep-water column. The different datasets compare best in the top layers, even though the products use distinct forcing and assimilation data and run on diverse resolutions. Evidence of consistency between the datasets exists: there is globally a positive trend in OHC, even for the deep layers of the ocean. Best correlation results are obtained for the subpolar gyre.

OBSERVATIONS AND MODELLING OF THE SHELF CIRCULATION SEASONAL CYCLE NEAR CAPE SILLEIRO

Cordeiro, N[1], Barton, D.[2], Nolasco, R.[1,3], Dubert, J.[1]

[1] Departamento de Física & CESAM, University of Aveiro, PORTUGAL.
[2] Instituto de Investigacións Mariñas IIM-CSIC, VIGO, SPAIN
[3] GOFUVI, University of Vigo, SPAIN

ngfc@ua.pt

The hydrography and circulation of the Northwestern Iberian shelf was studied for a full annual cycle, in the continental shelf near Cape Silleiro. The data analysed consisted in a series of monthly cruises across the shelf in front of Cape Silleiro with CTD stations and an upward looking ADCP moored at 75 m depth registering currents and bottom temperature for most of the period. To identify processes characterizing the full annual cycle, a ROMS-AGRIF configuration of the Northwestern Iberian Margin

was built, having as boundary conditions the Copernicus CMEMS system for temperature, salinity, currents and SSH. The atmospheric conditions for the period between November 2008 and December 2009 were introduced from a WRF configuration for the Iberian Peninsula The model results were validated with the available hydrography and currents data, through the standard method of Taylor diagram.
The different seasons were analysed by looking into the processes during events representative of particular periods of the seasonal cycle. Additionally, were calculated Empirical Ortogonal Functions of the physical properties in order to identify the main variability sources of the shelf circulation.
The exploration of the coastal circulation in these examples contributed to the understanding of the interactions between the Rias Baixas system and the continental shelf south of them.

O PAPEL DO ESTUÁRIO DO GUADIANA NO FERTILIZAÇÃO DA ZONA COSTEIRA ADJACENTE, SITUAÇÃO DE INVERNO 2019

Correia, C.[1], Torres, A.F.[1], Rosa, A.[1], Cravo, A.[1], Jacob, J.[1], de Oliveira Júnior, L.[1] e Garel, E.[1]

[1] CIMA, FCT, Universidade do Algarve, Campus de Gambelas, Faro, Portugal.

cfcorreia@ualg.pt

Os estuários representam importantes sistemas de transição, normalmente que regulam a produtividade biológica da zona costeira adjacente, através da exportação de matéria quer dissolvida quer particulada. Este estudo pretende quantificar a contribuição do estuário do Guadiana para a zona costeira adjacente numa situação de inverno. Este rio, devido à forte regulação por ação das barragens a montante, aliado à fraca precipitação que se faz sentir na região sul de Portugal, apresenta um baixo caudal (≤ 30 m3/s). Os dados foram recolhidos ao longo de uma secção reta no baixo estuário, durante um ciclo completo de maré semidiurna, de variação intermédia (2,2 m). Foram registados em contínuos dados de velocidade de corrente, através de um ADCP (Sontek 1.5-MHz) e feitas medições horárias de temperatura, salinidade pH e oxigénio, com sonda multiparamétrica (EXO2). Adicionalmente, foram recolhidas amostras de água, à superfície e no fundo, para análise de sólidos em suspensão (SS), clorofila a e nutrientes. Os nutrientes e clorofila a, foram analisados por espectrofotometria (Grasshoff et al.,1983 e Lorenzen, 1967, respetivamente) enquanto os SS por gravimetria (APHA, 2017). Nesta secção do estuário não se observou estratificação vertical, exceto na estofa de baixa-mar. Observou-se heterogeneidade no transporte de água ao longo do canal, preferencialmente para jusante na margem Oeste e para montante na região central. Os resultados mostram que os nutrientes e os SS estavam em anti-fase com a maré, ao contrário da temperatura, salinidade, oxigénio e clorofila que estavam em fase com a mesma. Globalmente, os transportes de massa foram assimétricos com uma velocidade maior e um período mais longo na vazante. Nesta situação de baixo caudal, o transporte residual indica que este estuário contribuiu para fertilizar as águas costeiras adjacentes, exportando vários kg de SS, clorofila a e

nutrientes. Contudo, esta contribuição pode ser alterada por outros mecanismos forçadores, tanto meteorológicos como oceanográficos ou descargas pontuais de fontes de contaminação ao longo do estuário.

PAPEL DAS BARRAS DO SETOR OESTE DA RIA FORMOSA NAS TROCAS DE MASSA COM A ZONA COSTEIRA ADJACENTE – EFEITO DOS MECANISMOS FORÇADORES

Cravo, A.[1], Jacob, J.[1]

[1]CIMA, FCT-Universidade do Algarve, Campus de Gambelas, 8005-139 Faro, Portugal

acravo@ualg.pt

O sistema lagunar da Ria Formosa, no sul de Portugal, apresenta uma elevada renovação diária de água devido à forte interconectividade com o oceano adjacente através das suas seis barras. Destas, o setor oeste, que engloba as três barras de Faro-Olhão, Armona e Ancão, contribui com cerca de 90% do volume de água trocado em cada ciclo de maré. Estas trocas são muito importantes pois controlam a produtividade biológica destes sistemas em permanente interação. O objetivo deste trabalho foi estimar a contribuição relativa de cada uma destas três barras em termos de água, nutrientes, clorofila a (como proxy do fitoplâncton) e material particulado (orgânico e inorgânico) em situação de maré viva e maré morta, na primavera, a estação do ano considerada a mais produtiva. Para tal, as amostras foram recolhidas de hora em hora durante ciclos de maré semi-diurnos consecutivos, conjuntamente com a medição da velocidade da corrente nas seções destas barras, onde foi estimado o seu caudal e posteriormente o transporte de água e de massa destes compostos. Os resultados contribuíram para: a) caracterizar a dinâmica desses compostos, b) compreender o papel dos mecanismos forçadores sobre as trocas entre este ecossistema e a zona costeira adjacente e c) avaliar seu impacto sobre a atividade fitoplanctónica. A comparação das três barras mostra que as trocas de nutrientes, clorofila a e sólidos em suspensão foram 1-2 ordens de magnitude mais elevadas na barra de Faro-Olhão do que restantes. Este facto deve-se ao facto da secção ser maior e mais profunda. Os dados demonstraram que as marés conjuntamente com episódios de afloramento costeiro podem importar material da costa capaz de fertilizar ainda mais este sistema, particularmente na primavera. No entanto, através de processos internos resultante de interações pelágico-bentónicas, a Ria Formosa, geralmente, exporta material (nutrientes e sólidos suspensos que incluem matéria orgânica) principalmente através da entrada de Faro-Olhão, contribuindo para fertilizar e aumentar a produtividade biológica do oceano adjacente.

DYNAMICS OF INNER SHELF FLOW INVERSIONS AT THE NORTHERN MARGIN OF THE GULF OF CADIZ

De Oliveira Júnior, L.[1], Garel, E.[1], Drago, T.[2], Relvas, P.[3]

[1] Centre for Marine and Environmental Research (CIMA), Universidade do Algarve, Faro, Portugal.
[2] Instituto Português do Mar e da Atmosfera (IPMA, I.P.) and Institute Dom Luiz (IDL), FCUL, Lisbon, Portugal.
[3] CCMAR Universidade do Algarve, Faro, Portugal.

lojunior@ualg.pt

Along the northern margin of the Gulf of Cadiz, the subtidal coastal circulation is highly polarized in the alongshelf direction, an eastward flow alternating with westward coastal counter currents (CCCs) twice a week in average. While the eastward flow corresponds to the typical coastal jets of upwelling systems (jets, hereafter), the westward CCCs are suspected to result from temporally varying factors (e.g., wind stress, alongshore pressure gradient, large scale meteorological conditions, offshore circulation). This study analyses the vertical structure of the flow when it changes direction, assuming that distinct drivers may lead to distinct flow characteristics. The subtidal alongshore flow patterns are described based on the vertical shear and time lag between surface and bed at the time of current inversion (i.e., from westward to eastward) and reversal (i.e., from eastward to westward) based on a multi-year (2008-2018) ADCP time-series offshore Armona island (23 m water depth). Results show that CCCs start mainly (64%) near the bed, with a vertical time lag of 9h on average. During inversions, CCCs tend to be barotropic in winter but vertically sheared in summer (upwelling season) in particular when the velocity prior to inversion is large. Jets also start often near the bed (40%) with an average time lag >13h but the associated shear is weaker than for inversions, and seasonal differences are not evidenced. The differences between CCCs and jets patterns denote distinct physical drivers. The lead of near bed flows for both inversions and reversals is explained by the depth dependence of the scale of turbulences (smaller near the bed than near the surface), allowing the near bed flow to adapt faster to fluctuations in particular when stratification is enhanced (in summer). However, contrarily to reversals, inversions start predominantly near the bed presumably as a result of surface pressure variations, rather than wind, as indicated by previous studies of oscillatory flows. In support, observed sea level slope in summer (from concurrent ADCPs deployment along the coast) matches remarkably the temperature rise that marks the start of inversions.

ASSESSMENT OF THE WAVE SPECTRAL CHARACTERISTICS OFFSHORE PORTUGAL: LEIXÕES AND PENICHE AS CASE STUDY

Lucas, C.[1], Bernardino, M.[1], Guedes Soares, C.[1]

[1] Centre for Marine Technology and Ocean Engineering (CENTEC), Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal

claudia.lucas@centec.tecnico.ulisboa.pt

A description of the sea wave climate through the climatic directional spectra offshore Portugal continental coast is presented. A statistical analysis of the wave parameters significant wave height (Hs) and peak period (Tp) is presented. Two points at different locations from the grid area of Leixões and Peniche were chosen. The spectral and parametric results used in this analysis were obtained from a 22-year hindcast study using the spectral wave model, SWAN. The modelling of the climatic variability of directional spectra provides reliable information of the most relevant parameters of the two locations, i.e., how the spectral parameters and their probability of occurrence vary in the regions studied. The occurrences of the spectral classes are estimated and the variability of the spectral parameters is described. The results of this study allow a more consistent knowledge of the sea states characteristics providing useful information of the wave conditions that can be used in design of civil engineering structures, in the assessment of the operability and safety of shipping and renewable energy devices.

HEAT, SALT AND THE MIXED LAYER: VENTILATION IN THE NORTH-EASTERN ATLANTIC

Teles Machado, A.M.[1], Carmo Costa, T.[1], Peliz, A.[1]

[1] IDL, FCUL, Lisboa, Portugal

ammachado@fc.ul.pt

The heat and salt content interannual variability on the Western Iberian margin were analysed using the results of a 20-year high-resolution simulation that spans from 1989 to 2008. The model results help to explain the connection between the Iberian Poleward Current intensity, temperature, and salinity. By analysing some specific winters, with different characteristics, it is confirmed that years of stronger IPC result in higher transport of heat and salt, and the development of positive anomalies of temperature and salinity. However, local air-sea fluxes are also important and explain the temperature and salinity anomalies observed in some of the winters. When anomalies are due to anomalous air-sea fluxes, their spatial extension is not confined to the margin, but extend to larger areas. Some of these events are characterized using ocean reanalysis and global data products. In the winter of 2000/2001 a negative salinity anomaly developed near the surface as a result of the strong precipitation that occurred in this winter. The winter of 2005/2006 has strong positive salinity anomalies as it marks the end of a period of approximately 3 years of anomalous atmospheric forcing in the salt budgets, that means strong evaporation and/or weak precipitation.

CHARACTERIZATION AND SIGNIFICANCE OF THE POCKMARKS FIELD IN THE ESTREMADURA SPUR, WESTERN IBERIAN MARGIN

Magalhães, V.H.[1,2], Duarte, D.[3,1], Freitas, M.[1,4], Terrinha, P.[1,2], Ribeiro, C.[5], Pinheiro, L.M.[4,6], Cepeda, C.[4,6], Correia, R.[4,6] & the PES team

[1] Instituto Português do Mar e da Atmosfera (IPMA), divisão de Geologia e Georrecursos Marinhos (DivGM), Lisboa, Portugal.
[2] Instituto Dom Luiz (IDL, LA), Portugal.
[3] Dept. Earth Sciences, Royal Holloway Univ. London, UK;
[4] Departamento de Geociências, Universidade de Aveiro, Portugal;
[5] Departamento de Geociências, Universidade de Évora, Portugal;
[6] Centro de Estudos do Ambiente e do Mar (CESAM, LA), Portugal.

vitor.magalhaes@ipma.pt

A field with more than 70 pockmarks in the Estremadura Spur outer shelf, on the Western Iberia margin, was discovered in 2011 and is the main focus of research of the PES project. High-resolution seismic reflection profiles and multibeam bathymetry allowed the characterization of the seismic sequence of a Pliocene-Quaternary basin as well as the pockmark field therein. The Pliocene-Quaternary basin developed on top of a folded, most probably, Miocene sequence. The pockmarks are found either sealed within the Pliocene-Quaternary sedimentary sequence or as depressions at the seafloor. Besides the pockmarks, several other seismic evidences of fluid migration and shallow gas accumulations are identified on the seismic dataset. No evidences of pockmarks were found below the Pliocene-Quaternary sequence. The seafloor observations with a ROV on three of those pockmarks show that, although several episodes of fluid migration and escape affected this region at present seepage seems to be mainly inactive.

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NEW INSIGHTS ON DEEP-SEA FISH COMMUNITY STRUCTURE ALONG ENVIRONMENTAL GRADIENTS

Oliveira, P.B.[1]

[1] IPMA - Instituto Português do Mar e da Atmosfera, Lisboa, Portugal.

pboliveira@ipma.pt

A 17 de Junho de 2008 foi publicada no Jornal Oficial da União Europeia (UE) a DQEM: Directiva-Quadro "Estratégia Marinha" (2008/56/CE), uma Lei que estabelece um quadro de acção comunitária no domínio da política para o meio marinho. Nos considerandos pode ler-se "O quadro legislativo deverá proporcionar uma estrutura global de acção e permitir que as medidas adoptadas sejam coordenadas, coerentes e correctamente integradas (...) é necessário prever a preparação, a nível nacional, de um

quadro adequado, incluindo operações de investigação marinha e monitorização, para uma definição de políticas devidamente documentada". Nesta comunicação apresenta-se uma reflexão sobre os desafios que esta directiva coloca aos Estados Membros da UE e a percepção do autor sobre a resposta nacional a esses desafios. Partindo do objectivo principal desta Directiva - alcançar o Bom Estado Ambiental das águas marinhas da UE até 2020 - são apresentadas e discutidas as definições e as metodologias propostas para avaliar o estado ambiental do meio marinho. Nesse percurso procura-se identificar as necessidades e as oportunidades que este quadro legal oferece, ou devia oferecer, para o aumento do conhecimento técnico-científico da oceanografia em Portugal.

E A CONTRA-CORRENTE DOS AÇORES, PÁ?

Peliz, A.[1]

[1] Instituto Dom Luiz Faculdade de ciências da Universidade de Lisboa, Lisboa, Portugal

ajpeliz@fc.ul.pt

É discutida a explicação do Corrente dos Açores como uma Pluma-Beta, focando aspectos conhecidos da sua dinâmica que parecem estar em contradição com a teoria, especialmente a questão da ausência de um escoamento de retorno claro: A Contra-Corrente dos Açores. Mostram-se resultados de modelos numéricos com aninhamento bidirecional onde, pela primeira vez, uma saída do Mediterrâneo e uma Pluma-Beta são representadas explicitamente num conjunto de experiências com crescente grau de realismo. Uma solução de circulação média obtida com a combinação de climatologia TS e trajectórias ARGO é usada para análise adicional. Estas experiências permitem o desenvolvimento de um cenário de circulação hipotético que concilia a teoria da Pluma-Beta com as observações. Propõe-se que a Corrente dos Açores é uma ramificação de uma Pluma-Beta assimétrica, onde o escoamento de retorno é uma corrente muito ampla e profunda. Isso tem implicações na circulação para oeste, pela sua interação com a topografia e, por fim, na própria Corrente dos Açores a oeste. Este escoamento de retorno constitui também o modo advectivo da Água Mediterrânica em profundidade.

A FIRST CATALOGUE OF INTERNAL WAVES IN SAR IMAGERY FOR SUMMER 2018 AND THEIR RELATIONSHIP WITH ATMOSPHERIC FORCING WITHIN THE FRAMEWORK OF PROJECT HABWAVE

Pires, A.C.[1], Oliveira, P.B.[2], Magalhães, J.M.[3]

[1] Marine and Environemental Sciences Centre (MARE), Faculdade de Ciências da Universidade de Lisboa (FCUL), Campo Grande, 1749-016 Lisboa, Portugal.
[2] Instituto Português do Mar e da Atmosfera – IPMA, I.P., Rua Alfredo Magalhães Ramalho, 6, 1495-165 Lisboa, Portugal.
[3] CIIMAR, Universidade do Porto, Rua dos Bragas 289, 4050-123 Porto, Portugal & Department of Geosciences, Environment and Spatial Planning (DGAOT), Rua do Campo Alegre 687, 4169-007 Porto, Portugal

acpires@fc.ul.pt

HabWAVE – From benthic resting stages to HAB events: understanding the role of physical-biological coupling off NW Portugal – is a project that aims at developing new forecasting capabilities for blooms of a paralytic shellfish poisoning species (Gymnodinium catenatum) that is particularly recurrent and economical relevant in the coast of Portugal. It is based on the hypothesis that oceanic internal waves (IW) and bottom currents are physical mechanisms capable of re-suspending dormant cysts of this species from sediments, allowing for planktonic blooms.
The first task within HabWAVE is to study the occurrence and the characteristics of oceanic IW off NW Portugal. Synthetic Aperture Radar (SAR) imagery is a well-established tool for this purpose. Oceanic internal waves originate from the barotropic tide and propagate in packs along the pycnocline. This results in convergence and divergence zones that in turn translate at the surface into regions of increased and decreased roughness, respectively. These patterns are seen as alternating brighter and darker bands on the SAR image. However, a number of factors can affect the characteristics of these signatures, namely the wind forcing.
All SAR images from ESA's Sentinel-1A and 1B for the period from June to October 2018 were obtained from the Alaska Satellite Facility (ASF) Vertex Data Portal, and visually inspected to detect IW signatures. The images were catalogued and grouped into four different types according to their visual characteristics: speckled, strong contrast, multi-signatures, and optimal. A preliminary analysis of this catalogue is presented by comparing the observed patterns with wind fields from the European Centre of Medium-range Weather Forecast (ECMWF) Atmospheric Model high resolution 10-day forecast. The purpose is to identify properties in the image more likely to be due to atmospheric forcing than to the properties of the IW themselves. The ultimate goal within HabWAVE is to identify the IW characteristics that are most prone to sediment re-suspension on the shelf, and therefore HAB events of G. catenatum in order to aspire to implementing a forecast system.

DISPERSAL MODELS FOR DEEP-WATER PENAEID SHRIMP LARVAE: THE CASE OF *PARAPENAEUS LONGIROSTRIS*

Pires, R.F.T.[1], Peliz, Á.[2], dos Santos, A.[1]

[1] Instituto Português do Mar e da Atmosfera, Lisboa, Portugal.
[2] Instituto Dom Luiz, Lisboa, Portugal.

rita.pires@ipma.pt

Penaeid shrimps compose highly commercially important species for worldwide fisheries. Penaeid larvae are frequent components of zooplankton samples collected on shelf areas, although usually registering low abundances. The high ecological importance of shrimps in deep-sea habitats is not reflected on the few studies addressing both larval distribution and the mechanisms intervening in their dispersal, considered essential knowledge for an ecosystem-based management of the adult populations. Penaeid larvae are found in shallower and more productive waters than the adults, where their development takes place, comprising interesting subjects for dispersal studies.
This scenario was actually found when examining summer zooplankton samples collected in the Western Iberian Margin, with larvae of the *Parapenaeus longirostris* shrimp distributed in the innershelf, contrasting with the outer shelf adult distribution. Important spatial distribution data was collected for larvae of *P. longirostris* that was the most represented Penaeid on the samples. A physical-ecological modelling approach was employed to explore the larval dispersal of the species from the release sites and the mechanisms involved in the offshore return, required for a successful recruitment and maintenance of adult populations. Parameters as larval phase duration, ontogenetic vertical migrations and sites/times of larval emission, based on the observations, were incorporated in the models and considered as drivers of the larval distribution. The main upwelling centres and submarine canyons of the area were tested as promoters of onshore dispersal and the impact on the return to adult populations assessed. The small abundances registered were addressed and related with the local hydrodynamic conditions.

TRENDS OF MARINE HEATWAVES IN THE ATLANTIC OCEAN

Plecha, S.[1], Soares, P.M.M.[1]

[1] IDL/FCUL, Lisbon, Portugal

smplecha@fc.ul.pt

All around the world an increase in water temperature extremes prolonged in time has been observed, both in frequency and duration, resulting in severe impacts on marine ecosystems structure and function and on ocean circulation. These extremes, called Marine HeatWaves (MHW), can be caused by a combination of atmospheric forcing

and oceanic conditions, reaching temporal and spatial dimension of several kilometers and persisting for several months.
Since both historic and modelled research shows that climate change is leading to an increase of extreme hot events in the atmosphere, it is not surprising to find the same pattern in the ocean. Furthermore, MHW are expected to increase in intensity and frequency under anthropogenic climate change despite the uncertainty in its magnitude. Within this work the state of the art definition for Marine HeatWaves is used, consisting in sea surface temperature (SST) data exceeding the 90th percentile of at least 5 consecutive days. The SST data used was obtained from the Phase 5 of the project Coupled Model Intercomparison – CMPI5 multimodel database, for the historical period of 1971-2000 and for a global climate models projections under the extreme Representative Concentration Pathway 8.5 (RCP8.5) scenario, for the periods of 2041-2070 and 2071-2100.
The analysis for the historical period shows an increase in MHW events frequency and duration. Under the climate change scenario, an increase of MHW events intensity and duration is expected. Although a higher frequency of these events was expected, the results indicate a decrease, justified by their longer duration.

REGIMES DE TRANSPORTE COSTEIRO NA MARGEM SUL DA ILHA DA MADEIRA

Reis, J.C.[1,2], Silva, G.[1,2], Azevedo, C.C.[1,2], Caldeira, R.M.A,[1,2]

[1] Observatório Oceânico da Madeira, Agência Regional para o Desenvolvimento da Investigação Tecnologia e Inovação, Funchal, Madeira, Portugal.
[2] Instituto Dom Luiz, Faculdade de Ciências da Universidade de Lisboa.

jesus.reis@oom.arditi.pt

A caracterização dos regimes de transporte costeiro é essencial para a compreensão e gestão das atividades antropogénicas que se desenvolvem em ambiente costeiro. Este trabalho foca-se no estudo das correntes costeiras da margem sul da ilha da Madeira, bem como no impacto que estas podem ter nos regimes de transporte de sedimentos, poluentes e/ou organismos. Foram utilizados dados in-situ provenientes de ADCPs (‘Acoustic Doppler Current Profiler’), de boias derivantes e dados de deteção remota medidos com recurso a radares de alta frequência, e com satélites de alta resolução (Landsat / Sentinel). Os resultados revelaram a formação de uma corrente paralela à costa, resultante da interação entre os processos de mesoescala e a plataforma insular, induzindo a retenção de sedimentos ao longo da costa sul da ilha. Esta corrente costeira demostra descontinuidade à superfície. A interrupção resulta de zonas de convergência à superfície, e de consequente zonas divergentes junto à costa, particularmente na zona do Cabo Girão. As imagens de satélite, bem como as trajetórias das boias derivantes, confirmam a existência desta corrente costeira que se desenvolve sobre a plataforma insular e que está muito pouco considerada em estudos de ilhas profundas. .

BIOGEOCHEMICAL BUFFERING CAPACITY OF RIA FORMOSA COASTAL LAGOON

Rosa, A.[1], Correia, C.[1], Jacob, J.[1], Cravo, A.[1]

[1] Universidade do Algarve, CIMA, Campus de Gambelas, 8005-139 Faro, Portugal

airosa@ualg.pt

UBEST project aims to improve the global understanding of the biogeochemical buffering capacity of Ria Formosa coastal lagoon, one of the most valuable ecosystems in the south coast of Portugal, and its susceptibility to future scenarios of anthropogenic inputs and climate change. For that an "observatory" was established that integrates in-situ observations and process-based numerical models. Here we will present data from a real-time monitoring station that was installed at a fixed station in an inner site of Ria Formosa, acquiring temperature, salinity, pH, dissolved oxygen, turbidity and chlorophyll a every 15 min for the last two years. This high frequency of data acquisition provided high-resolution temporal details, allowing to identify the seasonal cycle, semi-diurnal and diurnal signals, as well episodic oceanographic processes that usually are not captured by conventional campaigns. In addition, the seasonal variability along its water bodies (5), defined by Ferreira et al. (2005) under the Water Framework Directive, will also be shown, in terms of temperature, salinity, pH, dissolved oxygen, nutrients, chlorophyll a and suspended solids. These campaigns revealed that the stations at the shallowest regions with restricted circulation, located at the edges of the lagoon, had the highest variability in opposition to the boundary station (the main inlet, Faro-Olhão), particularly in summer. To better understand the biogeochemical buffering capacity of Ria Formosa, the data acquired by this "observatory" have being used to support the validation and calibration of the coupled hydrodynamic-biogeochemical model (SCHISM 3D), to predict future scenarios of anthropogenic inputs (changes in the nutrient loads) and global changes (sea level rise and changes in the air temperature).

SISTEMAS DE OBSERVAÇÃO DO OCEANO NO APOIO À GESTÃO DOS ECOSSISTEMAS MARINHOS

Santos, A.M.P.[1,2], Carvalho, A.J.[1], Guedes Soares, C.[3,4], OBSERVA.PT & OBSERVA.FISH teams

[1] IPMA-Instituto Português do Mar e da Atmosfera, I.P, Lisboa, Portugal
[2] CCMAR-Centro de Ciências do Mar do Algarve, Faro, Portugal
[3] CENTEC-Centro de Engenharia e Tecnologia Naval e Oceânica, Lisboa, Portugal
[4] IST-ID -Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento, Lisboa, Portugal

amsantos@ipma.pt

São apresentados vários sistemas de observação oceânica em desenvolvimento no Instituto Português do Oceano e da Atmosfera (IPMA) e Centro de Ciências do Mar do

Algarve (CCMAR). O projecto "OBSERVA.PT- Observações a bordo de navios comerciais nacionais para apoio à proteção e restauração da biodiversidade nos ecossistemas marinhos do Mar Português (16-01-04-FMP-002)", financiado pela UE e pelo Governo Português ao abrigo do Programa Mar2020, visa a implementação de tecnologias adequadas de monitorização do ambiente marinho (satélites e equipamento de registo automático contínuo) para a produção operacional de informações meteo-oceanográficas. Equipamentos meteorológicos e oceanográficos serão instalados a bordo de cargueiros, com rota entre Portugal Continental e Madeira, Açores e Cabo Verde (Nordeste do Oceano Atlântico). O projecto "OBSERVA.FISH - Sistemas de Observação Autónomos a Bordo de Embarcações de Pesca para Apoio a uma Gestão dos Ecossistemas Marinhos (PTDC/CTA-AMB /31141/2017)", financiado pelo Portugal2020 (UE e FCT), visa desenvolver um sistema totalmente autónomo, para instalar em todos os tipos de navios de pesca, integrando vários parâmetros meteorológicos, oceanográficos, de navegação e da actividade de pesca. Os testes operacionais serão realizados nos NI do IPMA, sendo proposto um TRL7. A instalação na frota de pesca, permitirá a recolha de dados com grande cobertura espacial e alta resolução temporal, difíceis de serem obtidos com outras plataformas de observação. O projecto "EA-RISE - Euro-Argo Research Infrastructure Sustainability and Enhancement (H2020-INFRADEV-2018-2020 No 824131)", pretende apoiar uma nova fase do Argo e tem como objectivo melhorar e ampliar as capacidades da rede (maiores profundidades e medições biogeoquímicas), para fornecer observações oceânicas essenciais para responder a novos desafios societais e científicos. O projecto é necessário para que a Europa desenvolva atempadamente a sua contribuição para esta nova fase e com novas equipas (e.g., Portugal). Uma das tarefas é desenvolver metodologias para observações Argo eficientes em sistemas oceânicos muito dinâmicos, como o Golfo de Cádis e a Corrente do Golfo.

TRAÇADORES SEDIMENTARES APLICADOS AOS ESTUDO DA DINÂMICA SEDIMENTAR NA ZONA COSTEIRA

Silva, P.A.[1], Ferreira, C.[1], Bernabéu, A.[2], Romão, S.[1,3], Taborda, R.[3], Duarte, J.[4], Abreu, T.[5]

[1] CESAM & Universidade de Aveiro, Aveiro, Portugal
[2] Departamento de Xeociencias mariñas e ordenación do territorio, Universidade de Vigo, Espanha
[3] Instituto Dom Luiz, Faculdade de Ciências Universidade de Lisboa, Lisboa, Portugal
[4] Instituto Hidrográfico, Lisboa, Portugal
[5] CESAM & Instituto Superior de Engenharia do Porto (ISEP-IPP), Porto, Portugal

psilva@ua.pt

Os estudos de dinâmica sedimentar são importantes para compreender a evolução morfológica dos sistemas costeiros como, por exemplo, as praias e as embocaduras. A interação entre o escoamento e o fundo arenoso com textura muito variável no espaço e no tempo implica uma dificuldade acrescida para efetuar medições e estabelecer formulações precisas para a avaliação do transporte sedimentar. Por esta razão, os modelos de morfodinâmica existentes consideram hipóteses muito simplificativas na

forma como caraterizam a distribuição de sedimentos depositados no fundo ou em suspensão, por exemplo, através do diâmetro mediano das partículas de sedimento, D50. As formulações para o cálculo do transporte que consideram sedimentos heterométricos são baseadas num conjunto muito limitado de estudos e resultam, geralmente, de ensaios laboratoriais efetuados em modelos reduzidos.

O presente trabalho apresenta uma experiência realizada no canal de ondas de Hannover (Großer Wellenkanal, GWK) com sedimentos heterométricos. Este canal simula a propagação de ondas sob um leito de fundo arenoso a uma escala 1:1. Foram consideradas quatro misturas de areia bem calibrada com diferentes proporções de fração fina (F, D50 = 0,21 mm) e grosseira (C, D50 = 0,58 mm): 100% F / 0% C; 75% F / 25% C; 50% F / 50% C e 25% F / 75% C. Cada mistura foi colocada no canal de ondas numa secção de teste com 30m de comprimento e 5m de largura. Um traçador fluorescente, previamente preparado com a mesma mistura de areia e tinta fluorescente, foi colocado ao longo de uma linha transversal na secção de teste. Sob a ação de ondas não-lineares regulares (com 7s e diferentes alturas de onda, 1 e 1,5 m) os traçadores movimentaram-se. Foram recolhidas amostras de sedimentos de fundo ao longo de cada ensaio com o objetivo de estimar o transporte total e fracionado de sedimentos. Para a estimativa da concentração do traçador, cada amostra foi exposta a luz ultravioleta (UV) e efetuada a análise da imagem. Nesta comunicação são descritas as experiências realizadas, o processamento das amostras recolhidas e apresentados alguns resultados preliminares relativos ao transporte sedimentar.

THE AZORES CURRENT EDDIES NEAR THE MID ATLANTIC RIDGE

Silva, S.M.[1], Peliz, A.J.[1]

[1] Instituto Dom Luiz – Faculdade de Ciências, Lisboa, Portugal.

smsilva@fc.ul.pt

The Azores Current (AzC) is the most prominent circulation structure in the Subtropical Northeastern Atlantic. It's an unstable zonal jet with prominent meanders which can evolve into free eddies. A peculiar aspect of the AzC is that it crosses two ridge systems with depths close to flow depth. Eddies of the AzC have been studied with in situ observations, satellite data and models, but their interactions with topography and the influence of the topography on the average current is practically unknown. Using 25 years of satellite altimetry Sea Level Anomaly (SLA) and SLA-derived eddy trajectories, a characterization of the Azores eddy kinematic properties (i.e. amplitude, radius and swirl velocity) and evolution above the MAR was conducted.
Two distinct vortex populations are found in the study region: above the 32ºN, vortices are generally more intense and seem to be directly related with the current meanders. South of that latitude, vortices display generally lower kinematic properties and the number of coherent isolated vortices seem to be higher. The meridional asymmetry in polarity: more anticyclones (cyclones) north (south) of the AZC axis, is confirmed for long lived eddies. In total, 210 tracked eddies cross the ridge. Only a small portion of these eddies generate away of the ridge on the East side. Most of the eddies present

over the MAR seem to have been generated locally and about 60% of them find their way to the west side of MAR. The eddy tracking statistics indicate that there is a clear influence of the MAR on the vortex evolution. However, the eddy field is largely turbulent and no clear recurrent patterns of interaction were observed.

O PROJECTO TROANTE E A COMPONENTE DE OCEANOGRAFIA

Sousa, F.M.[1]

[1] MARE – Marine and Environmental Sciences Centre & Departamento de Engenharia Geográfica, Geofísica e Energia, Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal.

fsousa@fc.ul.pt

O Projecto de ID&I "Desenvolvimento de Tecnologia UAV para Utilização de Âmbito Conjunto e Dual – TROANTE" teve início em Janeiro de 2016 e decorrerá até Julho de 2020.
No âmbito do Projecto TROANTE procedeu-se à construção de um veículo aéreo não tripulado (Unmanned Aerial Vehicle – UAV), que tem vindo a ser sujeito a inúmeros testes nomeadamente no que se refere à aeronavegabilidade e às telecomunicações. O Centro de Investigação, Desenvolvimento e Inovação da Força Aérea (CIDIFA) também já adquiriu um radiómetro de infravermelhos que será montado a bordo do UAV com o objectivo de medir a temperatura da superfície do mar (TSM) ao longo de linhas de voo que serão efectuadas frente à região dos Olhos de Água, no Algarve. Pretende-se assim detectar a assinatura térmica à superfície das Descargas de Águas Subterrâneas (DAS) identificadas através da análise de dados de CTD e de detecção remota recolhidos naquela região no âmbito do Projecto de I&D FREEZE. Está programada a realização de vários voos sobre a plataforma continental da região dos Olhos de Água, em várias épocas do ano, para identificar as anomalias da TSM que possam estar associadas às DAS.
O Projecto TROANTE é financiado pelo Ministério da Defesa Nacional e conta com os seguintes parceiros: Força Aérea Portuguesa (FAP/CIDIFA), Centro de Excelência e Inovação para a Indústria Automóvel (CEIIA), Centro de Informação Geospacial do Exército (CIGeoE), Centro de Investigação da Academia Militar (CINAMIL), Instituto Hidrográfico (IH) da Marinha Portuguesa, MARE - Marine and Environmental Sciences Centre/FCUL, Instituto Dom Luis/FCUL, Critical Software, Instituto de Telecomunicações de Aveiro e Altice Labs.

FIELD REPORT AND LESSONS-LEARNED: EXPLORING FRONTS WITH MULTIPLE ROBOTS

De Sousa, J.B.S.[1], **Mendes R.**[1,2,3], Costa, M.J.[1], Pinto, J.[1], Dias, P.S.[1], Pereira, J.[1], Lima, K. [1], Ribeiro, M. [1], Lukaczyk, T.[4], Tomasino, M.P.[2], Magalhães, C.[2], Belkin, I.[5], Skarpnes, K.[6], Rajan, K.[6], Lopez-Castejon, F.[7], Gilabert J.[7], Mirmalek, Z.[8], Chekalyuk, A.[9]

[1] Laboratório de Sistemas e Tecnologia Subaquática Faculdade de Engenharia da Universidade do Porto, Porto, Portugal.
[2] Centro Interdisciplinar de Investigação Marinha e Ambiental (CIIMAR), Universidade do Porto, Porto, Portugal.
[3] Centro de Estudos do Ambiente e do Mar (CESAM), Universidade de Aveiro, Aveiro, Portugal.
[4] FlightWave Aerospace Systems, Santa Monica, California, USA.
[5] University of Rhode Island, Kingston, Rhode Island, USA.
[6]Applied Underwater Robotics Laboratory Norwegian University of Science and Technology, Trondheim, Norway.
[7] Universidad Politécnica de Cartagena, Cartagena, Spain.
[8] Harvard University, Cambridge, Massachusetts, USA.
[9] Lamont-Doherty Earth Observatory, Columbia University, Palisades, New York, USA.

jtasso@fe.up.pt

Currently, oceanographic vessels are still the main asset for ocean field studies despite tremendous advances in long endurance autonomous underwater and surface vessels. This is expected to change soon. In fact, ships and autonomous assets have complementary capabilities and limitations:

I. Autonomous underwater, surface and air vehicles can go beyond the footprint of what a ship can do;
II. Ships carry heavy sensors and gear that cannot be presently mounted on most autonomous vessels;

III. Ships can be used to launch and recover unmanned vehicles;

IV. Endurance limitations of ships are imposed, in some cases, by the human presence onboard

In this presentation, we will discuss the lessons learned during the “Exploring the Subtropical front with multiple robots cruise” funded by the Schmidt Ocean Institute. The goal of this cruise, led by Underwater Systems and Technology Laboratory (LSTS) from the University of Porto (FEUP), was to demonstrate a novel method to observe the ocean with multiple underwater, surface, and aerial vehicles, as well with the R/V Falkor also used as the base and control center for all assets. Our approach combines a set of new technologies that enabled scientists and engineers to obtain a synoptic view of the study area, with an adjustable spatial and temporal resolution. This approach was applied to map the Pacific Ocean’s Subtropical Front.

First, the scientific and technological goals will be briefly presented as a background for the discussion on coordinated ship-robotic surveys. Second, the tools and

technologies used to enable coordinated surveys will be discussed with special emphasis on the LSTS software toolchain. Third, key aspects of the 3-week operational deployment will be described with a focus on the 24/7 operations and on the spatial and temporal footprint of the coordinated operations. Finally, short term developments and future challenges will be discussed.

Posters

P1. SAGA – SISTEMA DE APOIO À GESTÃO PORTUÁRIA

Almeida, S[1], Pinto, P[1], Madeira, F.[1], Alves, M.[1], Guerreiro, R[2], Grosso, N[3]

[1] Instituto Hidrográfico, Lisboa, Portugal
[2] Direção-Geral da Autoridade Marítima, Lisboa, Portugal
[3] Deimos Engenharia, S.A, Lisboa, Portugal.

sara.almeida@hidrografico.pt

O projeto SAGA pretende contribuir para a melhoria das condições de segurança nas zonas portuárias, assim como a salvaguarda da vida humana.
Na continuação de estudos realizados no âmbito do projeto SIMOcean (System for Integrated Monitoring of the Ocean) nomeadamente no caso intitulado "Índice do Estado do Mar nas Aproximações aos Portos", em que os locais de aplicabilidade foram Viana do Castelo, Póvoa do Varzim, Aveiro e Figueira da Foz, este caso demonstrativo resultou de uma análise das condições meteo-oceanográficas baseadas na utilização de modelos de alta resolução, com recurso a uma rede neuronal, criada a partir do estudo das diferentes situações de praticabilidade das barras.
Face aos resultados obtidos, considerámos relevante a parceria com a DGAM e a vontade de alargamento da metodologia a outros portos, de forma a construir uma ferramenta de apoio à decisão sobre a navegabilidade na zona portuária.
O projeto SAGA irá direcionar os resultados para os portos de Vila do Conde, Nazaré e Portimão. A metodologia a aplicar neste projeto irá ser idêntica à do SIMOcean, mas com a implementação do modelo DELPH 3D, que permitirá a previsão do estado do mar em zonas costeiras, com recurso a um conjunto mais alargado de parâmetros, tais como correntes de maré, ventos, agitação marítima e batimetria.
Incluído no Domínio da Vigilância Marítima no Apoio à Execução da Política Marítima Integrada é suportado pelo Programa Operacional Mar 2020 e tem comparticipação do Fundo Europeu dos Assuntos Marítimos e das Pescas. Os parceiros neste projeto são quatro instituições nacionais: o Instituto Hidrográfico, como coordenador, a Autoridade Marítima Nacional (DGAM), o Instituto Português do Mar e da Atmosfera e a Deimos Engenharia, S.A.

P2. DORIS – DEVELOPING AN AUTONOMOUS SURFACE VEHICLE FOR MEASURING MARINE SURFACTANTS AT THE OCEAN-RIVER INTERFACE SYSTEM

Baptista, I.[1,2], Galante, J.[3], Mendes, R.[1,2,3,4], Magalhães, J.M.[1,4], Santos, B.[3], Ferreira, A.S.[3], Almeida, A.[2,5], de Sousa, J.B.[3], da Silva, J.C.B.[1,4]

[1] Department of Geoscience, Environment and Spatial Planning (DGAOT), Faculty of Sciences, University of Porto, 4169 007 Porto, Portugal.
[2] Department of Biology, Department of Physics and CESAM, University of Aveiro, 3810 193, Aveiro, Portugal.
[3] LSTS, Department of Electrical and Computer Engineering, Faculty of Engineering University of Porto, 4200 465 Porto, Portugal
[4] Interdisciplinary Centre of Marine and Environmental Research (CIIMAR), 4450 208 Matosinhos, Portugal

maria.baptista@fc.up.pt

The sea surface microlayer (SML) is the boundary interface between the atmosphere and ocean which can be described as a micro habitat with a thickness between 1 and 1000 µm. It has unique biological and physicochemical properties compared to the underlying water (ULW) and plays an important role in a range of global biogeochemical and climate related processes.

Sampling the SML with conventional methods is a time consuming process (it may take up to 45 minutes to collect 1 L of sample) usually done with a hand operated glass plate or a screen sampler that should be conducted at a proper distance from a vessel to avoid contaminating and disturbing the integrity of the SML. To bypass these issues, catamarans with rotating glass drums or disks have been developed and are used. These catamarans can collect SML samples intended for the analysis of physical and chemical characteristics much quicker (one of the existing catamarans can collect 20 L of SML in one hour), with minimal disturbance. However, they are unsuited for the collection of microbiological samples and are not autonomous thus retaining a considerable logistical and workload cost for the human operator. Besides holding the advantages of other catamarans, DORIS will be an autonomous surface vehicle (ASV), with the ability to sample the SML for the analysis of surfactant films and microbiological communities.

Currently, DORIS is under development, specifically in the system analysis and system prototyping phases. DORIS will be built upon previous manned solutions and methodologies to create an automated strategy to collect surface films from the SML. Once DORIS is built, it will be tested in two specific study cases: a coastal study (Douro River plume) and an estuarine study (Ria de Aveiro). To validate DORIS, results from the analysis of the samples obtained using the new sampler and the analysis of samples obtained by the traditional method using the glass plate sampler will be compared. Despite being a prototype, DORIS will be a unique vehicle in Portugal and one of the first control autonomous vehicles in the world to sample the SML, specifically intended for microbiological analysis.

P3. COCCOLITHOPHORE PRODUCTIVITY AT THE WESTERN IBERIAN MARGIN DURING THE MIDDLE PLEISTOCENE (310-455 ka) – EVIDENCE FROM COCCOLITH Sr/Ca DATA

Cavaleiro, C.[1, 2, 3], Voelker, A.[1, 2], Stoll, H.[4], Baumann, K-H.[5] and Kucera, M.[3]

[1] IPMA – Instituto Português do Mar e da Atmosfera, Divisão de Geologia Marinha e Georrecursos Marinhos, Rua Alfredo Magalhães Ramalho 6, 1495-006 Lisboa, Portugal.
[2] CCMAR, Centro de Ciências do Mar, Universidade do Algarve, Campus de Gambelas, 8005-139 Faro, Portugal.
[3] University of Bremen, MARUM - Center for Marine and Environmental Sciences, Leobener Straße 28359, Bremen, Germany.
[4] Department of Earth Sciences, ETH Zürich, Sonneggstrasse 5, 8092 Zürich, Switzerland
[5] University of Bremen, Geosciences Department, Klagenfurter Straße 2-4, 28359 Bremen, Germany.

cdcavaleiro@gmail.com

Coccolithophores play a unique role on ocean biogeochemistry using carbon for photosynthesis (biological pump) as well as for calcification (carbonate pump). Their inclusion in global models would allow better predictions of the climate system responses to planetary change, such as atmospheric carbon dioxide and coupled temperature rise as well as ocean acidification. Still, coccolithophore paleoproductivity reconstruction has been tentative and relying on proxies dependent on the extent of the supply, dilution, sedimentation rates, and preservation conditions. This study reconstructs coccolithophore productivity based on the coccolith fraction Sr/Ca ratio in the western Iberian margin (Site MD03-2699).

We found that long-term coccolithophore productivity was primarily affected by changes in temperature and ocean circulation that lead to the predominance of different water masses in the Iberian margin. Polar and subpolar water masses during glacial substages decreased coccolithophore productivity, and the most abrupt minima were concomitant with Heinrich-type events. The predominance of subtropical and nutrient-poorer waters during interglacial substages increased competition for nutrients with diatoms, which lead to relative intermediate coccolithophore productivity levels. The transition between interglacial and glacial substages showed an increasing predominance of nutrient-richer waters, fed either by upwelling or surface waters of subpolar origin. The increasing availability of nutrients decreased the competition for nutrients with diatoms and coccolithophores reached their maxima in growth and calcification rates. During this transition coccolithophores were nonetheless forced to change their phenology due to low sea surface temperatures during spring, and the most productive season changed from spring to summer months. We suggest that this phenology change ultimately contributed to the dissonance between coccolithophore productivity, NAR and alkenone flux, as a consequence of the yearly time-window narrowing of coccolithophore productivity.

P4. PRECIPITATION OF AUTHIGENIC CALCITE AND ARAGONITE AT YINAZAO SERPENTINE MUD VULCANO

Freitas, M.[1], Magalhães, V.[1,3], Azevedo, M.R.[2], Pinheiro, L.[2,3], Salgueiro, E.[1,4] , Abrantes, F.[1,4]

[1] Instituto Português do Mar e da Atmosfera (IPMA) Algés, Portugal
[2] Departamento de Geociências, Universidade de Aveiro, Aveiro, Portugal
[3] Centro de Estudos do Ambiente e do Mar (CESAM, LA), Aveiro, Portugal
[4] Centro de Ciências do Mar, Universidade do Algarve Faro, Portugal

mmpvlf@ua.pt

Large seamount s and mud volcanoes occur in the Marianas forearc, an active non-accretionary convergent margin. These geologic structures provide a direct window to the processes occurring at the subduction zone and a t the boundary between Pacific and Philippine plates. The understanding of such geologic frames is of great importance once they are responsible for frequent and intense seismic activity, submarine slides and slope destabilization, potential triggers of natural catastrophic risks with big human impact. Furthermore, marine mud volcanism has an important role on climate change through gas release like methane besides being a gateway to several energy resources like gas hydrates

During IODP 366 expedition three serpentinite mud volcanoes were sampled from Marianas forearc. Authigenic carbonates (aragonite and calcite) were found in serpentinite dominated sediment samples from Yinazao serpentinite mud volcano (Sites U1491 and U1492), the closest mud volcano to the Marianas trench.

The aims of the present work are to understand the Yinazao features which provide authigenic carbonate precipitation and infer the major Carbon source in this system. Thereafter, propose a formation model of Yinazao authigenic carbonates by comparing them to authigenic carbonates from sedimentary mud volcanoes and pockmarks at Gulf of Cadiz (GOC).

It was performed a mineralogic and geochemical study in the Yinazao samples containing carbonates. These minerals were found predominantly within the top meters of the cores where both oxidation and seawater circulation in the sedimentary column are higher.

The different authigenic phases found indicate distinct formation temperature and/or pore fluids composition, differences clearly reflected on the mineralogy, possibly resulting of distinct setting: flank or summit of the mud volcano.

The results indicate that the major carbon source on authigenic carbon ate precipitation is seawater related in opposition to GOC authigenic carbonates, methane related)), outcome of the reaction between seawater sourced fluids with serpentinization sourced fluids ascending at the Yinazao mud volcano, highly alkaline and Ca and Sr enriched

P5. QUALITY ASSESSMENT OF THE ESA SST CCI PRODUCT OVER THE EASTERN ATLANTIC USING HISTORICAL IN-SITU DATA

Lamas, L.[1], Esteves, R.[2], Azevedo, E.[2], Correia, C.[3], Reis, F.[4], Pires Barroqueiro, T.[1]

[1] Instituto Hidrográfico, Lisboa, Portugal,
[2] Universidade dos Açores, DCA – Centro do Clima, Meteorologia e Mudanças Globais, Angra do Heroísmo, Portugal
[3] Administração dos Portos da Região Autónoma da Madeira, S.A., Gare Marítima do Porto do Funchal, Portugal
[4] Observatory for the Environment of the Azores, Angra do Heroísmo, Portugal.

luisa.lamas@hidrografico.pt

Sea surface temperature is a key parameter that influences many environmental processes, including ocean dynamics, biology and climate. Thermal gradients at the upper ocean are directly relatable with the heat budget between the ocean and atmosphere which has a crucial role in the global climate. The accurate knowledge of SST regarding not only its variability, but its short- and long-time trends is imperative to understand the ocean's role on a changing climate. Good assessment of the SST across the Atlantic is essential to understand the ocean's contribution to climate change and will contribute for the effectiveness of protective and preventive initiatives across the Europe, rendering this study directly aligned with at least two Sustainable Development Goals (Life below Water and Climate Action) of the UN 2030 Agenda.
Here, the European Space Agency's Sea Surface Temperature Climate Change Initiative (ESA SST CCI) product is validated using in-situ SST data collected in the eastern Atlantic. The main objective of this study is to show the applicability of the CCI data for ocean studies over the Atlantic, in particular over the coastal ocean, where the buoys are moored.
The ESA SST CCI Analysis Product Version 2.0 consists of daily maps of the sea surface temperature (at 0.2 m) spanning over the period between 1981 and 2016. Daily values of SST from the CCI product were compared against in-situ data acquired by thermistors located at 0.7 m depth, from 14 coastal buoys operated by the Portuguese Hydrographic Institute, the University of Azores, the Observatory for the Environment of the Azores, and the Ports Administration of the Madeira Autonomous Region, providing a significant coverage across the eastern Atlantic, in an area of relatively scarce in situ data.
The statistical relationship between daily ESA SST CCI retrievals and in-situ data will be analyzed as well as uncertainties associated with pixel match-ups and sensitivity of the results for different match-up techniques. The potential of the synergistic use of satellite and in-situ data to investigate the ocean dynamics at different spatio-temporal scales off the Portuguese Coast will be discussed.

P6. LATE PLIOCENE-EARLY PLEISTOCENE CHANGES IN THE MEDITERRANEAN OUTFLOW WATER AT THE SOUTHWEST IBERIAN MARGIN: A BENTHIC FORAMINIFER RECORD

Lopes, A.[1,2], Alonso-Garcia, M.[1,2,3], Salgueiro, E.[1,2], Rodriguez-Diaz, C.N.[2,4], Kuhnert, H.[5], Groeneveld, J.[5], Rodrigues, T.[1,2], Soares, W.[1,2], Voelker, A.H.L.[1,2], Abrantes, F.[1,2]

[1] Instituto Português do Mar e da Atmosfera, Lisboa, Portugal.
[2] Centro de Ciências do Mar, Universidade do Algarve, Faro, Portugal.
[3] Universidad de Salamanca, Salamanca, Spain.
[4] Universidad Complutense de Madrid, Madrid, Spain.
[5] MARUM, University of Bremen, Bremen, Germany.

ana.lopes@ipma.pt

The Pliocene-Pleistocene transition marked a profound change in the Earth´s climate system, with the expansion of the ice sheets in the Northern Hemisphere and the establishment of the glacial-interglacial cycles typical of the Pleistocene. Despite the importance of this event, its causes are still not fully understood and little is known about the role of the Mediterranean Outflow Water (MOW) during this transition. Changes in the strength of the MOW, which injects warm and saline water into the Atlantic's intermediate depths may have had a strong impact on the Atlantic Meridional Overturning Circulation. During the Integrated Ocean Drilling Program (IODP) Expedition 339, Site U1391 (37°21.5′N; 9°24.6′W, 1085 m water depth) was drilled at the Southwest Iberian margin allowing for the first time to reconstruct past changes in MOW at millennial scale resolution since the Late Pliocene.
Here we present a micropaleontological (δ18O, δ13C and Mg/Ca analyses on benthic foraminifera *Cibicidoides pachyderma*) and sedimentological (grain size) study from the IODP Site U1391 to reconstruct bottom water physico-chemical changes at the Southwest Iberian margin from ~2.8 to ~2.2 Ma. The age model has previously been constructed based on the benthic δ18O and Ca/Ti records combined with the refined biostratigraphic and paleomagnetic data obtained from Site U1391. The increase in δ13C and Mg/Ca in benthic foraminifers suggests a strengthening in the input of the warm waters of MOW at Site U1391 during the Early Pleistocene. The grain size record shows an increase in the silt percentage in the sediments during the glacial periods and greater oscillations in the silt content than during the late Pliocene. This supports the increase in MOW influence inferred with δ13C and Mg/Ca. Additionally, benthic foraminifera have been studied in selected samples to evaluate changes in the assemblages during the studied interval, indicating that the benthic foraminifer communities are influenced by MOW oscillations but also by the input of organic matter, i.e. variations in sea surface productivity.

P7. INCREASED SOUTHER SOURCED WATER IN THE FLORIDA STRAIT DURING THE LAST GLACIAL A COLD-WATER CORAL RECORD

Matos, L.[1,2], Colin, C.[3], Frank, N.[4], Wienberg, C.[5], Hebbeln, D.[5]

[1] IPMA, Lisboa, Portugal.
[2] CCMAR, Faro, Portugal.
[3] GEOPS, Orsay, France.
[4] Institut für Umweltphysik, Heidelberg, Germany.
[5] MARUM, Bremen, Germany.

leliamatos@yahoo.com

On longer (geologic) time scales, ocean circulation is strongly affected by the climatic cycles and events such as glacial-interglacial cycles and millennial-scale variability (e.g. Dansgaard-Oeschger cycles and Heinrich Events). Previous studies concerning the past distribution of intermediate water masses in the western subtropical North Atlantic are conflicting. Contrasting results have been shown regarding the northward penetration of the Antarctic Intermediate Water (AAIW) during stadial (cold) periods of the last glacial [e.g. Pahnke et al. 2008, *NatGeo* 1, 870–874; Huang et al. 2014, *EPSL* 389, 200–208]. The intermediate depths of the oceans are also home of highly diverse cold-water coral (CWC) ecosystems whose skeletons are easily preserved in the geologic record and precisely datable (U-series and radiocarbon). The chemical analysis of CWC skeletons is increasingly being used to reconstruct the past environmental conditions, especially from the poorly documented intermediate waters.

We have analyzed neodymium isotope signatures (eNd) and trace elements (Li/Mg) in a CWC *Lophelia pertusa* record from the East Florida Strait (at 700 mbsl) to reconstruct intermediate water mass variability and bottom water temperature changes, respectively. Our record is in agreement with the eNd record from the Demerara rise (located further south) for the last 14 thousand years [Huang et al. 2014]. More radiogenic (less negative) isotopic signatures and cooler bottom water temperatures suggest an increased presence of southern-sourced intermediate water (such as the AAIW) in the Florida Straits at 35-30 thousand and at 23 thousand years ago, in comparison to the Holocene. Changes in the isotopic signatures seem to concur with Greenland warming periods [Rasmussen et al. 2014, *QSR* 106, 14–28] and strengthening of the Atlantic Meridional Overturning Circulation [e.g. Böhm et al. 2015, *Nature* 517, 73–76].

P8. HIGHLY VARIABLE SURFACE WATER CONDITIONS OFF SOUTHERN PORTUGAL DURING MID-PLEISTOCENE MARINE ISOTOPE STAGES 20 TO 24

Mega, A.M.[1], Salgueiro, E.[1,2], Voelker, A.H.L.[1,2]

[1] Instituto Português do Mar e da Atmosfera (IPMA), Div. Geologia e Georecursos Marinhos Lisbon Portugal
[2] Centre of Marine Sciences (CCMAR), University of the Algarve, Faro, Portugal

alinemega20@gmail.com

The Mid Pleistocene Transition (MPT) was a global climatic event that occurred between 1250 and 700 thousand years (ky) ago This period was characterized by a drastic change in the deep thermohaline circulation during the glacial periods that resulted in more intense and longer lasting glacial periods (changing from 40ky to 100ky cycles) and cooler sea surface temperatures (SST). It is believed that the MPT may have been influenced by ocean-atmosphere system changes directly linked to an increased ice volume. A consensus point is that there was a pCO 2 reduction which in turn reduced the atmosphere's temperature, causing the expansion of continental ice sheets. I n the North Atlantic high-resolution records documenting the MPT's impact are still limited. The present study's objective is therefore to characterize surface water variations at the mid latitude southern Portuguese margin during the MPT. We are generating planktonic foraminifera faunal and related SST data for Integrated Ocean Drilling Program (IODP) Site U1387, retrieved from the Faro Drift in the Gulf of Cadiz, for the MPT interval from Marine Isotope Stage (MIS) 20 to MIS 26 at a temporal resolution of about 500 y. Nowadays, this site is dominantly influenced by subtropical surface waters. First results for the interval from MIS 20 to MIS 23 indicate highly variable SSTs off southern Portugal. Warmest summer SST between 23-25ºC are recorded during interglacial MIS 21 when the fauna is dominated by tropical subtropical species. During interglacial MIS 23 SST reached only 21ºC with warm periods being interrupted by abrupt cooling events with minimum SST of 10ºC. Glacial MIS 22 has three phases starting and ending with extreme cold events separated by an interstadial period of 14ky duration, during which SST increased up to 21ºC. During the first extreme cold event SST stayed below 10ºC for nearly 5ky. The impact of the second cold event was more extreme with SST dropping below 5ºC for 4ky. The transition from this cold event to MIS 21 interglacial conditions occurred within 1ky. Contrary to MIS 22, MIS 20 was a relative warm glacial period with SST dropping down to 9ºC only during the terminal event at the MIS 20/19 transition. So, the Site U1387 SST record reveals dominantly subtropical gyre influence interrupted by incursions of subpolar waters when the North Atlantic's subarctic front moved to southernmost position during the MPT.

P9. THE IBERIAN PENINSULA IN A WARMER WORLD: LEARNING FROM QUATERNARY SUPER-INTERGLACIALS

Oliveira, D.[1,2,3], Naughton, F.[1,2], Desprat, S.[3,4], Rodrigues, T.[1,2], Grimalt, J.[5], Martrat, B.[5], Voelker, A.[1,2], Trigo, R.[6], Polanco-Martínez, J.[7], Hodell, D.[8], Abrantes, F.[1,2], Sánchez Goñi, M.F.[3,4]

[1] CCMAR, Centro de Ciências do Mar, Universidade do Algarve, 8005-139 Faro, Portugal.
[2] Divisão de Geologia e Georecursos Marinhos, Instituto Português do Mar e da Atmosfera (IPMA), 1449-006 Lisboa, Portugal.
[3] Univ. Bordeaux, EPOC, UMR 5805, F-33615 Pessac, France.
[4] EPHE, PSL Research University, Laboratoire Paléoclimatologie et Paléoenvironnements Marins, F-33615 Pessac, France.
[5] Institute of Environmental Assessment and Water Research (IDAEA), Spanish Council for Scientific Research (CSIC), 08034 Barcelona, Spain.
[6] Instituto Dom Luiz, Universidade de Lisboa, 1749-016 Lisboa, Portugal.
[7] Basque Centre for Climate Change, 48940 Leioa, Spain.
[8] Godwin Laboratory for Palaeoclimate Research, University of Cambridge, Cambridge, UK.

dulce.oliveira@ipma.pt

The study of past interglacials, periods of reduced ice volume like our present interglacial, the Holocene, is crucial for understanding the future climate. The so-called super-interglacials MIS 11 (425-374 ka) and MIS 31 (1.082-1.062 ka) are periods of primary interest in this regard as they are considered among the best interglacial analogues for the current and projected global warming. Moreover, these interglacial stages offer the opportunity to understand the interglacial climate variability during two different worlds: MIS 11 dominated by eccentricity (100,000-year cyclicity) and the poorly known MIS 31 dominated by obliquity (41,000-year cyclicity), respectively.

We present a direct land-sea comparison of MIS 11 and MIS 31 from the IODP Site U1385, “Shackleton Site”, on SW Iberian margin. Pollen and biomarker analyses at centennial-scale-resolution provide new insights into the regional vegetation, terrestrial climate and oceanic temperature variability. Superimposed on the long-term variability, the highly resolved pollen records from Site U1385 reveal persistent variability with multiple millennial to- centennial scale shifts in the vegetation throughout MIS 11 and MIS 31. These vegetation changes represent recurring cool/cold and dry atmospheric episodes, which have hitherto not been identified in SW Iberia. The direct comparison between atmospherically-driven vegetation and oceanic changes allows the characterization of different types of millennial-scale cooling events across distinct boundary conditions. This work proposes that the diversity and complexity of millennial coolings in the western Mediterranean region was related to different atmospheric and oceanic configurations modulated by high or low-latitude forcing depending on the baseline climate states.

P10. FACTORS CONTROLLING THE DEPTH HABITAT AND SPATIAL DISTRIBUTION OF LIVING PLANKTONIC FORAMINIFERA IN THE SUBTROPICAL EASTERN NORTH ATLANTIC

Rebotim, A.[1,2,3], Voelker, A.H.L.[1,2], Jonkers, L.[3], Siccha, M.[3], Schulz, M.[3], Kucera, M.[3]

[1] Divisão de Geologia e Georecursos Marinhos, Instituto Português do Mar e da Atmosfera, Lisboa, Portugal
[2] CCMAR Associated Laboratory, Faro, Portugal
[3] MARUM – Center for Marine Environmental Sciences, University of Bremen, Bremen, Germany

andreia.rebotim@ipma.pt

The usefulness of planktonic foraminifera as a proxy relies on the understanding of each species' ecology and its relation to the surrounding environment. In this context, the horizontal and vertical distributions of planktonic foraminifera provide important insights of their preferred environmental conditions. Here we analyze the abundance of 21 living (cytoplasm-bearing) planktonic foraminifera species, identified in samples from vertical plankton tows taken in the subtropical eastern North Atlantic between 1995 and 2012. Analysis of the horizontal distribution revealed that the warmer water species are typically associated with the Iberian Margin and Canary Islands, whereas deep-dwelling species are preferentially found in the Azores Front/Current region. Within the tropical species, *Globigerinoides ruber* pink correlates with warmer temperatures and *Trilobatus sacculifer* with low chlorophyll a concentrations. On the other hand, *Globigerina falconensis* prefers high chlorophyll a concentrations. *Globorotalia truncatulinoides* relates to a deeper mixed layer (ML) depth, whereas *Orbulina universa* prefers a shallower ML depth. The average living depth (ALD) reveals three different groups of species: species living preferentially at the surface (ALD above 100 m) like *G. ruber* white and pink; species occurring from surface to subsurface such as *Globigerina bulloides*, *Globorotalia inflata* and *G. truncatulinoides*; and species inhabiting the subsurface layer as *Globorotalia scitula* and *Globorotalia hirsuta*. For 17 species with a variable ALD, we assessed whether their depth habitat could be predicted by ML depth, ML temperature, ML chlorophyll-a concentration or seasonal and lunar cycles. In most of the cases, the ALD variation could be predicted by a combination of ontogenetic and/or seasonal vertical migration and changing environmental conditions. The set of environmental conditions found in a geographic region also explain differences in the fauna composition and the preference of some of the most abundant species for that particular location.

P11. "WARM WORLDS" FEATURES AND LESSONS FROM PAST INTERGLACIALS "WARM PERIODS" DURING THE LAST 1.5 Ma

Rodrigues, T.[1,2] & WarmWorld team members

[1] Divisão de Geologia e Georecursos Marinhos, Instituto Português do Mar e da Atmosfera, Rua Alfredo Magalhães Ramalho, 6,1495-006 Lisboa, Portugal
[2] Centro de Ciências do Mar (CCMAR), Universidade do Algarve, Campus de Gambelas, 8005-139 Faro, Portugal

teresa.rodrigues@ipma.pt

Warm Worlds project (PTDC/CTA-GEO/29897/2017) is a IC&DT research project submitted in 2017 and it was approved for funding last year on the scope of the Support System for Scientific and Technological Research (29897/02/SAICT/2017) by FCT – *Fundação para a Ciência e a Tecnologia, I.P.* and cofounded by the *Programa Operacional Regional do Algarve (CRESC Algarve 2020)*. This project aims to reconstruct past interglacial climate features using environmental data from marine sediments in order to understand the climate system dynamics and identify the processes behind natural climatic variability in past warm periods. This study will provide new insights that will enable modelers to more accurately forecast future changes in ocean circulation and climate, and their potential impacts on society, and consequently, help policy makers to contend climate change effects on the global warming context.

P12. PLANKTONIC FORAMINIFERS' δ13C: EXPLORING VENUES TO A MORE ROBUST NUTRIENT PROXY

Salgueiro, E.[1,2], Castro, C.G.[3], Zuñiga, D.[3], Rufino, M.[1,2], Groeneveld, J.[4], de la Granda, F.[3], Villacieros-Robineau, N.[3], Alonso-Pérez, F.[3], Voelker, A.[1,2], González-Álvarez, R.[5], Abrantes, F.[1,2]

[1] IPMA, I.P., Lisboa, Portugal.
[2] CCMAR, Faro, Portugal.
[3] IIM – CSIC, Vigo, Spain.
[4] Bremen Univ., Bremen, Germany.
[5] Vigo Univ., Vigo, Spain.

emilia.salgueiro@pma.pt

The interpretation of the carbon isotopic (δ13C) signal of planktonic foraminifera in sediment records to reconstruct past nutrient availability is complex and poorly understood, especially in coastal upwelling areas, because the isotopic fractions of carbon incorporated into the shells may be derived from different sources and affected by different processes. To minimize the existing uncertainties affecting the use of δ13C in planktonic foraminifera (PF) as productivity proxy in the coastal upwelling areas, we investigate the content and distribution of δ13C in the water column, its transference into the PF shells, and, how the living PF δ13C signal is related to the same PF species

preserved in the sediment record. This study is based on a large data set from two stations (RAIA, CALIBERIA) located off the NW Iberian margin and includes: i) two year monthly water column data (temperature, salinity, nutrients, chlorophyll a, Ba/Ca, and δ13C); ii) δ13C in living PF multi-species at both stations; and iii) δ13C in PF multi-species from a large set of core-top sediment samples in the study region. Low δ13C values of PF upwelling species (*G. bulloides* and *N. incompta*) from core-top sediments followed low δ13C seawater values. However is fundamental to know if the PF species precipitated their calcite shells in equilibrium or not with the ambient seawater, for that will be calculate the offset between δ13C measured in PF preserved in sediments and the seawater δ13C. Indeed, δ13C seawater is highly correlated with nitrate, phosphate, Ba/Ca and Apparent Oxygen Utilization (AOU) in the water column. An inverse correlation is observed between δ13C and AOU in the deeper water column and after the upwelling season, associated with the high remineralization caused by the shelf-ocean blocking effect generated by the presence of the Iberian Portugal Current. This finding sheds light on the understanding of how nutrient contents associated to the NW Iberian coastal upwelling regime leave their imprint in upwelling-related PF shells preserved in the sediment record. The understanding of this relationship has especial relevance since it gives fundamental information related to the past oceanic biogeochemistry and/or climate and improves the prevision of future changes against possible climate variability due to anthropogenic forcing.

P13. CHANGES IN MONSOON PATTERNS DURING THE MIDDLE PLEISTOCENE TRANSITION A DIATOM RECORD FROM IODP CORE U1427

Ventura C.[1,2,3], Lopes C.[1,2]

[1] IPMA, Lisbon, Portugal
[2] CCMAR, Faro, Portugal
[3] UAlg, Faro, Portugal

cristina.ventura@ipma.pt

Monsoon rainfall is the life-blood of more than half the world's population. The East Asian Monsoon (is not only one the most important climate phenomena in Asia, but also plays a significant role in the global climate system. In this region, the seasons are defined by the behavior of this monsoon. In the summer, the EAM carries warm humid air originated from the northern low latitude of North Pacific Ocean. In contrast, the cold dry East Asian Winter Monsoon b rings air from high latitude lands.
Asia has the largest river network due to abundant monsoon precipitation and large runoff. Any change in the monsoon patterns will be recorded in the JapanvSea sediments. The input of freshwater brings specific markers into the marine sediments, such as freshwater diatoms and specific diatom ecological assemblages, which are preserved. This proxy is easily identifiable and have been used in the North Pacific Ocean to reconstruct environmental conditions and flooding episodes.
Aiming to better understand if and how de EAM patterns will be impacted by future climate changes we have studied how this proxy behaved during the Middle Pleistocene

Transition (MPT, 700ka to 1.25Ma), a major natural climate reorganization due to changes in Earth's orbital cycles. The shift from the 41ky obliquity to 100ky eccentricity increases long-term average global ice volume and establishes a strong asymmetry in global ice volume cycles.
Therefore, here we show the study from freshwater diatoms records from sitecvU1427 (IODP Expedition 346). The results reveal an increase in freshwater diatoms abundance during glacial periods through the MPT, particularly during the Marine Isotopic Stage 22 (866ka to 900ka) and a decrease in total diatoms and freshwater diatoms abundances at the end of MPT. Additionally, spectral analysis reveal that the processes controlling the presence of freshwater diatoms are influenced by orbital cycles, showing the 41 to 100ky shift.