

7a Conferencia Portuguesa CIENCIAS POLARES



28-29 OUTUBRO 2015



**Instituto de Ciências da Terra
Universidade de Évora**



Organização

Apoios



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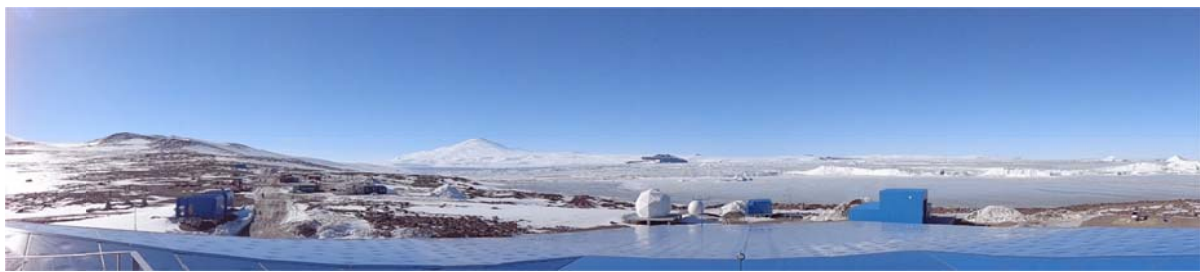
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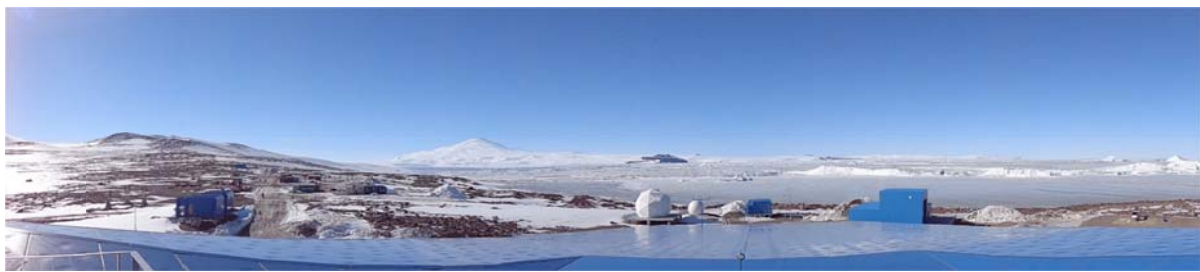
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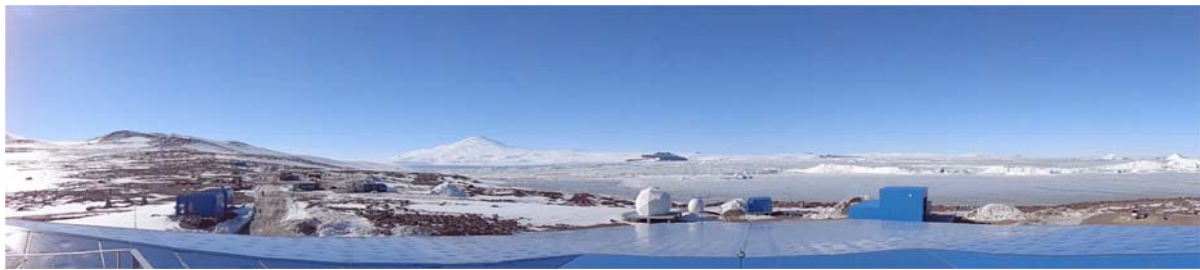


Contents

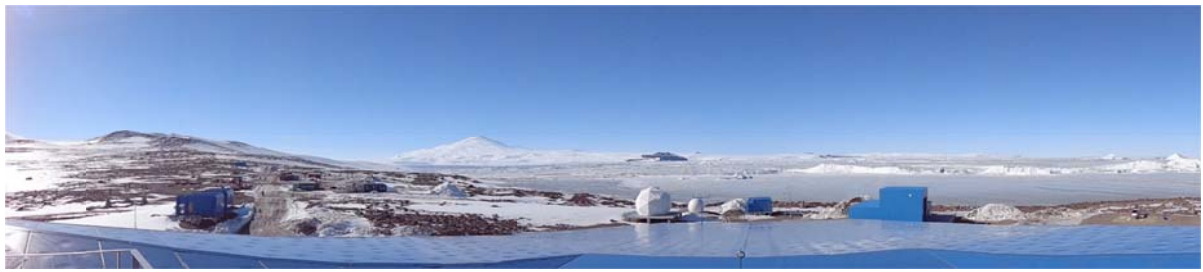
7ª Conferência Portuguesa de Ciências Polares	5
Apresentação	4
Organização	5
Programa - VI Workshop APECS Portugal	6
Mesa da Sessão de Abertura	7
Programa e Comunicações Orais – 7CPCP	8
Communications / Resumes.....	11
The renal responses of notothenia rossi: what makes it tinkle?	12
An overview of the Long-Term Ecological Research in the West Antarctic Peninsula region	13
Niche segregation between immature and adult seabirds: does progressive maturation play a role?.....	14
Cephalopod fauna of Antarctic waters: combining new information from predators, nets and habitat suitability prediction models	15
Food web models of the South Georgia shelf pelagic ecosystem	16
Environmental constraints controlling the distribution of prokaryotic communities and nifH gene diversity in the extreme Darwin Mountains, Antarctica	17
The Norwegian Young sea ICE cruise (N-ICE2015).....	18
First results of UAV surveying of thaw lake areas for the characterization of geomorphology, vegetation and water colour (Whapmagoostui-Kuujuarapik and Umiujak, Quebec, Canada)	19
Evaluating Hg stress caused by natural contamination in a volcanic island (Deception Island, Antarctica) using immobilized Phaeodactylum tricornutum and laser-induced fluorescence	20
Topoclimate controls on snow distribution during the melting season (Fildes Peninsula, King George Island, South Shetlands, Antarctica).....	21
Biogeochemistry of Canadian Subarctic Thermokarst Lakes	22



High resolution mapping of Barton Peninsula (King George Island, Antarctica) with a UAV	23
MATAGRO - Monitoring of Atmospheric TrAce Gases in Antarctica with GRound-based remote sensing Observations – Activities and obtained results.....	24
Meseta Norte of Fildes Peninsula (King George Island, Antarctica) in the scope of GEOPERM Project - lithological/geological mapping and insights into the volcanics geochemistry	25
Hydrodynamic Modeling of Port Foster (Deception Island, Antarctica)	26
A sustainable modular building for research development in the antarctic.....	27
Polar Educators International: fostering the bridge between the scientific community and society	28
Cryptoendolithic communities in the frozen desert of Antarctica	29
Analysis of stable isotope ratios in blood of tracked wandering albatrosses fails to distinguish a $\delta^{13}\text{C}$ gradient within their winter foraging areas in the southwest Atlantic Ocean.....	30
Intra-annual variations of the diet of gentoo penguins (Pygoscelis papua) at South Georgia (Southern Ocean).....	31
Testing how changes in environmental variables promote shifts in Nitrogen pathways and prokaryotic communities in soils from extreme Antarctica Dry Valleys.....	32
Distribution of short-finned squid illex argentinus (cephalopoda: ommastrephidae) in the south atlantic: little evidence from top predators that it extends to antarctic watersdistribution of short-finned squid illex argentinus (cephalopoda: ommastrephidae)	33
Detailed seafloor morphology of the Continental Shelf between 128°E and 134°E, East Antarctic.....	34
Wind regimes and nivo-eolian corrasion in the South Shetland Islands, Antarctic	35
Image analysis based methodology for the construction of ground-truth datasets in ice-free surfaces of Fildes and Barton Peninsulas, King George Island (Maritime Antarctica).....	36
Remote Sensing applied to the study of the dynamics of subarctic vegetation: the case of Kuujjuarapik-Whapmagoostui (Quebec, Canada).....	37



MATAGRO2 - Monitoring of Atmospheric TrAce Gases in Antarctica with GRound-based remote sensing Observations – New technological and scientific goals	38
In situ measurements of atmospheric aerosols at a remote site, north of the Arctic Circle	39
Holocene environmental changes in Byers Peninsula (South Shetland Islands, Antarctica) inferred from lake sediments	40
Regional mean annual air temperatures and local thermo-mechanical dynamics of the active layer (Livingston and Deception Islands. Antarctica)	41
Vegetation mapping using high resolution remote sensing imagery (Barton Peninsula, King George Island – Antarctica)	42
Advances in modelling TTOP in Hurd Peninsula (Livingston island, Maritime Antarctic) .	43
Evaluate Earth's Health through Polar Regions: a thematic module from IRRESISTIBLE project highlighting the Portuguese Polar Science	44
An Antarctic expedition from a E&O perspective: local, regional and national impacts ..	45
Author index	46



7ª Conferência Portuguesa de Ciências Polares

2015 - O ano internacional da luz em regiões polares

VI Workshop APECS Portugal

28/29 Outubro de 2015

Universidade de Évora - Colégio Espírito Santo

Organização

Instituto de Ciências da Terra – Universidade de Évora.

Programa Polar Português - PROPOLAR

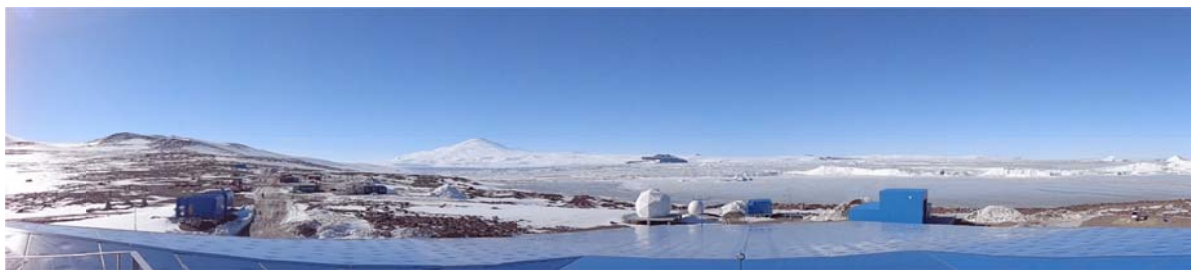
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Apresentação

Um dos aspectos mais fascinantes das regiões polares, além das temperaturas extremamente baixas (até 89 graus negativos), é a luz do sol 24h durante o verão e a noite profunda para a estação invernal. Embora este fenómeno aconteça apenas numa parte relativamente pequena do planeta, tem um forte impacto sobre o ambiente global e a vida humana. Além disso, as regiões polares são as mais influenciadas pelas atividades humanas que ocorrem nas médias e baixas latitudes. A fim de entender e quantificar esse feedback entre os ambientes extremos e as regiões temperadas e equatoriais, é claro que os esforços científicos se deveriam expandir em todas as áreas de investigação; da Glaciologia à Oceanografia; da Geofísica à Biologia; da Química às Ciências Atmosféricas. Uma vez que as regiões polares são tão distantes, geralmente os media (televisão, rádio, jornais), com excepção de algumas empresas de comunicação, não disseminam de forma ampla os resultados das investigações polares e as consequências dos nossos comportamentos no planeta. Portanto, a participação em reuniões científicas para a disseminação dos conhecimentos adquiridos por investigadores polares que operam no campo, é essencial para uma melhor compreensão do ambiente.

Neste quadro, gostaríamos de vos convidar para se juntarem ao 7º Encontro Português de Ciências Polares, que começará a 28 de outubro com a sexta reunião da APECS (Associação de Jovens Investigadores Polares em Portugal). A 29 de Outubro o programa preliminar prevê a participação dos investigadores portugueses que participaram recentemente na campanha de campo em regiões ártica e antártica, com a apresentação dos últimos resultados obtidos em todos os campos de investigação. Haverá também espaço e tempo para a participação do público, para perguntas e esclarecimentos sobre as actividades apresentadas.

A comissão organizadora





Organização

Instituto de Ciências da Terra – Universidade de Évora.

Programa Polar Português - PROPOLAR

Instituto de Geografia e Ordenamento do Território (IGOT), Universidade de Lisboa

Associação de Jovens Investigadores Polares em Portugal – APECS Portugal

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João Canário (CQE-IST)

José Xavier (IMAR)

Marc Oliva (CEG/IGOT-ULISBOA)

Pedro Ferreira (LNEG)

Pedro M Guerreiro (CCMAR)

Pedro Pina (IST)



Programa - VI Workshop APECS Portugal

28 Outubro/28 October

9:00 - 9:30 - Registo e entrega de documentação / Registration

9:30 – 9:45 – Sessão de Abertura/Opening Session

9:45 – 10:25 - Teresa Cabrita - PROPOLAR
 - PROPOLAR funding opportunities

11:15 – 12:00 - Huw Griffiths - British
 Antarctic Survey - International funding
 opportunities

12:00 -14:00 - Lunch

14:00 – 14:45 - Maria João Leão -
 Maratona da Saúde - Different ways to
 Fundraising

14:45 – 15:30 - Pedro Pina - Instituto
 Superior Técnico - CrowdFunding.

15:30 – 15:50 - coffe break

15:50 – 16:30 - APECS Portugal –
 Reunião Anual

20:00 – Social Dinner





Mesa da Sessão de Abertura

- Professor Doutor Paulo Quaresma, Sr. Vice-Reitor da Universidade de Évora
- Doutor João Canário, Programa Polar Português (PROPOLAR)
- Professor Doutor António Heitor Reis, Diretor do Instituto de Ciências da Terra (ICT)
- Professor Doutor Manuel Collares-Pereira Diretor do Instituto de Investigação e Formação Avançada (IIFA) da Universidade de Évora
- Doutor Daniele Bortoli, Organizador Local da 7ª Conferência Polar Portuguesa

Oradores Convidados

Doutor Enrico Brugnoli, Diretor do departamento de Ciências da Terra e tecnologias do Ambiente do Conselho Nacional de Investigação (CNR), Itália.

29 Out 15:25 – “The Italian Antarctic Program: Overview and Opportunities for Collaboration”



Enrico Brugnoli was born in Frascati (Rome) and he is currently director of Department of Earth System Science and Environmental Technologies of CNR (Research National Council).

Laurea degree cum laude in Agricultural Sciences at Perugia University (in 1983) and Specialization in Environmental Biology, Research School of Biological Sciences at Australian National University (in 1987), he is a high qualified expert in Plant Eco-physiology. After the specialization he was at Carnegie Institution of Washington, in Stanford (California) to study interactions between plants and environment.

From 1995 to 2001 he was contract professor of Plant Eco-physiology at Verona University for six years. The main fields of his research are: plant physiology, life sciences, climate changes and renewable energies. Enrico Brugnoli is CNR exponent in the International Forum for Climate Changes, member of the Scientific Committee of FAO International Poplar Commission, coordinator of the Operative Understanding between Italian Ministry of Economic Development and CNR about Renewable Energies and Energetic Saving, CNR exponent in the Marine Board (European Science Foundation) and CNR exponent in the Polar Board (European Science Foundation).

He is member of the Editorial Board of many international journals about Ecology, Botany, Plant Physiology and Environment.

He published more than 130 papers on scientific peer reviewed journals, books and conference proceedings.



Programa e Comunicações Orais – 7CPCP

29 Outubro/29 October

08:30 - Registo e entrega de documentação / Registration

09:00 - Sessão de Abertura / Opening Session

09:30 - The Portuguese Polar Program (PROPOLAR), *João Canário*

Ciências Biológicas / Biological Sciences

Chair: José Xavier & Maria Teresa Cabrita

09:45 - Food web models of the South Georgia shelf pelagic ecosystem; *Irene Martins*

10:00 - The Norwegian Young sea ICE cruise (N-ICE2015); *Pedro Duarte*

10:15 - Niche segregation between immature and adult seabirds: does progressive maturation play a role?; *Letizia Campioni*

10:30 - The renal responses of notothenia rossi: what makes it tinkle?; *Pedro Guerreiro*

10:45 - Coffee Break

Ciências Biológicas / Biological Sciences

Chair: Pedro Guerreiro & Pedro Duarte

11:15 - An overview of the Long-Term Ecological Research in the West Antarctic Peninsula region; *Filipa Carvalho*

11:30 - Cephalopod fauna of Antarctic waters: combining new information from predators, nets and habitat suitability prediction models; *José Xavier*

11:45 - Environmental constraints controlling the distribution of prokaryotic communities and nifH gene diversity in the extreme Darwin Mountains, Antarctica; *Joana Séneca*



Education Outreach & Communication

12:00 - Polar Educators International: fostering the bridge between the scientific community and society; *Patrícia Azinhaga*

Nova Geração de Jovens Cientistas / New Generation of Young Scientists

12:15 - APECS Portugal, *José Seco*

Engenharia Civil Polar / Polar Civil Engineering

12:30 - A sustainable modular building for research development in the Antarctic; *Manuel Guedes*

12:45 - Lunch

Ciências da Terra e do Ambiente / Earth and Environmental Science

Chair: Daniele Bortoli & Pedro Pina

14:15 - Biogeochemistry of Canadian Subarctic Thermokarst Lakes; *Leandro Castanheira*

14:30 - Topoclimate controls on snow distribution during the melting season (Fildes Peninsula, King George Island, South Shetlands, Antarctica); *Inês Girão*

14:45 - Hydrodynamic Modeling of Port Foster (Deception Island, Antarctica); *Daniel Figueiredo*

15:00 - Evaluating Hg stress caused by natural contamination in a volcanic island (Deception Island, Antarctica) using immobilized *Phaeodactylum tricornutum* and laser-induced fluorescence; *Maria Teresa Cabrita*

15:15 - First results of UAV surveying of thaw lake areas for the characterization of geomorphology, vegetation and water colour (Whapmagoostui-Kuujuarapik and Umiujak, Quebec, Canada), *Gonçalo Vieira*



Orador Convidado / Invited Speaker

15:30 - The Italian Polar Program. Overview and Opportunities for Collaboration.

Enrico Brugnoli

16:00 - Coffee & Poster session

Ciências da Terra e do Ambiente / Earth and Environmental Science

Chair: João Canário & Gonçalo Vieira

17:15 - High resolution mapping of Barton Peninsula (King George Island, Antarctica) with a UAV; Pedro Pina

17:30 - MATAGRO - Monitoring of Atmospheric TrAce Gases in Antarctica with GRound-based remote sensing Observations – Activities and obtained results; Daniele Bortoli

17:45 - Meseta Norte of Fildes Peninsula (King George Island, Antarctica) in the scope of GEOPERM Project - lithological/geological mapping and insights into the volcanics geochemistry; Pedro Ferreira

18:00 - Encerramento / Closing and Farewell



Communications / Resumes



Oral: Ciências Biológicas / Biological Sciences

The renal responses of *notothenia rossi*: what makes it tinkle?

Pedro M Guerreiro (a), Alexandra Alves (a), Bruno Louro (a), Jonathan M Wilson (b), Ana Eufrazio (a) and Adelino Canario (a)

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(b) Wilfrid Laurier University, Waterloo, Canada

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The extant cold-adapted Antarctic fish radiated from ancestral temperate species. The evolution for about 30 million years in extreme stenothermal isolation of a highly endemic fish fauna, with physical and functional constraints, was a strong selective pressure for the development of unique structural and physiological features. Whether the aglomerular kidneys of Nototheniids, which favor the maintenance of the small antifreeze proteins, were developed during radiation or inherited from aglomerular ancestral species is unclear. Several other marine species are aglomerular, which favors water conservation in a hyperosmotic environment. Moreover, can this feature be pertinent during the acclimation to new environmental scenarios?

We have challenged the *Notothenia rossi* renal system by reducing salinity and increasing temperature, two factors known to increase urine production in temperate fish. Blood samples were taken at different exposure periods and urine was collected from the urinary bladder using a catheter. Immunohistological preparations confirmed the aglomerular nature of the kidney and showed regionalization of ion transporters in renal tubule.

Both conditions favored a decrease in blood and urine osmolality and an increase in the amount of urine produced. Urine to plasma ratios and urine ionic composition were greatly altered by salinity, with Na as the main cation in seawater (SW) and Mg in diluted seawater (DSW). Chloride increased in DSW and was probably the main driver for water secretion in the renal tubule leading to urine production. In parallel, temperature had a marked effect over renal Na/K-ATPase, which may help driving ions and water into the lumen. Interestingly, even fish in cold SW showed a considerable urine volume, made obvious by enlarged urinary bladders in dissected fish. The physiological reason for this in aglomerular fish is unclear as urine secretion is energetically costly, but may be related to a need to keep blood osmolality high to prevent ice crystal formation. On the other hand, diluted urine without anti-freeze proteins is susceptible to freezing and should not be stored. Whether the bladder epithelium has a role in urine formation or contributes to its composition is unknown but the focus of future investigations.

Supported by PROPOLAR, FCT-FAAC Noto, CGD Programa Jovens Cientistas Polares and FCT Grants PEst-C/MAR/LA0015/2011 to CCMAR, SFRH/BPD/89889/2012 to BI and PTDC/BIA-ANM/4225/2012



Oral: Ciências Biológicas / Biological Sciences

An overview of the Long-Term Ecological Research in the West Antarctic Peninsula region

Filipa Carvalho (a), Oscar Schofield (a); Josh Kohut (a); Hugh Ducklow (b)

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(b) Lamont-Doherty Earth Observatory, Columbia University, NY, USA

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The Palmer Long-Term Ecological Research (PAL-LTER) study area is located to the west of the Antarctic Peninsula extending 700 km southward from the Palmer basin (64°S) to Charcot Island (70°S) and 200 km westward from the coast (3000 m depth, 68°W). Increasing atmospheric and surface water temperatures, decreasing sea ice extent and duration have changed the ecosystem from a typical polar sea to a more subpolar system with more microbes at the base and declining populations of apex predators.

Since its beginning in 1991, the study was focusing on the central hypothesis that the phenology, extent, duration and seasonality of sea ice and inputs from glacial meltwater strongly influenced the ecological and biogeochemical processes in the coastal marine ecosystem. With its 24 years of research endurance, the PAL-LTER tries to capture the seasonal cycle by focusing on 6 months of bi-weekly surveys from Palmer Station and a more spatially focused effort during our annual 1-month long cruise down the Peninsula in January.

It has long been recognized that Adélie penguin colonies on the WAP are all located near the coastal termini of cross-shelf canyons or troughs, suggesting the hypothesis that these areas are zones of more predictable or even elevated food availability. Canyons are known to serve as conduits for the transport of warm, nutrient rich deep water from offshore into the coastal region, increasing the heat content and the nutrient concentration nearshore.

The introduction of autonomous, high-resolution observing systems such as gliders has allowed us to look at both large and small scale processes and ecosystem responses (from microbes to apex predators) to climate change. Currently glider surveys combined with ship-board incubations suggest the local phytoplankton “hotspots” are due to local circulation, shoaling of the upper mixed layer and increased delivery of micronutrients.





Oral: Ciências Biológicas / Biological Sciences

Niche segregation between immature and adult seabirds: does progressive maturation play a role?

Letizia Campioni (a), José Pedro Granadeiro (b), Paulo Catry (a)

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In long-lived species with slow maturation the ecology of pre-breeders, which often represent a large percentage of the individuals, is still understudied. Recent works have found pre-breeding seabirds to differ in their isotopic (and trophic) niche from adult breeders. These have been hypothesized to be linked to the less developed foraging performance of younger and less experienced immatures, or perhaps to their inferior competitive abilities. Such differences from adults would wane as individuals mature (“the progressive ontogenetic shift hypothesis”) and could underpin the prolonged breeding deferral until adulthood displayed by those species. This study documents a marked difference in the isotopic signatures measured in the blood of immatures and breeding Black-browed Albatrosses *Thalassarche melanophris* from the West Falkland Islands. Immatures seem to show an extended movement range and several foraging areas with respect to breeders, reaching the Subantarctic Front. However, blood isotopic values did not present a relationship with pre-breeder age, suggesting no gradual ontogenetic shift from an immature towards an adult isotopic niche. Furthermore, isotopic signature of sabbatical adults could not be separated from those of immatures attending the same colonies, but were clearly segregated from adult breeders. Our results support the “the reproductive constrain hypothesis” suggesting that isotopic differentiation between breeders and non-breeders is mainly related to the severity of central-place-foraging and reproduction requirements.



Oral: Ciências Biológicas / Biological Sciences

Cephalopod fauna of Antarctic waters: combining new information from predators, nets and habitat suitability prediction models

José Xavier (a,b), Jaime Ramos (a), Vitor Paiva (a), Filipe Ceia (a), Irene Martins (a), Sílvia Lourenço (a), José Seco (a, c, d), Sílvia Tavares (e), Sara Pedro (a, f), Danijela Dimitrijević (a), Barbara Guimarães (a, g), Jorge Pereira (a), José Queirós (c), Lucas Kruger (a), Ben Raymond (h, i, j), Huw Griffiths (b), David Thompson (k) and Yves Cherel (l)

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(k) National Institute of Water and Atmospheric Research Ltd., Wellington, New Zealand

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Cephalopods play an important ecological role in the Southern Ocean, being the main prey group of numerous top predators. However, their basic ecology and biogeography is still poorly known. We assessed the habitats and distributions of Southern Ocean cephalopods, using net-catch data and predators diets to develop habitat suitability models for 15 of the commonest pelagic squid in the Southern Ocean. The individual habitat suitability models were overlaid to generate a “hotspot” index of species richness. The “hotspot” regions in the distribution of cephalopods from the Southern Ocean are related to oceanic waters, across various oceanic fronts. Complementary to this work, we provide new information on Antarctic cephalopods, using Antipodean and Gibson’s albatrosses (*Diomedea antipodensis antipodensis* and *D. antipodensis gibsoni*, respectively) as biological samplers, known to cover huge areas of the Southern Ocean. A total of 9111 cephalopod beaks, from 41 cephalopod taxa, were identified from their diets, with the families Histioteuthidae and Onychoteuthidae, as the most important cephalopods numerically and by reconstructed mass, respectively. Combining both datasets (i.e. habitat suitability precaution models and predator diets), we provide evidence from predators of the circumpolar distribution of numerous key cephalopod species in the Southern Ocean, and provide new information on poorly known cephalopods. Our work emphasize a need for future work to focus on projecting these distributions under scenarios of climate change and their effects on the distributions of Antarctic squid from the Southern Ocean, using habitat suitability prediction models.



Oral: Ciências Biológicas / Biological Sciences

Food web models of the South Georgia shelf pelagic ecosystem

Martins Irene (a), Hill Simeon L. (b), Moreira Ricardo (c), Dias José (c), José Xavier (a)

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Food web models are useful tools to study the structure and dynamics of marine ecosystems, which in turn provides indications about the directions of variations, stability and resilience of those systems. Due to the importance of Polar Regions on the Earth system, the complexity of interacting factors and the fast changes of environmental conditions within the Polar Regions induced by climate change, it is crucial to develop a framework of ecosystem modelling approaches able to capture the consequences of those changes and advise for management and conservation of these cornerstones regions of the planet.

Under the ANTARCTIC FOOD WEBS project, the joint efforts of researchers from the Polar team of the Marine and Environmental Science Centre of the University of Coimbra, British Antarctic Survey and the Department of Mathematics of Lisbon School of Economics and Management of the University of Lisbon have produced a set of mass balanced models to study the food web of South Georgia shelf pelagic ecosystem.

Besides using ECOPATH for constructing internally consistent marine food web models, we use a randomization procedure, written in MATLAB code, to generate a set of random models (usually 1000) as a way to deal with the uncertainty of parameters. Finally, this methodology is used to estimate several metrics (Mixed Trophic Impact- MTI, TI- Total Impact, RTI- Scaled Total Impact or Keystoneness), which are essential to characterise food web structure and, therefore, making comparisons amongst different models. In this presentation, we present the initial results, which indicate the importance of Antarctic krill and other zooplankton groups in the structure of food webs of the South Georgia pelagic system. MTI analyses suggest a dominance of bottom-up prey effects on food web dynamics. Results are further on discussed within the context of using different currencies (wet mass versus carbon) and different initial conditions depending on uncertainties (high versus low fish biomass) to develop food web models.



Oral: Ciências Biológicas / Biological Sciences

Environmental constraints controlling the distribution of prokaryotic communities and nifH gene diversity in the extreme Darwin Mountains, Antarctica

Séneca, J., Machado, A., Monteiro, M. (a), Torgo, L., Charles, L. (b), Cary, S. C. (b,c), Magalhães, C (a).

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Approximately 99.7% of continental Antarctica is permanently covered by the Antarctic Ice sheet and the few remaining ice-free areas are patchily distributed across the continent. The existing environmental conditions have shaped soil ecosystems of low diversity and simple trophic structure in which soil microorganisms face severe conditions. In these areas, the diversity of microorganisms involved in key biogeochemical processes such as the nitrogen (N) cycle is still largely unknown.

The Darwin Mountains represent the second largest ice free region in continental Antarctica and the Darwin-Hatherton region is an important outflow glacier system that connected the East and West Antarctic ice sheets during previous glacial maxima. Little is still known about its glacial history, geomorphology and biodiversity, but previous studies have reported relationships between biodiversity levels and environmental variables such as salinity as a function of drift age, level of soil development and water availability. Regarding the N cycle, phototrophic N fixers such as cryptoendolithic Cyanobacteria are thought to represent keystone species in these environments by indirectly supplying fixed N to the whole Antarctic ecosystem

This study represents the first environmental survey in the Darwin-Hatherton glacier region using not only high-throughput sequencing methodologies (amplification of the prokaryotic 16s rRNA), but also a functional approach targeting the nifH gene which encodes a sub-unit of the nitrogenase enzyme, responsible for N fixation. Preliminary results from the NGS meta-analysis have confirmed the presence of taxonomically different N fixers, which is supported by variability at the level of the nifH gene sequences.

Future work will consist on establishing statistically and significant correlations between the presence, abundance and diversity of N fixing microorganisms and the intrinsic environmental features that characterize the Darwin Mountains.



Oral: Ciências Biológicas / Biological Sciences

The Norwegian Young sea ICE cruise (N-ICE2015)

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An ice drift cruise took place in the Nansen Basin between January and June 2015, on board of the Norwegian Polar Institute's Research Vessel Lance. A multidisciplinary team of scientists monitored the atmosphere, the sea ice and the sea water, integrating atmospheric physics with physical and biological oceanography sampling and experiments. The main project goals were to improve the understanding of the energy budget of the Arctic Ocean, the sea ice mass balance and the seasonal dynamics of the ice-associated ecosystem under the new ice regime, with a shift from multi-year to first year ice and a reduction of the summer ice cover. The main objective of this communication is to provide an overview of the project and of some of the results obtained, with emphasis on marine ecology aspects. The main goal of the biological oceanography work was to understand the complex feedbacks between seasonal ice dynamics and ecosystem processes, with emphasis on the physical forcing of the spring "wake up" of the ice associated ecosystem. Another important goal was to obtain data on important biological rates to feedback current modelling efforts of the Arctic Ocean. Water column and ice chemistry were monitored along with phytoplankton, ice algae, zooplankton and ice fauna abundance and taxonomy. Photosynthetic quantum yields, primary production and community respiration were measured to get insight into the autotrophy/heterotrophy relationship over the Winter-Spring transition. Sediment traps were deployed to measure biogenic fluxes from the ice. Zooplankton respiration and grazing rates were also measured. This project will help to fulfil important knowledge gaps on aspects that are relevant to properly forecast the evolution of the Arctic marine ecosystem in the context of the global change trends.



Oral: Ciências da Terra e do Ambiente / Earth and Environmental Science

First results of UAV surveying of thaw lake areas for the characterization of geomorphology, vegetation and water colour (Whapmagoostui-Kuujuarapik and Umiujak, Quebec, Canada)

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Thaw lakes are frequent features in regions with degrading ice-rich permafrost. They show a strong biogeochemical dynamics and are significant for the carbon cycle. Arctic warming is accelerating thaw, affecting the whole landscape and influencing hydrology and soils, therefore generating new conditions for the vegetation communities. Significant changes affect the tundra-taiga boundary, with a marked increase in both tree and shrub formations. This project takes place in the Kuujuarapik and Umiujaq areas and aims at analysing these processes, as well as geomorphological changes in thaw lake basins. This will be done by using historical aerial imagery, high resolution satellite imagery and very high resolution imagery obtained with a UAV. The spatial variability of the physico-chemical characteristics of the lakes will be analysed as a function of environmental conditioning factors.

We present the results from the field surveys that took place in Aug-Sept 2015 with a fixed-wing ebee UAV equipped with a RGB camera and a NIR camera. Aerial imagery was acquired at a resolution of 3 cm allowing to generate high resolution orthophotos produced, as well as Digital Surface Models. The preliminary results allow for a preliminary identification of the controls geomorphological controls on lake colour and also provide for significant advances in what concerns to the development of new spatial strategies for water sampling.

The following sites have been surveyed:

- SAS thaw lakes (55°13'N, 77°42'W), part of a permafrost peatland at a mean altitude of 110 m a.s.l.. The site is located in the sporadic permafrost zone, in the Sasapimakwananiskw River Valley. These lakes are associated to palsa collapse.
- The KWK thaw lakes (55° 18'N, 77°30' W) are in a zone of isolated permafrost in the Kwakwatanikapistikw River valley, 110 m asl. These lakes span a wide range of colours and have derived from fully thawed lithalsas, with extensive tree and shrub development.

BGR ponds (56°37'N, 76°13'W) are in the Sheldrake River valley in the discontinuous permafrost zone. The ponds have formed in thawing permafrost mounds that are primarily organic (peat) or mineral from the thawing of lithalsas and are surrounded by shrubs (*Salix planifolia* and *Betula glandulosa*) and sparse trees.



Oral: Ciências da Terra e do Ambiente / Earth and Environmental Science

Evaluating Hg stress caused by natural contamination in a volcanic island (Deception Island, Antarctica) using immobilized *Phaeodactylum tricornutum* and laser-induced fluorescence

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Antarctica is one of the most remote and pristine places on Earth. However, volcanic activity may be an important natural source of mercury (Hg) that may become bioavailable, and enter the Antarctic marine food webs via phytoplankton, which are at the base of these webs. Changes in phytoplankton photosynthetic physiology triggered by Hg may be potentially used to evaluate Hg contamination. Deception Island is the caldera of an active volcano in the South Shetland Islands archipelago (Antarctica), where high Hg levels can be found in inshore seawaters. This study reports levels of dissolved Hg from Colatina Beach (CB), Whaler Bay (WB), Fumarole Bay (FB), Pendulum Cove (PC) and Morature Point (MP), and investigates changes on cell number, Hg cell content, and laser-induced fluorescence (LIF) spectra of immobilised *Phaeodactylum tricornutum* exposed to water from those sites, during February 2015, to be used as Hg stress indicators. Increased Hg concentrations in exposed *P. tricornutum* compared to control cells, indicated that this element was bioavailable in the water, and readily absorbed by the cells. Mercury levels in exposed cells reflected the dissolved Hg spatial variation, with MP presenting the highest levels. LIF emission spectra showed two typical emission bands in red (683-698 nm) and far-red (725-730 nm) regions. Deviations in LIF spectra and changes ratio F685/F735 were investigated as indicators of Hg induced changes. Fluorescence intensity emitted by exposed cells declined in the red and far-red regions when compared to control cells, suggesting chlorophyll a damage and impairment of pigment biosynthesis pathways by Hg. Significant increase in F685/F735 ratio was detected for all sites, more accentuated for MP. Cell number changes agreed with deviations in F685/F735 ratio, supporting ratio F685/F735 applicability as Hg stress indicator. This study clearly shows that immobilized *P. tricornutum* is a promising tool to evaluate Hg stress that can reduce environmental impact of scientific work, and thereby help preserve the Antarctic environment. LIF technique can be used as time-saving, highly sensitive and effective tool for the detection of Hg stress, with potential for remote sensing and Hg contamination screening in polar areas.



Oral: Ciências da Terra e do Ambiente / Earth and Environmental Science

Topoclimate controls on snow distribution during the melting season (Fildes Peninsula, King George Island, South Shetlands, Antarctica)

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Snowpatches are late lying mantles of snow occurring outside glacier areas and that are frequently pervasive during the whole summer season. They normally occur as a result of various topoclimatic factors (e.g. concavities, solar radiation, wind effect, etc.) and provide an important source of information regarding climate change and geomorphological processes induced by snow (Christiansen 1997). The climate conditions of the South Shetlands archipelago, with mean annual air temperatures of -2 °C at sea-level and summers showing mean monthly temperatures above freezing, with frequent rainfalls favour the development of snow free areas normally at low altitude, where snow patches are frequent from December to April, many of them showing a perennial presence. Research conducted in the previous decade in the Maritime Antarctic has shown that snow patches are important factors for the natural system dynamics and especially for permafrost (Guglielmin et al. 2014, Goyanes et al. 2014, Vieira et al. 2014,). Given this framework, the objective of this presentation is identifying, quantifying and analysing the influence of topoclimatic factors on the occurrence and distribution of snow in the summer season. The research is based on the classification and analysis of high resolution multispectral remote sensing imagery from Fildes Peninsula. The imagery is classified for snow patch detection and different classification algorithms are tested for accuracy. The second step consists on applying spatial analysis techniques using variables derived from digital elevation models (i.e. altimetry, slope, aspect, global radiation) which are used as proxy of topoclimates and known to influence both snow accumulation and snow-melt. The influence of the variables is assessed through exploratory statistical analysis and discussed according to local factors and snow melt conditions preceding image acquisition. This approach allows the development of spatial modelling (e.g. logistical regression and informative value) aiming at mapping the probability of occurrence of snowpatches. Maps of snow patch distribution are presented, providing valuable tools for modelling the spatial distribution of permafrost, as well as a better understanding of nivation-driven geomorphic processes.



Oral: Ciências da Terra e do Ambiente / Earth and Environmental Science

Biogeochemistry of Canadian Subarctic Thermokarst Lakes

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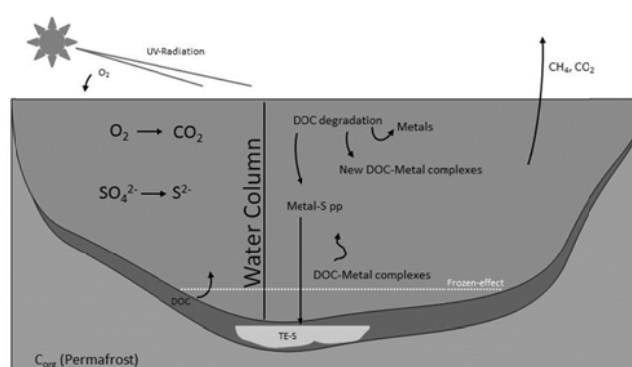
This research was carried out in the Canadian sub-Arctic in order to better understand the biogeochemical processes occurring in thermokarst lakes. Several soils, sediments and water depths were sampled in lakes localized in different permafrost areas.

To chemically characterize the samples in terms of their composition and trace elements (TEs) content, several analytical techniques were used. In this work, sulphur compounds were measured for the first time.

The reduction of dissolved oxygen and sulfate with depth in the water column of all lakes, suggested their consumption during the mineralization of Natural Organic Matter, such as dissolved organic carbon (DOC) which increased with depth apparently related to molecular diffusion and/or freeze-concentration effects of DOC at the sediment/water interface. More than 14% of analyzed TEs were remobilized in water when the DOC mineralized, which may precipitate by the production of sulphide ions.

High sedimentary organic matter was observed in SAS/KWK lakes samples (max. 94%) while in BGR lake samples lowest levels were determined (<2%). Also, organic-S was less abundant in this lake accounting only 33% whereas for the others more than 50% was observed. A tendency for TEs to increase with higher aluminium content in soils/sediments was verified suggesting an association with inorganic material, with sulphides playing an important role.

This work points to the importance of organic matter composition in the biogeochemical processes occurring in thermokarst lakes, and provides the first evidence of the importance of the sulphur chemistry in these carbon-enriched freshwater systems.





Oral: Ciências da Terra e do Ambiente / Earth and Environmental Science

High resolution mapping of Barton Peninsula (King George Island, Antarctica) with a UAV

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The permafrost environment, currently in a critical threshold in the South Shetlands, may suffer drastic changes if the warming trend is to continue. The availability of remotely sensed images with higher resolutions than those provided by commercial satellites is a significant advance for mapping glacial and ecological features in detail and in a multi-temporal framework in order to contribute to a better monitoring of the increasing climatic changes at permafrost terrains of the free-ice areas, where changes are occurring fast.

We present the activities of the campaign developed in Barton Peninsula (King George Island, 62°S) during three weeks in February 2015 for acquiring ultra-high resolution images with a drone, an unmanned aerial vehicle. The main activities developed during this campaign were: (1) Collection of detailed ground data with D-GPS coordinates and ground images; (2) Acquisition of ultra-high resolution images with an UAV and (3) detailed survey for geomorphologic mapping. This campaign was preceded by two other campaigns to the same location in previous years that allowed us to collect multi-temporal data of the studied regions [1].

The data collection on the field consists now of about 3150 points with planimetric and altimetric information (to be used in geometric correction procedures) evenly distributed along Barton Peninsula, from which about 2/3 of them also contain the attribute related to the type of surface cover. Efforts are being done to cover the entire peninsula with remotely sensed imagery of ultra-high spatial resolution captured in the UAV flights. Up to now, we managed to fly over about half of the peninsula, corresponding to 5 km², where we have in some small selected locations the spatial resolution of about 1.5 mm/pixel, but the overall resolution is of ~4 cm/pixel. The mosaics will be used to perform image classification and geomorphologic mapping of the surface.

[1] Bandeira L., Pina P., Vieira, G., 2014, *Ultra-high resolution image acquisition with an Unmanned Aerial Vehicle for detailed mapping in Barton Peninsula (King George Island, Antarctica)*, in Ortiz, A. et al. (eds.) *Avances, métodos y técnicas en el estudio del periglaciario*, 219-229, Universidad de Barcelona, Barcelona.



Oral: Ciências da Terra e do Ambiente / Earth and Environmental Science

MATAGRO - Monitoring of Atmospheric TrAcE Gases in Antarctica with GRound-based remote sensing Observations – Activities and obtained results

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MATAGRO was the first Portuguese project to establish activities in Antarctica in the field of atmospheric sciences. The main objectives stated in the work plan of the MATAGRO project were accomplished; namely: i) installation in Antarctic region of new spectrometric instrumentation (SPATRAM – Spectrometer for ATmospheric Tracers Measurements) for the automatic and unattended monitoring of the ozonosphere; ii) re-analysis of more than 10 years of data measured with the old spectrometric system at the Mario Zucchelli Station (MZS); iii) formation of graduate and master students in the spectral analysis with the Differential Optical Absorption Spectroscopy (DOAS) technique and inversion methods to retrieve total column and vertical distributions of atmospheric tracers such as nitrogen dioxide (NO₂), ozone (O₃) and bromine oxide (BrO). The activities in Polar Regions resulted in the participation of the project PI in four Italian Antarctic expeditions, which was possible only thanks to the collaboration with the ISAC institute, taking advantage of the logistic coordination of the Italian Project for Antarctic Research. Thanks also to the support of the Portuguese polar program (PROPOLAR). In the PROPOLAR website (<http://www.propolar.org/matagro.html>) the activities carried out within the MATAGRO project during the Antarctic expeditions were detailed described in almost real time. In this presentation, the complete description of the activities developed within the MATAGRO and the obtained results are deeply described and explained.



Oral: Ciências da Terra e do Ambiente / Earth and Environmental Science

Meseta Norte of Fildes Peninsula (King George Island, Antarctica) in the scope of GEOPERM Project - lithological/geological mapping and insights into the volcanics geochemistry

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Meseta Norte is the most pronounced relief of Fildes Peninsula (King George Island, Antarctica) forming a relatively flat-topped hill. Its shape is well defined by the 100m altitude quota, clearly separated from the surrounding platform (50-60m altitude), but having some confining reliefs that can reach the maximum altitude of 150-160m. The combined effects resulting from the recent periglacial environment (medium Holocene, between 8000 and 6000 years B.P.) associated to differential erosion of the distinct outcropping volcanic rocks are, probably, the factors controlling the geomorphology of this region.

During February-March 2015, a field work campaign was carried out in this area with the objective to perform a detailed (1/5000 scale) lithological and geological mapping. During this work various lithological units were established: 1) fine porphyritic basalts and andesitic basalts, forming generally altered lava flows; 2) volcaniclastic rocks, having various grain sizes and compositions, but frequently with veins and amygdals filled by calcite, zeolites, jasper and quartz. These volcanic clastic rocks are interbedded with basaltic lava flows and have lateral irregular thicknesses. Units 1) and 2) outcrop in about 75% of the Meseta area. 3) subvolcanic intrusions having basaltic or dacitic compositions, being fine grained or aphyric and mostly outcropping in the NE border of the Meseta, in the eastern vicinity of Laguna Cisnes. 4) fine grained volcanic clastic rocks (tuffs and volcanic sandstones), graded normally and forming layers with well-defined stratifications planes. 5) Agglomerates containing sub-rounded andesitic fragments, with an average diameter of 20 cm, spatially associated with andesitic lava flows underlying the agglomerates. These two last units outcrop SE of the Meseta. The mineralogy of the collected volcanics, studied in thin section, is mainly formed by clinopyroxene, plagioclase and ilmenite.

An assemblage of 29 volcanic rock samples was collected in the study area for chemical characterization. We will present the entire major and some trace elements composition of the volcanics (total rock analysis by FRX) representing the rocks of each unit and their chemistry of the main rock forming mineral phases (Electron Microprobe analysis).



Oral: Ciências da Terra e do Ambiente / Earth and Environmental Science

Hydrodynamic Modeling of Port Foster (Deception Island, Antarctica)

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The need of a hydrodynamic model capable of explaining how different elements, such as Hg and MeHg, would disperse in Port Foster (Deception Island, Antarctica) and the semi-enclosed nature of the basin, the presence of hydrothermal activity, the sudden variations in topography and the fact that is located in the most remote continent on Earth in a region with severe weather conditions, are some of the challenging features that make this study worthwhile. The paucity of taxa in Port Foster can be related with the existence of trace metals, and some concentrations of those metals, such as mercury, are 10 times bigger than those found in the Southern Atlantic Ocean. Little is known about mercury biogeochemistry in Antarctica, and an integrated study is needed, that takes into account the sources, fluxes, pathways and bioavailability of mercury in Port Foster's ecosystem. Using a numerical model named MOHID, one can better understand the bay hydrodynamics and also correlate them with other published results. Using the 2D hydrodynamical model, tidal circulation and residence time were calculated. The validation of the hydrodynamical model was done comparing the results with tidal data collected in loco. Results show that the higher tidal current velocities occur in Port Foster narrow entrance (Neptune's Bellows), reaching maximums of 0.6 m/s, whereas within Port Foster are very low. The 3D model gives an insight to how the circulation is done and also to how variations of temperature and salinity can affect the water column. Other findings include the recognition of internal tides generation in summer and winter, and the importance of knowing how different elements circulate inside Port Foster. Lagrangian Tracers were used to depict how mercury particles circulate within the bay. The residence time of 1.7 years calculated and the poor particle exchange between Port Foster and the surroundings seen in the model results, prove that the bay is a good place for mercury accumulation, therefore being a rising threat to the local ecosystem...since it only tends to increase.



Oral: Engenharia civil Polar/Polar civil engineering

A sustainable modular building for research development in the antarctic

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This paper discusses the first year results of the "Polar Lodge" research project. The objective of the project is to research the use of sustainable modular building (small scale movable lodge) in extreme cold climates, using eco-friendly building materials, and aiming at energy self-sufficiency, in order to minimize environmental impacts. The Polar Lodge involves a joint collaboration between the Instituto Superior Técnico, the University of Cambridge, and the Universidade de Brasília. A field work was carried out during a two week stay in the Antarctic Peninsula. A variety of Antarctic Polar Stations was visited, and data was collected and analysed - regarding building performance, constructive characteristics of the existing pavilions, and the energy and comfort performance of each building.



Oral: Education, Outreach & Communication

Polar Educators International: fostering the bridge between the scientific community and society

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Polar Educators International (PEI) is a vital international network of educators and researchers aiming to provide a deeper understanding of current polar science. PEI represents trusted leaders working to inspire appreciation and knowledge of the polar regions, their connectedness to all Earth's systems, and importance to all humans across latitudes and cultures.

The purpose of developing this network is to create a workspace for collaboration between those who educate in, for, and about the polar regions. This network of more than 1000 member from around 90 polar and non-polar nations are the PEI greatest resource. A PEI membership survey was conducted to gather member feedback and the results informed the global philosophy, mission and vision of the current organization.

PEI is being legitimated as an emerging organization for polar education by endorsement of Scientific Committee on Antarctic Research (SCAR), International Arctic Science Committee (IASC), Association of Polar Early Career Scientists (APECS), Ice Drilling Program Office (IDPO), New Zealand Ice Fest, GAIA - Antarctica and sponsored by Arctic Research Consortium of the United States (ARCUS) and Climate and Cryosphere (CLIC).

The Master Classes in a wide range themes and the bi-annual International workshop, are one of the most strong developed activities providing relevant and timely professional development opportunities for both education and scientific communities.

PEI Portugal will be one of the first national committees of PEI and arises in order to develop national level initiatives and overcome the language barrier experienced by educators and the community at large. PEI Portugal has already contributed to the international workshop in polar science education in Coimbra and Hannover, as well to the 1st national workshop. All the work will be developed in a strong collaboration with APECS PT and Portuguese Polar Program- Propolar. It is intended presenting the organization, the goals and the outgoing activities while providing guidance of how scientific community can engage in Polar science education and outreach at an national and international level in the future.



Poster: Ciências Biológicas / Biological Sciences

Cryptoendolithic communities in the frozen desert of Antarctica

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The McMurdo Dry Valleys (MDV), in Antarctica, have low biodiversity being characterized by extreme and unfavorable conditions for life. However, in the middle of these frozen deserts emerges a true “oasis”: the cryptoendolithic communities that proliferate inside rocky substrates. In this work we characterized the cryptoendolithic communities of MDV with particular emphasis on those involved in the nitrogen biogeochemical cycle. To meet our goal, we followed four sequential approaches: (1) enrichment of cultures from cryptoendolithic samples, to cultivate unique ecotypes; (2) diversity characterization by using molecular fingerprinting and next generation sequencing (NGS) techniques; (3) identification of dinitrogen (N₂) fixers and nitrifying prokaryotes and (4) isolation of diazotrophs and nitrifiers by conventional culturing techniques. Our results revealed that the cryptoendolithic community is dominated by Cyanobacteria (44%) and Actinobacteria (30%), suggesting a structural role of those groups in the community and a close syntrophy relationship between the two groups. Some phylotypes with low representativeness in the original sample became enriched in culture conditions, such as members of the Bacteroidetes, Cyanobacteria and Proteobacteria, while others were almost undetected, such as Actinobacteria. We also identified a genus related to Archaea ammonia oxydizers AOA (Candidatus Nitrososphaera), a genus associated with nitrite-oxidizing bacteria (Nitrobacter), and several diazotrophic non-heterocystous cyanobacteria (Chroococcidiopsis, Cyanothece, Leptolyngbya, Oscillatoria) which provide important insights for further understanding of nitrogen recycling in the cryptoendolithic communities of MDV. Further research should concentrate efforts on isolating these extreme microorganisms responsible for the bioavailability of essential elements (N, C) in one of the most extreme ecosystems on Earth.



Poster: Ciências Biológicas / Biological Sciences

Analysis of stable isotope ratios in blood of tracked wandering albatrosses fails to distinguish a $\delta^{13}\text{C}$ gradient within their winter foraging areas in the southwest Atlantic Ocean

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Analysis of intrinsic markers, such as stable isotopes, provides a powerful approach for tracing movements of marine wildlife. It has the advantage that animals need only to be sampled once, unlike deployment of tracking devices that often requires recaptures for data retrieval. The main limitation of isotopic tracking for inferring distribution is the lack of detailed reference maps of the isotopic landscape (i.e. isoscapes) in the marine environment. Here, we attempt to map the marine $\delta^{13}\text{C}$ isoscape for the southwestern sector of the Atlantic Ocean, and assess any temporal variation using the wandering albatross *Diomedea exulans* as a model species. Tracking data and blood and diet samples were collected monthly from wandering albatrosses rearing chicks at Bird Island, South Georgia, during the austral winter between May and October 2009. $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values were analysed in blood plasma and blood cells, and related to highly accurate data on individual movements and feeding activity obtained using three types of device: GPS, activity (immersion) loggers and stomach temperature probes. The tracked birds foraged in waters to the north or northwest of South Georgia, including the Patagonian shelf-break, as far as 2000 km from the colony; birds did not travel to the south or east. Nevertheless, the foraging region encompassed the two main fronts in the Southern Ocean (Polar and Subantarctic fronts). $\delta^{13}\text{C}$ values varied by only 2.1 ‰ in plasma and 2.5 ‰ in blood cells, and no relationships were found between $\delta^{13}\text{C}$ in plasma, and mean latitude or longitude of landings (from immersion data) or feeding events (from stomach temperature records) of each individual. The failure to distinguish a major biogeographic gradient in $\delta^{13}\text{C}$ in comparison with results from a similar study in the Indian Ocean suggest either limitations of using wandering albatrosses as a sampling tool, or that $\delta^{13}\text{C}$ values in the south Atlantic Ocean are more homogenous. There was no substantial variation among months either in $\delta^{13}\text{C}$ or $\delta^{15}\text{N}$ values of plasma or blood cells of tracked birds. These results provide no evidence for major temporal variation in stable isotope ratios in consumer tissues, or in the regional marine isoscape in the austral winter.



Poster: Ciências Biológicas / Biological Sciences

Intra-annual variations of the diet of gentoo penguins (*Pygoscelis papua*) at South Georgia (Southern Ocean)

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Gentoo penguins *Pygoscelis papua* are excellent bio-indicators of local prey availability (within 50 km) around their colony. As their foraging behaviour does not change considerably, and they come regularly to their breeding island, all through the year it is possible to assess in detail the availability and population dynamics of poorly known marine organisms (i.e penguins prey) during the Antarctic winter, when research cruises are extremely rare. In this study we assess the feeding ecology of gentoo penguins at Bird Island, South Georgia (54° S, 38° W) during the Antarctic Winter of 2009, using scats, to assess intra-annual variations in their diets, population dynamics of their most abundant prey and evaluated the implications of these results for the conservation of these penguins. The amphipod *Themisto gaudichaudii* was the main prey of gentoo penguins (present in 77.1% of the samples). Gentoo penguins diets were able to show the growth of *T. gaudichaudii* through the Antarctic Winter. As environmental conditions seemed unfavourable to gentoo penguins in 2009, with apparently lack of Antarctic krill *Euphausia superba* in close-by waters, these penguins struggled in finding sufficient amount of prey to maintain their body condition levels for reproduction. This was expressed in their attempt to breed in the following Summer 2-3 weeks later (British Antarctic Survey, unpublished data). In terms of conservation, if these unfavourable conditions continue to occur during the Antarctic Winter in this region, the population of gentoo penguins in South Georgia can be affected by decreasing their breeding performance.



Poster: Ciências Biológicas / Biological Sciences

Testing how changes in environmental variables promote shifts in Nitrogen pathways and prokaryotic communities in soils from extreme Antarctica Dry Valleys.

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The Dry Valleys of Antarctica comprise vast ice-free areas considered some of the most extreme terrestrial environments. Being very limited by Nitrogen, its recycling becomes crucial for life. However, the low water and nutrients availability restrict this process by challenging the physiology of the organisms that support it. In order to understand how environmental conditions constrain microbial activity and their ecological function on N cycle, two bulk soils from two chemically and physically distinct Antarctic valleys: Beacon and Miers Valleys were incubated for 68 days and subjected to five different treatments mimicking low and high concentrations of ammonia, high conductivity and high concentrations of organic matter and copper in the soils. Samples were taken after 24h, 28 days and at the end of incubation (68 days) for DNA/RNA 16S community analyses, functional genes quantification, nutrient fluxes and nitrification rates measurements. Preliminary results showed differences between Miers and Beacon core communities, however along the time course such dissimilarities were maintained even when subjected to the same treatments. Nonetheless, in each type of soil, treatments promoted shifts on the structure of prokaryotic communities followed by an alteration of the genetic functional content seen during our *in silico* analysis. The main shifts were notorious after two weeks and related to pathways like nitrification, denitrification, dissimilarity nitrate reduction and anammox. Concerning nitrifying communities, ammonia oxidizing archaea were the main active group in both soils, being especially more abundant under copper, ammonia and glucose additions. No ammonia oxidizing bacteria nor nitrite oxidizing bacteria were found in Beacon soils at the beginning or end of incubation time, which led us to believe that nitrification process beside occurring in a very lower scale, when compared to Miers, is mainly supported by archaeal activity.

These preliminary results claim to the importance of the environment to Antarctic ecosystem sustainability warning to the impacts of chemical and physical variations on biogeochemical cycles and on ecosystem functionality.



Poster: Ciências Biológicas / Biological Sciences

Distribution of short-finned squid *illex argentinus* (cephalopoda: ommastrephidae) in the south atlantic: little evidence from top predators that it extends to antarctic waters
distribution of short-finned squid *illex argentinus* (cephalopoda: ommastrephidae)

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Global warming effects may change the distribution pattern of many species and some might extend into Antarctic waters. However, little evidence comes from pelagic marine species. The short-finned squid *Illex argentinus*, a species of commercial interest in the South Atlantic, has been reported in the diet of grey-headed *Thalassarche chrysostoma*, black-browed *T. melanophrys* and wandering *Diomedea exulans* albatrosses breeding in the Antarctic waters, suggesting that *I. argentinus* might occur in colder waters. To verify such hypothesis, we used stable isotope analyses from the cephalopod beaks collected in the diet of these three albatross species breeding in Bird Island, South Georgia (54°S 28°W). Our results show that *I. argentinus* identified in their diet has a Sub-Antarctic distribution (i.e. $\delta^{13}\text{C}$: -18.77 to -15.28 ‰). Thus, it is more likely that these albatross species foraged in Sub-Antarctic waters, at the Patagonian Shelf, where *I. argentinus* is commonly distributed (validated by the $\delta^{13}\text{C}$ of the Patagonian shelf distributed *Octopus tehuelchus*) rather than *I. argentinus* extending their distribution further south.



Poster: Ciências da Terra e do Ambiente / Earth and Environmental Science

Detailed seafloor morphology of the Continental Shelf between 128°E and 134°E, East Antarctic

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Understanding the reaction of large ice sheets to climate change is critical for elucidating unprecedented environmental changes that have significant potential impacts on sea levels, ocean currents, ecosystems and society. Recent satellite data and aerogeophysical ice-penetrating radar surveys suggest that the East Antarctic Ice Sheet (EAIS) is more vulnerable than previous thought. However, the current lack of suitable data from the seafloor morphology of the East Antarctic continental shelf to assess the current and past EAIS behavior is a major restraint, and has motivated to conduct further investigations.

Recent multibeam swath bathymetry data covering a previously uncharted area of the East Antarctica continental margin allow detailed mapping of the geomorphic features formed during past times of extended grounded ice from an expanded EAIS. Under the umbrella of the U.S. NSF project 'Vulnerability of East Antarctic ice shelves' and the PROPOLAR project EAST-MARGINS, we interpreted the seafloor morphology to reconstruct past ice flows and better understand the retreat history of the EAIS. The study area includes a segment of the continental shelf and slope between the Dibble Ice Tongue and Frost Glacier (128°E and 134°E). The data were collected with the hull-mounted multibeam system Kongsberg EM122 on board the U.S. icebreaker R/V Nathaniel B. Palmer in April 2015 (cruise NBP1503).

The preliminary results show a continental shelf with varying depths between 300m and 990m. In the inner and mid shelf area west of the Dibble Ice Tongue the seabed has a high relief with up to 230 m deep meltwater channels and drumlinized bedforms at 800-900 m of water depth. The drumlinized bedforms are coalescent and have diversified morphologies, leading to interpret this region as transition with paleo-ice flow acceleration and confluence. Sporadic iceberg scours occur in the outer continental shelf between 310-350 m of water depth. The shelf break is characterized by sets of small-scale gullies, which merge into larger channels on the continental slope separated by sediment mounds. Those incisions on the shelf break constitute a strong evidence that the grounded ice reached the shelf break in the past and was more dynamic than previously thought.



Poster: Ciências da Terra e do Ambiente / Earth and Environmental Science

Wind regimes and nivo-eolian corrasion in the South Shetland Islands, Antarctic

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The South Shetlands show Polar maritime climate, mean air temperatures at sea-level of ca -2 °C, strong winds all year-round and annual precipitation of 400-700 mm, most of it as snow. The terrain is rugged in most islands, with prevailing glaciated areas, but with ice-free peninsulas and nunataks. The ice-free peninsulas frequently show rock outcrops and boulders, which are wind-exposed above the snow surface, even during winter. Nivo-eolian corrasion features associated to the impact of wind-blown snow are commonly found in wind-exposed rock surfaces in many areas.

Hurd Peninsula in Livingston Island is mountainous and shows several ice-free areas with exposed and convex outcrops, prone to nivo-eolian corrasion. To characterize meteorological and snow conditions, we have installed a meteorological station near the Bulgarian Station, time-lapse cameras, as well as snow thickness poles. Wood poles have been installed and repainted annually, allowing to assess corrasive wind directions. At key sites we have conducted high resolution mapping of wind-polished rock outcrops. Rock varnish has been also described and sampled. Bioindicators of scarce snow cover during the cold season (*Usnea* spp.) have been mapped in situ and using high resolution remote sensing (QuickBird). Wind data was used to force wind fields over a digital elevation model and the velocity and direction results were compared to the mapped features and wood pole data.

The results show that the climate favours the action of nivo-aeolian corrasion on exposed surfaces. Observations of abraded boulders and corrasion of painted poles show that erosional winds are from NE to SE. The erosive action of wind-blown snow is clear on the mitigation of lichen growth in exposed rock surfaces and leads to the development of erosive features (polishing and pitting). In Hurd Peninsula the lack of moving sediments indicates that corrasion is not due to sediment impact; Corrasion direction indicates that the presence of a snow area (glacier surface) upwind is an essential factor in such a windy environment.

This research has been conducted in the framework of project PERMANTAR-3 (PTDC/AAG-GLO/3908/2012 - FCT). PROPOLAR is thanked for logistical support.



Poster: Ciências da Terra e do Ambiente / Earth and Environmental Science

Image analysis based methodology for the construction of ground-truth datasets in ice-free surfaces of Fildes and Barton Peninsulas, King George Island (Maritime Antarctica)

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The use of remote images for surface mapping in the Polar Regions is increasing rapidly, not only using space [1] and airborne systems [2] but also UAV-Unmanned Aerial Vehicles [3] to obtain higher resolution of the surface with a higher temporal frequency, in regions where cloud coverage is a frequent obstacle. The correct practice of the classification procedures of those images requires always a confrontation with reference data acquired in the field describing the type and nature of surface cover in order to validate the thematic maps.

We present an approach to identify in each true-colour image obtained with a camera attached to a D-GPS, the proportion of the surface cover class (soils, rocks and vegetation) around each coordinated geographic point. The algorithm consists of an object-based image analysis that starts by the segmentation of the image into homogeneous regions that are next labeled by a supervised classifier. This approach was tested with images captured in Fildes and Barton Peninsulas in 2012, 2013 and 2014 campaigns in the frame of PROPOLAR projects SNOWCHANGE and HISURF.

The procedure allows building accurate ground-truth datasets in regions of difficult access, detailing the type and amount of surface cover around each sampled point and providing a good estimation of each pixel mixture for a better training and testing of the classifiers of remotely sensed imagery.

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Poster: Ciências da Terra e do Ambiente / Earth and Environmental Science

Remote Sensing applied to the study of the dynamics of subarctic vegetation: the case of Kuujuarapik-Whapmagoostui (Quebec, Canada)

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This research aims at identifying changes on vegetation cover in the subarctic region of Kuujuarapik-Whapmagoostui (Quebec, Canada), using a temporal series of satellite images. The study area, located at the boundary between the boreal forest (*Picea glauca*, *Picea marina* and *Larix laricina*) and the shrub tundra (Dwarf Birch and several ericaceous vegetation) has recorded a significant temperature increase as well as a decrease of the snow cover in the last decades. Although there is still a certain degree of uncertainty about the relation between climate change and changes in vegetation cover, the satellite data and field observations evidence changes in the vegetation since the 1990s.

A regional analyses was conducted using a time-series of images from Landsat 5 (1991), 7 (2000), and 8 (2014), in order to evaluate the main changes in vegetation cover. A detailed study area was studied using very high resolution Quickbird (2006) and Worldview 2 (2014) scenes. In this area target areas were selected in order to carry out a detailed study on both the regional and local scales. The focus of the analysis is to identify, quantify and understand the vegetation changes from 1991 to 2014 from multiple training sets designed to represent the spectral variability of the surface classes. Classification tests were conducted using the maximum likelihood algorithm. A different set of ground truth areas was used to validate the performance of the classification using a confusion matrix approach in Envi 5.1, which allows to evaluate the precision and errors of the classification. Ground truthing was obtained from a field survey in August-September 2015.

This research is integrated in the project ADAPT-PT2 - Arctic Development and Adaptation to Permafrost in Transition – Portuguese Branch, funded by the Portuguese Polar Program (PROPOLAR – Fundação para a Ciência e a Tecnologia).



Poster: Ciências da Terra e do Ambiente / Earth and Environmental Science

MATAGRO2 - Monitoring of Atmospheric TrAcE Gases in Antarctica with GRound-based remote sensing Observations – New technological and scientific goals

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The MATAGRO project started in 2011 and the atmospheric group of the Institute for Earth Sciences (ICT) (former Geophysics Centre of the University of Evora / CGE-UE) conducted the research in collaboration with the Italian Institute of Atmospheric Science and Climate of the National Research Council (ISAC-CNR). The activities in polar regions resulted in the participation of the PI project to four Italian Antarctic expeditions that were possible thanks the collaboration with the ISAC institute taking advantages of the coordination of the Italian Project for Antarctic Research. MATAGRO was the first Portuguese project related to atmospheric science to start activities in Antarctica. Actually the new instruments are measuring zenith sky scattered radiation and the diffused radiation in directions away from the vertical one, allowing for the monitoring of tracers not only in the stratosphere but also in the low troposphere. One further step in the atmospheric physics research in Antarctic region related to MATAGRO and foreseen in the MATAGRO2 proposal is the possibility to setup a new optical device allowing for the exploitation of the so-called LP-DOAS (Long-Path Differential Optical Absorption Spectroscopy). This configuration allows for the determination of the mean concentration of atmospheric tracers along a fixed path of measurement. The new optical device is an emitting/receiving telescope linked to the main body of the spectrometric system already installed at the MZS, coupled with a retro-reflecting mirror at about 4/5 Km from the telescope. The increasing interest on reactive halogens monitoring that has improved in the past years due to their strong impact on tropospheric composition, is the main motivations for this activity. In addition, the attention for halogen oxides, such as iodine and bromine oxides, is intensified by the recently developed space based remote sensing instrumentation. Within the MATAGRO2 proposal beside the extension of the measurements capabilities of trace gases retrieval and detection above described, we would like to enlarge the research field introducing also a biological component using satellite measurements of BrO and of chlorophyll-a to study correlations between biomass activity in ocean and halogen in the atmosphere.



Poster: Ciências da Terra e do Ambiente / Earth and Environmental Science

In situ measurements of atmospheric aerosols at a remote site, north of the Arctic Circle

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The ALOMAR (Arctic Lidar Observatory for Middle Atmosphere Research) station is located in Andøya island close to the town of Andenes (69°16'N, 16°00'E, 380 m a.s.l.) on the Atlantic coast of Norway, approximately 300 km north of the Arctic Circle. The facility is managed by the Andøya Space Center, and the site is well-suited for measurements of remote background aerosols due to the absence of large regional pollution sources.

In the first part of this work we present in situ data collected by our team in ALOMAR during the past few years. We have collected aerosols on filters for gravimetric and chemical (major ions) analysis. Optical data, including the scattering and absorption coefficients, as well as their derived parameters, were obtained with a polar nephelometer and a particle soot absorption photometer (PSAP). The number size distributions were measured separately for the fine and coarse fractions using a scanning mobility particle sizer (SMPS) and an aerodynamic particle sizer (APS), respectively. Columnar data is also available, obtained from a sun radiometer but it is beyond the scope of this work.

The second part of this work intends to explain the main objectives of the POLARUBI project. This project will take place during March 2016 and will focus on the individual particle analysis of atmospheric aerosols. Aerosol samples are to be deposited onto membrane filters. The total aerosol concentration and the size distribution are to be obtained as well as the chemical composition and the morphology of the individual atmospheric aerosols. The techniques used are gravimetry and scanning electron microscopy with energy dispersive x-ray (SEM/EDX) analysis. The main goal is the characterization of individual particles but this information is to be studied together with air masses origins and in situ data from the nearest stations, with the purpose of determining possible local sources and long range sources of imported particles.



Poster: Ciências da Terra e do Ambiente / Earth and Environmental Science

Holocene environmental changes in Byers Peninsula (South Shetland Islands, Antarctica) inferred from lake sediments

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The current ice-free environments in the Antarctic Peninsula region are a consequence of the long-term retreat of the ice caps still covering most of these islands. The warmer conditions recorded during the Holocene led to the shrinking of the ice masses and favoured the expansion of periglacial processes. This is the case of the Byers Peninsula, the largest ice-free environment in the South Shetland Islands (ca. 60 km²).

The present research introduces a multiple dating approach applied to four lake sedimentary sequences from the Byers Peninsula (lakes Chester, Escondido, Cerro Negro and Domo) that complement and greatly expand the deglacial chronology of the area. The chronological framework for environmental changes was established using TL dating, tephrochronology, Pb210 and AMS C14.

Five different tephra layers of cm-scale thickness were identified in the lake sediments from Byers Peninsula. The geochemical and textural properties of these tephras point to the Deception Island volcano as the source of their source eruptions. The available chronological models suggest that these eruptions occurred at ca. 5.0, 4.8, 3.9, 2.3 and 1.8 ka cal BP.

These lake sediment ages provide key information for interpreting the deglaciation sequence in this ice-free peninsula. The onset of the deglaciation of the Byers Peninsula started during the Early Holocene in the western fringe of the peninsula according to the basal (just above the diamicton) dating of Limnopolar Lake (ca. 8.3 ka cal BP). Glacial retreat also exposed the highest parts of Cerro Negro nunatak in the SE corner of Byers, where Cerro Negro Lake is located. This lake was glacier-free by at least 7.5 ka cal BP. During the Mid-Holocene the retreat of the Rotch Dome glacier cleared the central part of the Byers plateau of ice, and Chester and Escondido lakes formed at 5.9 ka and 5.1 ka cal BP, respectively. Finally, in Domo Lake, cored at only 300 m from the present-day glacier front, we report an age of 2.3 ka cal BP for the apparently basal sediments, which suggests that the deglaciation of the easternmost part of the Byers Peninsula is of Late Holocene age.

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poster: Ciências da Terra e do Ambiente / Earth and Environmental Science

Regional mean annual air temperatures and local thermo-mechanical dynamics of the active layer (Livingston and Deception Islands. Antarctica)

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Regional analysis of the Mean Air Annual Temperatures (MAAT) by means of the monthly mean air temperatures series developed by METeorological REference Antarctic Data for Environmental Research (MET-READER – SCAR, The Scientific Committee on Antarctic Research) and implemented by the Goddard Institute for Space Studies, GISS surface temperature analysis tool, in the western Antarctic Peninsula, show a dispersion in the MAAT values, resulting in a warming trend in the last 60 years. However, short time-series show periods in which the tendencies can be opposite. One of the more interesting problems in the active layer thermal evolution is the effect of the soil and air energy balance and the ground propagation of the thermal wave. Some of the main parameters for studying this problem are air temperature and snow depth during the winter. In this work, we present long-term regional and seasonal MAAT data in comparison with the active layer depth and thermal regimes recorded in the experimental sites located in Livingston and Deception Island.

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Key words.- Active layer. Permafrost. Antarctic Peninsula.



Poster: Ciências da Terra e do Ambiente / Earth and Environmental Science

Vegetation mapping using high resolution remote sensing imagery (Barton Peninsula, King George Island – Antarctica)

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Keywords: Supervised classification, vegetation, Barton Peninsula, Antarctica

Barton Peninsula is located in King George Island, part of the South Shetland Islands in Maritime Antarctica, on of the Earth's regions that have shown strongest warming on the last six decades. Since small fluctuations on climate are known to cause significant changes on the terrestrial Antarctic environments it is important to study those effects on the vegetation communities present in the area, here dominated by lichens and mosses, the most representative being *Usnea* spp., *Andreaea* spp. and *Sanionia georgico-uncinata*.

The classification of satellite imagery of remote areas allows the identification of the vegetation cover thus generating relevant data for spatial analysis and modelling. Vegetation communities were mapped using a high resolution IKONOS-2 scene (4 m) with three visible (RGB) and one near infra-red (NIR) bands.

Using the Maximum Likelihood algorithm for the image classification and a vegetation map produced by Kim et al. in 2007, for selecting training and validation areas, the method proofed very robust with an overall accuracy of 98,6%.

The results showed: 1) the effect of elevation, on the distribution of the vegetation, with over 90% of moss areas occurring below 100m, whereas lichen formations can be found up to 260 m, with 60% between 80 and 120 m; 2) the effect of slope, with the presence of both communities decreasing with increasing gradient, with ci. 40% of the total vegetation occurring in flat areas; 3) the effect of aspect, with the mosses distributed mostly in the south slopes, with nearly 60% of the area close to the shoreline, and lichens mostly facing the, Northwest and North, corresponding closely to the directions of prevailing winds.



Poster: Ciências da Terra e do Ambiente / Earth and Environmental Science

Advances in modelling TTOP in Hurd Peninsula (Livingston island, Maritime Antarctic)

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The Western Antarctic Peninsula has been one of the world's regions where atmospheric warming occurred at a faster rate. Mean annual air temperatures increased c. 3.4°C since 1950 and permafrost degradation was reported in the Palmer archipelago (Bockheim et al. 2013). Warm permafrost areas and discontinuous and sporadic permafrost are sensitive to climate change effects, since they show temperatures near thawing (1-2°C).

The main objective of the ongoing research in Livingston island is to study the characteristics and thermal state of the permafrost, the factors that control its variability, as well as its spatial distribution. Temperature at the Top of Permafrost (TTOP) modelling, provides a functional framework of the climate-permafrost system, relating the influence of climate, terrain and lithological factors on thermal regime and distribution of permafrost. Surface conditions of this equation are provided by n-factors, which are the ratio between soil and air freezing indexes. N factors are frequently used as a representative value of the joint insulating effects of vegetation, organic matter in the soil surface and snow conditions in the ground.

Measurements of air and ground surface temperatures, and snow thickness between 2009 and 2013, for seven sites in different geographical settings in Hurd Peninsula provided the initial framework for modelling n factors. Since snow conditions are the main controls of n factor variability, a thematic map concerning melt patterns derived from Landsat images, was used to access spatial distribution of late lying snow cover. Thermal conductivity and its variation in depth were measured for rock samples for seven study sites following Correia et al. (2012).

Modelled TTOP values show a good approximation to observed permafrost temperatures, showing that where n factors are higher (late lying snow), usually below 40 m altitude permafrost is absent. Modelled TTOP using only altitude showed more accurate results limiting positive values of TTOP around 150 m altitude. When introducing parameters involving snow the model showed an overestimation of TTOP temperatures. This occurs due to the poor quality of snow data and its high variability in time and space.



Poster: Education, Outreach & Communication

Evaluate Earth's Health through Polar Regions: a thematic module from IRRESISTIBLE project highlighting the Portuguese Polar Science

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IRRESISTIBLE is an European project on teacher training, combining formal and informal learning focused on Responsible Research and Innovation (RRI). The goal of the project is to design activities that foster the involvement of students and the public in the process of RRI. The project aims to increase students' content knowledge about research by bringing cutting edge research into the school program, and to foster the discussion among students about RRI issues by the introduction of relevant topics.

In each of the ten partner countries a Community of Learners - science teachers, education experts, exhibition experts from museums/science centres and researchers - developed a thematic module. Polar science was one of the cutting edge themes choose to develop a module, proving to be an outstanding context for discussion of the dimensions of IIR. This module was applied for the 1st time at a Portuguese school and students from 10th grade had the opportunity to contact for the first time with the polar science that is being developed by, and with the contribution of, Portuguese scientists, it's importance and the reason why Portugal should do polar science.

The module purposes the analysis of scientific papers from Portuguese authors or co-authors. It is intended that students conclude about the relevance of the research for the advance of knowledge in Polar Science and identify RRI practices. As product the students have to build an interactive exhibition on the theme open to general public. The best exhibits from the project will be presented to the European public during a special session at an international conference.

The module will also be available online in English and is expected to be applied by other countries and by other Portuguese schools, being an excellent opportunity to promote the Portuguese polar science.

It is intended to present the potential of scientific articles as an educational tool and as a promoter of knowledge about polar science and a more scientifically literate and participatory society open the discussion of socio-scientific controversies.

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Poster: Education, Outreach & Communication

An Antarctic expedition from a E&O perspective: local, regional and national impacts

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The participation on GEOPERM Project able me not only take part in the geological mapping campaign in King George Island but also was an excellent opportunity to doing a relevant E&O work about the project, spread the polar science, whether carried out at national level and promote debate on the theme.

The activities carried out were a personal blog 60°S – towards Antarctica (<https://regioespolarespazinhaga.wordpress.com>), skype calls with schools in Portugal (4), pre(1) and post (9) campaign lectures in Portuguese schools, interviews with local and regional media: 4 interviews for newspapers, 1 radio interview, 2 articles in national circulation magazines, and participation in a major report of a national television channel.

The activities had its beginning even before the campaign start and its high point was post campaign. Currently it is still visible the impact of these activities. In total was directly reached 1152 students from 3 to 18 years old and 48 teachers/educators. It was impossible to get the numbers of all general public reached but certainly were very high. The blog in two months received 837 views and 328 visitors from 23 countries from different parts of the globe and the associated facebook page already has 680 followers reaching the range of over a thousand people in some of the publications (maximum of 1869 people in a publication).

The personal character given of all activities, reporting several common aspects of everyday life has been proving to be a successful strategy as it promotes a close link between the scientist and the general public allowing science to emerge integrated naturally in own narration.

It is intended to demonstrate the potential and impact of E&O associated with scientific research in scientific projects dissemination and science promotion to society. The results further demonstrate the importance of including in research projects more E&O activities or someone who can develop in a systematic way this type of activity, helping to create awareness and discussion about the themes and justifying the importance of public funding to projects in the field of polar science.

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Author index

- A. de Frutos, 43
A. Ferreira, 45
A. Molina, 45
Adelino Canario, 16
Aires dos Santos, 30
Alexandra Alves, 16
Alexandre Nieuwendam, 39
Alice Ferreira, 39, 47
Ana David, 9, 39
Ana Eufrasio, 16
Ana Maria Silva, 9, 28, 42
Ana Padeiro, 23
Ana Pestana, 29
Ana Rita Marques, 48
António Lopes, 39
António Sousa, 33
Barbara Guimarães, 19
Ben Raymond, 19
Betty Trummel, 32
Biersma, E, 31
Bruno Boto, 32
Bruno Louro, 16
C. Broyer, 35
C. Lavoie, 38
Cantuária, G, 31
Carla Mora, 9, 39, 40
Carlos Schaefer, 25
Cary, S. C., 21
Catarina Magalhães, 21, 33, 36
Charles Lee, 33, 36
Charles, L., 21
Correia Guedes, M., 31
Craig Cary, 33, 36
Dan Jones, 34
Daniel Figueiredo, 13, 30
Daniele Bortoli, 28, 42
Danijela Dimitrijević, 19
David Martinez, 32
David Thompson, 19
Dermot Antoniades, 44
Dias José, 20
E. Conceição, 43
Emma J. Liu, 44
F. C. Garcia, 35
F. O. Nitsche, 38
Fernanda Guimarães, 29
Filipa Carvalho, 12, 17
Filipe R. Ceia, 19, 34, 37
G. Goyanes, 45
G. Tarling, 35
Gary Wesche, 32
Giorgio Giovanelli, 28
Gonçalo Vieira, 23, 25, 26, 27, 29, 39, 40, 41, 45, 46, 47
Gustavo Daneri, 37
Hélia Oliveira, 24
Hill Simeon, 20
Holger Hintelmann, 24
Hugh Ducklow, 17
Huw Griffiths, 19
Hyun-cheol Kim, 25
Ignacio Granados, 44
Inês Girão, 25
Irene Martins, 19
Jaime A. Ramos, 34
Jaime Ramos, 19
J.J. Jiménez, 45
Joana Seneca, 36
João Branco, 27, 46
João Canário, 23, 24, 26
João Mata, 29
Jonathan M Wilson, 16
Jorge Pereira, 19
José Ascenso, 26
José Pedro Granadeiro, 18
José Queirós, 19
José Seco, 19, 35, 37
José Xavier, 19, 20, 32, 34, 35, 37
Josh Kohut, 17
K. Erzini, 35
L. Neves, 43
Leandro Castanheira, 13, 26
Letizia Campioni, 18
Louise Huffman, 32
Lourenço Bandeira, 27, 40
Lucas Kruger, 19
Luís Tinoca, 48
Luís Torgo, 36
M. A de Pablo, 45
M. Medeiros, 43
M. Ramos, 45
Machado, A, 21
Mafalda Baptista, 36
Manuel Toro, 44
Marc Oliva, 9, 44
Marcos Mateus, 30
Margarida Correia dos Santos, 24, 26
Maria Conceição Oliveira, 26
Maria Fátima Araújo, 26
Maria João Costa, 28, 42
Maria João Ferreira, 26
Maria Monteiro, 33, 36
Maria Teresa Cabrita, 12, 13, 24



Marques, B., 31
Martins Irene, 20
Matteo Cattadori, 32
Miguel Potes, 42
Miguel Ramos, 47
Mónica Batista, 48
Monteiro, M., 21
Moreira Ricardo, 20
N. Ratcliffe, 35
N. Velez, 35
Oliva M., 31
Oscar Schofield, 17
P. N. Trathan, 35
Patricia Azinhaga, 29
Patrícia F. Azinhaga, 32, 48, 49
Paulo Catry, 18
Pavan Kulkarni, 28, 42
Pedro Duarte, 22
Pedro Ferreira, 29, 39
Pedro Leão, 33
Pedro M Guerreiro, 9, 16
Pedro Pina, 14, 27, 40
Pedro Reis, 48
R. Correia, 38
R. Martins, 43
Richard A. Phillips, 34
Rita Caldeira, 29

Rogério Calvo, 29
Rui P. Vieira, 34
Rui Pedro Vieira, 37
Rui Salgado, 42
S. Mogo, 43
Santiago Giralt, 44
Sara Pedro, 19
Séneca, J., 21
Sergi Pla-Rabes, 44
Sílvia Lourenço, 19
Sílvia Tavares, 19
Simeon L. Hill, 37
Sónia Ferreira, 32
Soon Gyu Hong, 46
Stéphane Boudreau, 41
Susana Gomes, 26
Teresa Cunha, 29
Teresa Duarte, 26
Teresa G. Nunes, 26
Torgo, L., 21
V. Cachorro, 43
Vanessa Paulo, 41
Vitor Paiva, 19
Vitor Ramos, 33
Warwick F. Vincent, 26
Warwick Vincent, 23
Y. Cherel, 35
Yves Cherel, 19, 34