



INSTITUTO DO MAR
UNIVERSIDADE DE COIMBRA
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III CONFERÊNCIA PORTUGUESA DAS CIÊNCIAS POLARES

12 de ABRIL

> PROGRAMA <
> PROGRAMME <

ORGANIZAÇÃO



UNIVERSIDADE DE COIMBRA



IGOT
Instituto de Geografia e
Ordenamento do Território

APOIOS



PROGRAMA
NOVA GERAÇÃO
DE CIENTISTAS
POLARES



MUSEU DA CIÊNCIA
UNIVERSIDADE DE COIMBRA

COM O ALTO PATROCÍNIO
DE SUA EXCELÊNCIA
UNDER THE HIGH PATRONAGE OF THE
PRESIDENT OF THE PORTUGUESE REPUBLIC



O Presidente da República



III CONFERÊNCIA PORTUGUESA DE CIÊNCIAS POLARES

III PORTUGUESE CONFERENCE ON POLAR SCIENCES

A importância da internacionalização da Ciência Polar Portuguesa

The importance of International Collaborations in Portuguese Polar Science

12 - 04 - 2011

Organização/Organisation

Instituto do Mar (IMAR-CMA) da Universidade de Coimbra
Centro de Geofísica da Universidade de Coimbra

Instituto de Geografia e Ordenamento do Território
Universidade de Coimbra

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Bem-vindos à III Conferência Portuguesa de Ciências Polares!

Após o Ano Polar Internacional 2007-2009 (API), Portugal manteve-se bastante activo ao nível das ciências polares. O crescimento da comunidade polar foi grande. De momento, somos aproximadamente 15 equipas de várias universidades e institutos de investigação nacionais, perfazendo mais de 50 cientistas. Após as reuniões da comunidade polar portuguesa dos últimos 2 anos focarem na ciência, na educação e divulgação científica polares dentro do API, é agora fundamental discutir e informar toda a comunidade polar portuguesa como as equipas portuguesas se poderão consolidar internacionalmente, através de novas colaborações internacionais e/ou integrar outros programas científicos internacionais e interdisciplinares. Os objectivos desta conferência na Universidade de Coimbra consistem em reunir as equipas polares portuguesas para rever quais os desenvolvimentos científicos que tiveram lugar no último ano, identificar futuras oportunidades científicas, e obter informações sobre as vantagens que a comunidade científica polar portuguesa pode obter de organizações internacionais como a *Scientific Committee for Antarctic Research* (SCAR), o *International Arctic Science Committee* (IASC), o *European Polar Board* (EPB) e a *Association of Polar Early Career Scientists* (APECS). Estas informações são essenciais para consolidar um programa de investigação polar e maximizar a adesão ao Tratado da Antárctida, que decorreu em Janeiro 2010.

Welcome to the III Portuguese Conference on Polar Sciences!

After the International Polar Year (IPY), Portugal continued being very active in polar research. The growth of the polar community was high. Presently, we are approximately 15 teams from various Universities and research institutes around the country, and more than 50 scientists. The previous two Portuguese conferences on polar sciences focused on science, education and outreach within IPY. Today, it is essential to discuss and inform all the Portuguese Polar community on how the Portuguese teams (particularly the new one 's) can establish themselves at an international level, through new international collaborations and/or integrating other international and interdisciplinary programs and organizations. The main objectives of the III Portuguese Conference on polar sciences are to gather the latest scientific results from the national polar teams, identify future research opportunities, and obtain information from key international organizations such as the Scientific Committee on Antarctic Research (SCAR), the International Arctic Science Committee (IASC), the European Polar Board (EPB) and the Association of Polar Early Career Scientists (APECS). This information is essential to consolidate a polar research program, after Portugal signed the Antarctic Treaty in January 2010.

PROGRAMA/ PROGRAM

09h00: Registo e entrega de documentação /*Registration*

09h30: Sessão de Abertura /*Opening Session*

10h00: Sessão 1/*Session 1*: Novos resultados científicos das ciências sociais e da vida / *New results on social and life sciences*.....4

11h15: Coffee-break

11h45: Sessão 2/*Session 2*: Novos resultados científicos das Ciências da Terra e da Atmosfera/*New results on Earth sciences and Atmospheric sciences*.....10

13h00- 14h00: Almoço livre /*Lunch*

14h00-15h00: Sessão de Posters /*Posters Session*.....16

15h00: Sessão Internacional/*International Session*.....40

16h20: Coffee-break

17h00: Sessão APECS Portugal (Association of Polar Early Career Scientists)/*APECS Portugal Session*
..... 45

18h00: Considerações finais e perspectivas futuras/*Final considerations*

18h30: Fim dos trabalhos/*The End*

Novos resultados científicos das ciências sociais e da vida

New results on social and life sciences

10.00-10.15 - Project POLAR: Major results on Marine Ecology from the Southern Ocean

José C. Xavier, Jaime A. Ramos, Filipe R. Ceia, Martin Collins, Sílvia Lourenço, Rui P. Vieira, Vitor Paiva, Bruno Cruz, Richard A. Phillips, Yves Cherel, Eugene Murphy, Vicky Wadley, Anton Van de Putte, Jenny Baeseman and João C. Marques

10.15-10.30 - Responses of Key components of Polar food-webs to Environmental Changes: an Environmental genomics approach

Gareth A. Pearson, Ana A. Ramos, Francisco Cánovas-Garcia, Cymon J. Cox, Asuncion Lago-Leston, Susana Augusti, Carlos Duarte and Ester Serrão

10.30-10.45 - Transport mechanisms of Contaminants in the Arctic: Effects and Consequences on seasonal ice melting levels

João Canário, Laurier Poissant, Marta Nogueira and Martin Pilote

10.45-11.00 - Temporal variation of Carbon and nutrients in aquatic systems in the Canadian Arctic

Marta Nogueira, Laurier Poissant, João Canário and Martin Pilote

11.00-11.15 - Populations of the Russian Arctic during soviet and post-soviet periods

António E. Mendonça

Project POLAR: Major Results on Antarctic Marine Ecology

José C. Xavier^{1,2}, J. A. Ramos¹, F. R. Ceia¹, M. Collins³, S. Lourenço¹, R. P. Vieira¹, V. Paiva¹, B. Cruz¹, R. A. Phillips², Y. Cherel⁴, E. Murphy², V. Wadley⁵, A. Van de Putte⁶, J. Baeseman⁷ and J. C. Marques¹

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POLAR was a research project financially supported by the Portuguese Foundation for Science and Technology (FCT), which was awarded the classification of EXCELLENT by an international panel. POLAR was a key research project within the Portuguese Polar Programme PROPOLAR. POLAR produced 1 book, 9 book chapters/sections, 14 scientific papers, organized 10 science workshops and conferences, gave 60 talks in conferences and members of POLAR represented Portugal in 9 international scientific programs or organizations. These outputs were far more than those predicted before POLAR started. Moreover, a great number of outputs are still in preparation and will be submitted in the near future. The scientific objectives of POLAR were all achieved. Using data from 3 Antarctic research cruises, we were able to assess inter- and intra-annual variations on the oceanographic conditions in the Antarctic and how marine organisms are distributed accordingly (data to be published in a special issue of Deep-Sea Research II in 2011). We also assessed the foraging patterns of wandering albatrosses, grey-headed albatrosses and gentoo penguins, how their diet changed inter- and inter-annually (e.g. Xavier et al. 2007), and modelled their behaviour in relation to their conservation and identifying key area of the ocean for conservation (e.g. Tancell et al. submitted). We also produced a methods book (Cephalopod beak guide for the Southern Ocean, Xavier and Cherel 2009) that was endorsed by the International Polar Year and by major international Antarctic scientific programs (ICED-IPY and CAML-IPY), and has been considered one of the highest contribution in the last 20 years in this research area. Educationally, members of POLAR was highly engaged in co-coordinating an educational programme (LATITUDE60!) that involved more than 35 000 people in Portugal in more than 40 activities (e.g. Kaiser et al. 2010).

Responses of Key components of Polar Food-webs to Environmental changes: an Environmental Genomics Approach

Gareth A. Pearson¹, A.A. Ramos¹, F. Cánovas-García¹, C.J. Cox¹, A. Lago-Leston¹, S. Augusti², C. Duarte² and E. Serrão¹

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Climate change may lead to regime shifts having a profound impact on ecosystem functioning and productivity in Polar Regions. Numerous ecological perturbations due to regional environmental changes and driven by climate change have been reported in Arctic and Antarctic phytoplankton communities (e.g. species composition, geographical ranges). Using a functional genomics approach our main goal is to investigate how primary and secondary key components of simple polar marine food-webs will respond/adapt, at the genetic level, to ongoing environmental changes. Samples of eukaryotic phytoplankton communities were collected (> 5 µm; 2009) from different polar habitats: (1) Atlantic- and Arctic- water masses in the Barents Sea and (2) three regions in the Antarctic Peninsula; the Bransfield Strait, Weddell Sea, and an ice community from the Wilkins Ice Shelf. Shipboard experiments were also performed to evaluate short-term communities' responses to temperature shifts (Barents Sea - 2010) and UV radiation (Weddell Sea - 2009). Transcriptomes of key grazers were also investigated, *Calanus glacialis* (temperatures from 0-10 °C) and *Euphausia superba* (UV radiation and starvation). cDNA libraries were sequenced using 454 pyrosequencing. High-quality reads were functionally annotated (Gene Ontology, KEGG, InterPro databases) and taxonomically profiled (rRNA). We present functional-diversity results showing: a) taxonomic composition (microscopic vs. rRNA analysis), main cellular/metabolic processes and community-specific pathways in different polar phytoplankton communities; b) major gene expression differences observed in response to imposed stress conditions for diatoms and key crustacea species; c) important metabolic pathways and regulatory controls involved in environmental adaptation (community and individual taxa level). Despite the limitations of current genome databases, transcriptomics and metatranscriptomics are powerful tools to access detailed information about gene expression. This work was financed by the projects "Arctic Tipping Points" (European Union) and "Environmental Genomics of the Southern Ocean phytoplankton communities" (Fundação para a Ciência e Tecnologia). A.A.Ramos was supported by the Fundação para a Ciência e Tecnologia, Portugal (Fellowship SFRH/BPD/64174/2009).

Transport Mechanisms of Contaminants in the Arctic: Effects and Consequences on Seasonal ice Melting Levels

João Canário¹, L. Poissant², M. Nogueira¹ and M. Pilote²

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The Arctic is a natural ecosystem with high ecological, economic and human importance. In the last decades many changes have been observed in these environment particularly high levels of contaminants in the Arctic food chains and consequently in the Inuit people. There are innumerable sources of those contaminants although it is of vital importance to understand how these pollutants are dispersed within the Arctic ecosystem. In order to access how some pollutants are transported within the Arctic environmental compartments, field campaigns were performed in the Canadian Sub-Arctic. Ice cores, river water and sediments were collected and analysed for particulate and dissolved Al, Si, Fe, Mn, Co, V, As, Zn, Cd, Cr, Cu, Ni, Pb and U concentrations as well as organic carbon (DOC & POC). Results showed that element partitioning between the environmental compartments is related to their chemical proprieties and to their higher or lower affinity with dissolved and/or particulate organic carbon. These studies also showed that the nature of the ice particles is different from the water ones and that Si/Al concentration ratio may be used as a tracer of the contaminant source in a particular ecosystem. Therefore, the increase of some element concentrations in the water column during spring time ice melt was related to its accumulation in the ice formed during the winter and to the primary production. In this presentation it will also be discussed the potential effects of these phenomenon's in the Arctic aquatic organisms.

Temporal Variation of Carbon and Nutrients in Aquatic Systems in the Canadian Arctic

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O aumento da temperatura do ar e do solo que tem sido observado no Ártico, na última década é um dos efeitos mais visíveis das alterações climáticas. Consequentemente observa-se o impactodirecto nos rios e zonas costeiras da região devido a vários factores conduzindo a alterações na mobilização da matéria orgânica e nutrientes nas bacias de drenagem de rios, cujo impacto ainda está pouco estudado. Com o objectivo de melhor compreender as variações temporais na dinâmica das várias fracções de carbono e nutrientes, em sistemas aquáticos do Ártico, em Maio de 2009, foi realizada uma campanha de amostragem na zona de Umiujaq, Québec (Canada). Recolheram-se diariamente amostras de água no rio Umiujaq e na baía de Hudson, durante um período de 6 dias, para a determinação de carbono orgânico e inorgânico dissolvido (DOC e DIC) e particulado (POC e PIC), nutrientes, compostos húmicos e outros parâmetros interpretativos. Durante o período de amostragem, foram vivenciadas duas situações climáticas distintas, uma tempestade que ocorreu no segundo dia de amostragem e dias de céu limpo. No rio Umiujaq, observou-se que a situação de tempestade pôde o aumento de nitrato, amónio, fosfato e de DOC assim como a diminuição de DIC. Após este evento, as concentrações dos parâmetros em estudo mantiveram-se relativamente constantes com a excepção dos nutrientes, onde se verificou uma diminuição das suas concentrações ao longo do tempo. Na baía de Hudson, os resultados mostram existirem variações mais acentuadas a nível do carbono, tendo sido observada a diminuição de DOC e clorofila a e um aumento de DIC. Os resultados permitem concluir que a ocorrência de variações curtas nas condições climáticas têm influencia na dinâmica quer das várias fracções de carbono e nutrientes.

Populations of the Russian Arctic during soviet and post-soviet Periods

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A presente comunicação pretende apresentar as transformações sociais, económicas e políticas registadas na situação e no estatuto das populações árticas da Rússia ao longo do último século - primeiro na época soviética, depois após o colapso da União Soviética, em 1991. Dos Sami ("lapões") da Península de Kola, junto à Finlândia, aos Even, aos Chukchis e aos Yupik ("esquimós") do nordeste siberiano, já na vizinhança do Estreito de Bering; dos criadores de renas aos pescadores e caçadores marítimos, veremos aqui como estes pequenos grupos étnicos - por vezes, de poucas centenas de indivíduos - enfrentaram os constrangimentos externos - por exemplo, a sedentarização e a colectivização forçadas -, adaptaram os seus modos de vida a novos contextos político-económicos, preservaram (ou não) as suas línguas e culturas, e enfrentam hoje novos desafios - como sejam as alterações climáticas.

Novos resultados científicos das Ciências da Terra e da Atmosfera

New results on Earth sciences and Atmospheric sciences

11.45-12.00 - Project PERMANTAR-2: Permafrost thermal state in the Antarctic Peninsula. Current knowledge and objectives of PERMANTAR-2 and beyond

Gonçalo Vieira, Carla Mora, Mário Neves, Marc Oliva, Vanessa Batista, Alice Ferreira, Marco Jorge, Alexandre Trindade, António Correia, Paulo Amaral, Fernando Santos, Ivo Bernardo, António Soares, Alberto Caselli, Gabriel Goyanes, Carlos Schaeffer, Felipe Simas, Christo Pimpirev, Rositza Kenderova, Miguel Ramos, Miguel A. de Pablo and James Bockheim

12.00-12.15 - Why do we study permafrost in the "Tropical" Antarctic Peninsula Region? The benefits of the Portuguese-Spanish Cooperation

Miguel Ramos and Gonçalo Vieira

12.15-12.30 - First field campaign on Adventdalen (Svalbard) to gather polygonal pattern features for comparison with Martian analogues

Pedro Pina, Gonçalo Vieira, Hanne H. Christiansen, Teresa Barata, José Saraiva, Lourenço Bandeira, Cristina Lira, Marco Jorge, Carla Mora, Alice Ferreira, Marc Oliva, Alexandre Trindade, Everton Poelking, Adriane Machado, Mário Neves and Maura Lousada

12.30-12.45 - The multipurpose UV-Vis spectrometer to be installed in Antarctic regions for atmospheric tracers monitoring

Daniele Bortoli, Maria J. Costa, Pavan S. Kulkarni, Ana Maria Silva, Ana F. Domingues and Giorgio Giovanelli

12.45-13.00 - NO₂ vertical profiles comparisons from satellite and ground based measurements over Mario Zucchelli Station (MZS), Antarctica

Pavan S. Kulkarni, Daniele Bortoli, Maria J. Costa and Ana Maria Silva

Project PERMANTAR-2: Permafrost Thermal State in the Antarctic Peninsula. Current

Knowledge and objectives of PERMANTAR-2 and Beyond

Gonçalo Vieira¹, C. Mora¹, M. Neves¹, M. Oliva¹, V. Batista¹, A. Ferreira¹, M. Jorge¹, A. Trindade¹, A. Correia², P. Amaral², F. Santos³, I. Bernardo³, A. Soares³, A. Caselli⁴, G. Goyanes⁴, C. Schaeffer⁵, F. Simas⁵, C. Pimpirev⁶, R. Kenderova⁶, M. Ramos⁷, M.A. de Pablo⁷, J. Bockheim⁸

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The Antarctic Peninsula is one of Earth's regions where air temperature has increased the most in the last 60 years and it is now becoming clear that it shows a very high sensitivity of permafrost to warming. In the South Shetlands, permafrost temperatures are just below freezing and therefore permafrost degradation is prone to occur. Consequences in the terrestrial ecosystems are still unknown, but changes in hydrology, carbon storage and geomorphological dynamics are expected. The region is therefore a key natural laboratory for understanding permafrost's reaction to climate change and quite different to the Arctic, with the unique influence on physical and life processes of the Southern Ocean. PERMANTAR-2 (Portugal) is part of an international consortium of nationally funded projects from Brazil (CRIOSSOLOS), Spain (PERMAPLANET) and the United States (ANT-6900673) that aims at improving the knowledge on the permafrost environment of the Antarctic Peninsula Region. The main research themes are the thermal state of permafrost and climate change, geomorphodynamics and soils. The activities aim at installing key monitoring sites along a latitudinal gradient in the northern part of the western coast of the Antarctic Peninsula, along a latitudinal gradient from 61 to 65°S. Current permafrost monitoring sites have been installed by the PERMANTAR team in Deception, Livingston and King George Islands and new sites are planned for Brabant and Anvers Islands in 2012. In this presentation we'll show the present knowledge on permafrost thermal state in the Antarctic Peninsula region, discuss ground temperature trends during the last decade and explain the needs for future research.

Why do we study Permafrost in the "Tropical" Antarctic Peninsula Region? The benefits of the Portuguese-Spanish Cooperation

Miguel Ramos¹ and G. Vieira²

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Studies on permafrost are a recent subject in Spanish and Portuguese science. The national committee of the International Permafrost Association (IPA) in Spain was created in the early 1990's, with biennial Iberian IPA meetings taking place since 2007. These are currently an important regional forum on ideas on permafrost and periglacial processes. Permafrost in the Iberian Peninsula is concentrated in small high mountain areas, with seasonal frost occupying larger areas. The increasing interest on polar science in the Iberian countries, first in Spain in the eighties and then, in Portugal a few years later, operated like a stimulus for research in remote Polar Regions. This occurred mainly in the Antarctic and especially in the region where the Spanish Antarctic Stations (SAS) are located, near the northern tip of the Antarctic Peninsula (South Shetlands). There, climate can almost be considered a "tropical" Antarctic climate, with a mean annual air temperature close to -2 °C, just in the limit of permafrost. In the last 50 years the region showed a significant warming trend, producing interesting geomorphological processes associated with permafrost degradation. On the other hand, the link between the permafrost cryosphere system and climate change is a very interesting and multidisciplinary subject. The Portuguese and Spanish collaboration in polar permafrost research started 11 years ago with the participation of the Centre for Geographical Studies of the University of Lisbon in the 1999-2000 Spanish Antarctic campaign following an invitation by the Alcalá University Environmental Physics Group. The International Polar Year 2007-08 consolidated the Iberian collaboration in permafrost and a strong impulse in field work occurred. Bilateral contacts were strengthened including at the science politics level. A significant milestone was the Memorandum of Understanding on Polar Research signed by the ministries of science of both Portugal and Spain in Zamora in 2009.

First field Campaign on Adventdalen (Svalbard) to gather Polygonal Pattern Features for comparison with Martian Analogues

Pedro Pina¹, G. Vieira², H.H. Christiansen³, M.T. Barata⁴, J. Saraiva^{1,3}, L. Bandeira¹, C. Lira¹, M. Jorge², C. Mora², A. Ferreira², M. Oliva², A. Trindade², E. Poelking², A. Machado⁴, M. Neves², M. Lousada¹

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Terrestrial polygonal networks were analysed in detail at test sites in the Arctic region at 78°N of latitude, Svalbard (Norway), by three Portuguese and one Norwegian research teams during a campaign developed in June 2010 in the frame of project ANAPOLIS. This text describes the campaign, the data acquired and the preliminary results obtained. The common and diversified occurrence of ice-wedge polygons, previous process studies and the easy access to Svalbard make it a good choice for terrestrial analogue studies, namely with the abundant networks on Mars, as other teams testing probes for future planetary missions or working on similar studies on these and other geomorphological features have demonstrated. The field survey, conducted in a selected area of about 0.65 km² in Adventdalen, permitted to gather accurate data on the geometry and topology of the polygons, on the characteristics of the vegetation and on the depth of the active layer. A geomorphological survey, together with an inventory of the vegetation cover, was achieved too. The features measured in-situ are being integrated with two sets of remotely sensed imagery with very high spatial resolution (6 and 20 cm/pixel) of the test site and will be later confronted with those of Martian networks to help in their understanding. The importance of this information resides on the fact that this data is a “true” ground-truth which is expected to be of great value for the validation and calibration of the segmentation and characterization algorithms we have been developing for Martian networks. Another campaign in Svalbard is being prepared for the summer of 2011, where ground surveys in other field sites with polygonal networks will be performed.

The multipurpose UV-Vis Spectrometer to be installed in Antarctic regions for Atmospheric Tracers Monitoring

Daniele Bortoli^{1,3}, M. J. Costa^{1,2}, P. Kulkarni¹, A. M. Silva^{1,2}, A. F. Domingues¹, G. Giovanelli³

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At the 'Mario Zucchelli' Italian Antarctic Station (MZS) the GASCOD (Gas Analyzer Spectrometer Correlating Optical Differences) is installed since 1995 furnishing very interesting results regarding the total columns as well as the vertical profiles of ozone and nitrogen dioxide. In the next Italian Antarctic Expedition, a new multi-purpose UV-Vis. remote sensing equipment will be installed in parallel at least for one year with the 'old' GASCOD. The new instrument is the results of a close collaboration between CGE-UE and ISAC-CNR. The equipment is called SPATRAM/GASCODNG (Spectrometer for Atmospheric Compounds Measurements/GASCOD New Generation) and is a scanning spectrometer for the measurements of the electromagnetic radiation in the 250-950 nm spectral range. Here the SPATRAM will be presented and the new solutions adopted will be described and discussed. The monochromator is based on the one installed in the GASCOD. The most important improvements of the SPATRAM relative to the GASCOD are summarized as: i) the wider spectral range scanned allowing for the detection of more atmospheric compounds than with GASCOD; ii) the increased number of inputs resultant in the possibility of quasi simultaneous measurements from different optical devices; iii) the focusing optic system adopted permitting a simple procedure of optical alignment and a low cost; iv) the electronic self-thermoregulation allowing for reliable spectral measurements unaffected by the mechanical deformation caused by variation of temperature; v) the adoption of a CCD sensor resulting in the increase of sensibility of the equipment and therefore the enhancement of the time resolution of measurements; vi) the use of an advanced CPU and a standard OS guaranteeing the full stability of the equipment; vii) the development of a new software tool for the complete control of the whole instrument and for the pre-processing of the measured data. In the future two more instruments are planned to be installed at the French/Italian station (DOME/C) and at the MAITRI Indian station.

NO₂ vertical profiles Comparisons from Satellite and Ground Based Measurements over Mario Zucchelli Station (MZS), Antarctica

Pavan S. Kulkarni¹, D. Bortoli^{1,2}, M. J. Costa^{1,3} and A. M. Silva^{1,3}

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The discovery of the infamous ‘Ozone hole’ over Antarctica in the mid-1980’s took atmospheric scientists by surprise and lead to various field campaigns, analysis works, satellite investigation, modeling and laboratory studies to characterize the entire process that control the dynamics of Antarctic ozone (O₃) hole. Stratospheric nitrogen dioxide (NO₂) plays a key role in the chemical cycle of O₃, particularly in the formation of Antarctic O₃ hole. The monitoring of NO₂ vertical distribution from satellite as well as from ground based platform is therefore of extreme importance as, satellite measurements provide greater coverage, whereas, ground-based measurements provide nearly continuous time series data over the same spot. It is of crucial importance to assure consistency between both kinds of data, hence the comparison between satellite and ground- based measurements is critical. With this in view NO₂ vertical profiles (vp) of the lower stratosphere, obtained from two satellite based instrument: (a) the Polar Ozone and Aerosol Measurement (POAM) III and (b) HALOgen Occultation Experiment (HALOE) are inter-compared, for the first time, with the ground based observations carried out with the GASCOD (Gas Analyzer Spectrometer Correlating Optical Differences) instrument installed at the Mario Zucchelli Station (MZS) in Antarctica (74°26’ S, 164°03’ E). POAM III is a nine-channel solar occultation instrument designed to retrieve vp of O₃, NO₂ and water vapor, aerosol extinction, and temperature. HALOE is a solar occultation instrument designed to retrieve vp of O₃, HCl, HF, CH₄, H₂O, NO, NO₂, aerosol extinction, and temperature. The data product from the HALOE version 19 is used in this study. The GASCOD instrument is a UV-VIS spectrometer developed at the ISAC-CNR Institute and installed at the Antarctic station since December 1995. During the period 1999-2005, there are in total 12 and 11 coincident NO₂ vp observations from POAM III and GASCOD, and from HALOE and GASCOD, respectively, in a domain of 10° longitude by 4° latitude, with MZS in it’s centre. The comparison reveals a fairly good agreement between profiles structure, magnitude and temporal variation. The maximum NO₂ concentration found in all the vp, obtained from the said three instruments, is nearly at the same height (~ 25 km).

14h00-15h00: Sessão de Posters / *Posters Session*

Ciências Biológicas/*Biological sciences*

Poster 1 - “Polarstern expeditions in the Arctic: the ornithological point of view” by *David Monticelli and Claude R. Joiris*

Poster 2 - “Short- and Long-term foraging niche specialization in albatrosses” by *Filipe R. Ceia, Rui Vieira, Pierre Richard, Jaime A. Ramos, Richard A. Phillips and José C. Xavier*

Poster 3 - “Feeding ecology of toothfish species as a means for characterising the slope megafauna of the South Sandwich Islands, Southern Ocean” by *James Roberts, José C. Xavier and David J. Agnew*

Poster 4 - “Advances in the feeding ecology methods on Seabirds: Relevance for Polar studies” by *José C. Xavier, Norman Ratcliffe, Yves Cherel and Richard A. Phillips*

Poster 5 - “POLAR SCIENCE at the Institute of Marine Research (IMAR-CMA), University of Coimbra” by *José C. Xavier, Jaime A. Ramos, Filipe R. Ceia, Sílvia Lourenço, Rui P. Vieira, Sue Bloom, Vitor Paiva, David Monticelli, Miguel Guerreiro, Pedro Alvito, Bruno Cruz, José Seco and João C. Marques*

Poster 6 - “Feeding and activity patterns of white-chinned petrels around South Georgia (Southern Ocean)” by *José C. Xavier, Sue Bloom, Jaime A. Ramos and Richard A. Phillips*

Poster 7 - “Myctophid life strategies and population dynamics in the Scotia Sea of the Antarctic Ocean: Ageing Myctophidae Fish” by *Sílvia Lourenço, Rui P. Vieira, Martin Collins, Carlos Assis, Jon Watkins and José C. Xavier*

Poster 8 - “Lifespan mercury bioaccumulation patterns in wandering albatrosses (*Diomedea exulans*) from South Georgia” by *Sílvia Tavares, Miguel Pardal, Maria E. Pereira, Armando C. Duarte, Richard A. Phillips and José C. Xavier*

Ciências da Atmosfera/*Atmospheric sciences*

Poster 9 - “Chlorine-chemistry and Polar Stratospheric Cloud Evolution over the Antarctic Polar Vortex derived from MLS observations” by *Andolsa Arevalo-Torres and Adrian McDonald*

Ciências da Terra/*Earth sciences*

Poster 10 - “Geoquímica Isotópica das Rochas Vulcânicas da Península Fildes, Ilha King George, Arquipélago Shetland do Sul, Antártida” by *Adriane Machado, Teresa Barata, Farid Chemale Jr. and Delia P. Almeida*

Poster 11 - “Detecção remota da cobertura de neve na Península de Hurd (ilha Livingston, Antártida) através do tratamento de imagens Landsat” by *Alice Ferreira, Gonçalo Vieira, Carla Mora and Miguel Ramos*

Poster 12 - “A comparison between thermal diffusivities measured in cores and estimated from heat conduction theory for P-G 1 Borehole of Livingston Island, maritime Antarctic” by *António Correia, Gonçalo Vieira, Miguel Ramos and Jan Safanda*

Poster 13 - “Mapping surface features of ice-wedge polygons using high resolution aerial imagery and field data (Adventdalen, Svalbard)” by *Carla Mora, Gonçalo Vieira, Marco Jorge, Hanne H. Christiansen and Pedro Pina*

Poster 14 - “Analysis of the snow cover regime in Livingston and Deception Islands (Maritime Antarctic) using multi-temporal analysis of ASAR imagery” by *Carla Mora, Gonçalo Vieira and Miguel Ramos*

Poster 15 - “Identificação preliminar da deformação de terreno rico em gelo, nas Ilhas Shetlands do Sul (Antártica Marítima), com InSAR” by *Marco Jorge, João Catalão and Gonçalo Vieira*

Poster 16 - “Data Integration of Periglacial Polygonal Networks into a Geodatabase – A Case Study in Svalbard, Norway” by *Maura Lousada, Marco Jorge, Cristina Lira, José Saraiva, Pedro Pina and Lourenço Bandeira*

Poster 17 - “Random nature of geographic shift: difficulty in predicting the next polar locations” by *Ryunosuke Kikuchi and Romeu Gerardo*

Ciências Planetárias/*Planetary sciences*

Poster 18 - “Comparação entre feições periglaciares (hummocks) das superfícies Terrestre e Marcianas, baseado em hummocks na região de Adventdalen, arquipélago de Svalbard” by *Teresa Barata, Adriane Machado, Eduardo I. Alves, José Saraiva, Cristina Lira and Pedro Pina*

Educação e promoção de ciência/Education and Outreach

Poster 19 - “Poles apart? An assessment of the acceptance and recognition of interdisciplinary research in polar science” by *Mike A. Rawlins, Daniela Liggett, José C. Xavier, Jenny Baeseman and Michelle Koppes*

Poster 20 - “Novo Portal Polar Português” by *Ana S. David, Gonçalo Vieira and José C. Xavier*

Poster 21 - “Linking Polar science Brazil and Portugal - Bringing polar scientists, educators and the new technologies together from the field: communication science using the World Wide Web!” by *Miriam H. Almeida, José C. Xavier and Virginia M. M. Miranda*

Poster 1 - Polarstern expeditions in the Arctic: the ornithological point of view

David Monticelli¹ and C. R. Joiris²

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The icebreaking RV Polarstern is a German research vessel cruising both the Arctic and Sub-antarctic oceans year-round. Scientists hosted aboard the vessel originate from various fields of polar and marine research carried out at the Alfred-Wegener-Institute (Bremerhaven, Germany). In the Arctic, the most regularly covered routes are the 75°N and 79°N transects between E Greenland and W Svalbard (Spitsbergen). In the frame of a long-term project aimed at quantifying the at-sea distribution of seabirds and marine mammals in polar seas -mainly the European Arctic-, observers of the Laboratory for Polar Ecology of the Free University of Brussels, Belgium (PoE; coordinator C. Joiris) have also participated in Polarstern expeditions. So far, a total of about 10,000 half-an-hour transect counts have been carried out during the periods 1988 – 1993 and 2003 – 2010, and data collection is still ongoing. The ornithological dataset reflect as expected a very low biodiversity with a list of 30 seabird species, of which 4 represent 95% of the total: little auk *Alle alle*, fulmar *Fulmarus glacialis*, kittiwake *Rissa tridactyla* and Brünnich's guillemot *Uria lomvia*. Typical indicator bird species bound to pack ice are Ivory gull *Pagophila eburnea*, Sabine's gull *Xema sabini*, and Ross's gull *Larus rossii*. Transect counts of marine mammals such as dolphins and whales suggest that the most frequently-encountered species are white-beaked dolphin *Lagenorhynchus albirostris*, bowhead *Balaena mysticus*, blue whale *Balaenoptera musculus*, humpback whale *Megaptera novaeangliae* and sperm whale *Physeter macrocephalus*. Polar bears *Ursus maritimus* and pinnipeds - mainly harp seal *Pagophilus (Phoca) groenlandica* – are also regularly seen. This dataset collected since 1988 (14 years of data) provides a baseline to monitor population changes and can make a significant contribution to understanding long-term changes in the distribution of seabirds and marine mammals and its relationship with environmental and weather-related factors.

Poster 2 - “Short- and Long-term foraging niche specialization in albatrosses”

Filipe R. Ceia¹, R. P. Vieira¹, P. Richard³, J. A. Ramos¹, R. A. Phillips² and J. C. Xavier^{1,2}

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Wandering Albatrosses (*Diomedea exulans*) are regarded as a generalist seabird species foraging over vast areas of southern oceans. However, can they be specialists at an individual level? The aim of this study was to evaluate foraging niche specialization in Wandering Albatrosses, using stable isotope analysis ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) of plasma, red blood cells and breast feathers, in order to identify individual foraging specialization at short- and long-term periods (from 2-3 weeks to 5-6 months). Data were collected monthly at Bird Island, South Georgia, between May and October 2009, from 35 individuals of both sexes. Blood (plasma and red blood cells) and breast feathers from adults and breast feathers from chicks were sampled for stable isotopic analyses. Positive significant linear correlations were found ($p < 0.001$) between plasma and red blood cells of individual adults for both $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$. These results suggest consistency in short-term foraging niche specialization in relation to both oceanic water masses and prey items consumed. Moreover, a positive significant linear correlation was also found ($p < 0.05$) between plasma and feathers from adults on $\delta^{13}\text{C}$, which suggest long-term individual foraging niche specialization at specific oceanic water masses. However, no significant correlations were found between tissues of adults and feathers from chicks. This study provides an approach into individual foraging consistency of a species considered as a generalist and highlights the importance of studies at the individual level.

Poster 3 - “Feeding ecology of toothfish species as a means for characterising the slope megafauna of the South Sandwich Islands, Southern Ocean”

James Roberts¹, J. C. Xavier^{2,3} and D. J. Agnew^{1,4}

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The South Sandwich Islands remain one of the least well sampled areas of the Southern Ocean. The few survey trawls conducted there have mostly been limited to regions shallower or deeper than the 500-2000m depth range operated by the longline fishery. In this study, the diet of Patagonian toothfish (*Dissostichus eleginoides*) and Antarctic toothfish (*D. mawsoni*) was examined in one of few regions with overlapping distributions of the two species. Macrourids and muraenolepidids dominate the finfish prey and the spatial distribution of their occurrence in toothfish stomachs was correlated with estimates of relative abundance from fishery bycatch data. Large onychoteuthid squid (particularly *Kondakovia longimana*) also appear to be important prey for both toothfish species and are likely to be abundant throughout the island chain. A single colossal squid (*Mesonychoteuthis hamiltoni*) beak and two portions of tissue were also found in three separate stomachs. This study highlights the usefulness of analysing predator diet as a means for ‘sampling’ prey faunal distributions where information from other means is limited.

Poster 4 - “Advances in the feeding ecology methods on Seabirds: Relevance for Polar studies”

José C. Xavier^{1,2}, N. Ratcliffe², Y. Cherel³ and R. A. Phillips²

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Dietary studies are essential understanding the role of seabirds in the marine ecosystem and therefore, form an integral component of most monitoring programmes worldwide. Collecting diet data can be a challenging and requires careful planning with respect field and analytical methodology and selection of study species. In this poster, we will review the most recent advances in methods used to quantify diets of seabirds worldwide, providing a case-study of the Antarctic seabird studies. Firstly, we will briefly outline conventional diet quantification methods (e.g. analysis of stomach contents, faeces or pellets or identification of prey carried in the bill) and discuss their advantages and limitations. Furthermore, we will provide the most recent advances related to feeding ecology studies to improve our knowledge on what seabird eat (e.g. stable isotopes, fatty acids, DNA signatures) and the most recent prey identification guides. Special attention will be paid to the book published during the International Polar Year, to identify cephalopods, using their beaks, in the diets of top predators (Xavier & Cherel 2009). Finally, some recommendations for the suite of methods that could be used to describe year-round diet for a number of seabird species with differing feeding ecology will be presented.

Poster 5 - “POLAR SCIENCE at the Institute of Marine Research (IMAR-CMA), University of Coimbra”

José C. Xavier, J. A. Ramos, F. R. Ceia, S. Lourenço, R. P. Vieira, S. Bloom, V. Paiva, D. Monticelli, M. Guerreiro, P. Alvito, B. Cruz, J. Seco and J. C. Marques

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Polar Research in Portugal has emerged strongly in the XXI century. In the late 1990's only a handful of Portuguese scientists were conducting polar science. With the International Polar Year (IPY) between 2007 and 2009, Portugal produced a scientific program PROPOLAR and an educational and Outreach program that had a major impact nationally and internationally (Xavier et al. 2006; Xavier and Vieira 2010). Presently it is estimated that 15 research teams from various Universities and research institutes in Portugal do polar research, accounting for more than 50 scientists. The Institute of Marine Research (IMAR-CMA) of the University of Coimbra is one of those institutes that became highly active on polar science after the IPY, in 2009. At present, IMAR has more than 10 scientists (including MSc and PhD students, post-doctoral researchers and senior scientists) working on polar science and education and outreach. The polar research of IMAR focuses mainly on marine ecology. For the Antarctic, the foraging and feeding ecology of albatrosses, penguins, white-chinned petrels, toothfish, trophic interactions and the biology of various organisms, including of myctophid fish, have been carried out. Recent work on seabirds abundance and distribution in the Arctic region has just been developed. Work on education and outreach has been carried out mostly through the Museu da Ciência of the University of Coimbra and through the Portuguese Polar committee. Since joining polar science, IMAR published 1 research book, 8 book sections/chapters and 2 research papers on polar research. IMAR has established international collaborations with numerous countries including UK, Spain, Brazil, France, USA, New Zealand, Chile and Norway and is represented in various organizations (Scientific Committee for Antarctic Research (SCAR) Finance committee, SCAR Capacity Building, education and training, SCAR Expert group of seals and seabirds, SCAR Standing Scientific Committee on Life Sciences and Association of Polar Early Career Scientists).

Poster 6 - “Feeding and activity patterns of white-chinned petrels around South Georgia (Southern Ocean)”

José C. Xavier^{1,2}, S. Bloom¹, J. A. Ramos¹ and R. A. Phillips²

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White - chinned petrels *Procellaria aequinoctialis* are one of the most abundant pelagic seabirds in the Southern Ocean and has the highest incidental mortality rate by long-line fisheries in the region. A total of 40% of the world population of white-chinned petrels (2 million pairs) breeds at South Georgia. Tracking results on this population have shown that their foraging areas cover the waters around South Georgia, Scotia Sea and sub-Antarctic waters to the Patagonian shelf. However, much information on their diet, and activity patterns is needed. The diet of white-chinned petrels has been broadly characterized previously but no information is available from white chinned petrels caught at sea. Moreover, no detailed information is available on the cephalopod component of their diet; as cephalopods are poorly known in the Southern Ocean, and they have no Antarctic fisheries targeting them, understanding their importance in the diet of these predators can contribute to our understanding to how white-chinned petrels may compete for no fisheries related cephalopods with other predators while foraging. The diving and activity patterns of white-chinned petrels related to their feeding ecology are poorly understood. White-chinned petrels possibly feed by seizing live prey from the surface, by surface plunging, and they are also excellent divers. As they are also considered scavengers, feeding on bait and discards from long-line fishing vessels, they may become even more vulnerable species in terms of their conservation. The objectives of this study is to study the diet of white-chinned petrels caught at sea close to South Georgia (i.e. accidental catch from longliners) and their diving and activity patterns of white-chinned petrels from South Georgia.

Poster 7 - “Myctophid life strategies and population dynamics in the Scotia Sea of the Antarctic Ocean: Ageing myctophidae Fish”

Sílvia Lourenço^{1,2}, R. P. Vieira^{1,3}, M. Collins⁴, C. Assis⁵, J. Watkins⁶ and J. C. Xavier^{1,6}

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The myctophid fish play a key role in the food web of the Southern Ocean, being recently recognized as far more abundant, and relevant in the diets of predators, than previously thought. However, their basic biology is still poorly known, including their age and growth. Fish otoliths are natural data loggers that record the life cycle information in their structure and chemistry at different temporal scales related to the growth of fish in relation to the marine environment. The regular pattern of deposition of the hyaline and opaque material associated to the natural cycle of winter and summer, creating annual marks of similar nature and the consistency over the life of the fish are the basic criteria to start an ageing study. Considering the specific environmental features of the Antarctic Polar Region, with a strong seasonality in the day length associated to constant water temperature, is possible to associate this seasonality with variations on the fish growth. Our study focused on identifying the otolith ageing criteria for key myctophid species (*Electrona antarctica*, *Gymnoscopelus braueri*, and *Krefftichthys anderssoni*) in order to assign correct ages to the populations of those species in the Scotia Sea. The criteria were validated in terms of precision with a second reading, and the criteria revealed to be quite precise, although the validation in terms of accuracy needs to be tested in order to validate the seasonality of those annual marks. Our results suggest that Scotia sea population of *E. antarctica* can attain 7 to 8 years old, *G. braueri* population can reach 5 to 6 years old, and the life span of *K. anderssoni* is no longer than 3 years old.

Poster 8 - “Lifespan mercury bioaccumulation patterns in wandering albatrosses (*Diomedea exulans*) from South Georgia”

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Wandering albatrosses (*Diomedea exulans*) are the largest of seabirds and a vulnerable species in the IUCN Red List. Their populations have been undergoing a rapid decline over the past decades, which is believed to be mainly associated with the adverse effects of longline fishing linked with its low reproductive rates. As top predators, the mercury concentrations in albatrosses it's expected to be high due to the food chain amplification. In fact, the highest mercury concentration of any vertebrate species was reported in wandering albatross, much higher than those registered for other species of seabirds. The main aim of this work was, thus, to relate the mercury concentrations in feathers, plasma and blood cells with the age, gender and moult patterns of wandering albatrosses, as well as establishing a connection between mercury accumulation patterns and its reproductive, trophic and foraging characteristics. Mercury concentrations revealed minimum values in chicks, in both feathers (6.14 ± 1.91 mg kg⁻¹) and blood samples (1.14 ± 0.91 and 0.14 ± 0.09 mg kg⁻¹ for blood cells and plasma, respectively) being significantly different from the values registered in the adults. The higher values were presented by adults feathers (21.06 ± 11.18 mg kg⁻¹), were no differences were detected between genders. Mercury concentrations in blood samples were higher in females (11.22 ± 4.63 in blood cells and 1.05 ± 0.79 mg kg⁻¹ in plasma) than in males (7.69 ± 3.50 in blood cells and 0.65 ± 0.28 mg kg⁻¹ in plasma), but the differences were not statistically significant. The complexity of the mercury accumulation process and the large number of variables that affects it along the long lifespan of the species is expressed in the high variability of the data.

Poster 9 - “Chlorine-chemistry and Polar Stratospheric Cloud Evolution over the Antarctic Polar Vortex derived from MLS observations”

Andolsa Arevalo-Torres^{1,2} and A. McDonald^{1,2}

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When very low temperatures occur in the Southern hemisphere winter stratospheric polar vortex, type I-II Polar Stratospheric Clouds (PSC) formation occurs above the Antarctic. An enhanced number of PSC particles are observed in a highly activated Antarctic Polar vortex (APV) where heterogeneous ozone-chemistry reactions occur on the surface of these particles. Chlorine activation processes, a set of chemical reaction cycles which involve the conversion of chlorine reservoir species into more reactive chlorine forms, are an unambiguous sign of the presence of sunlit PSC. We present in this study an examination of the spatial and temporal evolution of type I-II PSC inferred from temperature variations in the lower-middle atmosphere over the APV, derived from MLS satellite observations and NCEP/NCAR reanalysis. We then utilize MLS chemical concentration observations to correlate the role of temperature variations on PSC formation with stratospheric chlorine partitioning. In particular, we present our latest results on the analysis of HCl, an important chlorine reservoir in the stratosphere, and daytime ClO change signal calculations as a way to unambiguously determine PSC formation and evaporation temperatures together with an assessment of the likely periods of the year where PSC and chlorine activation events occur. Preliminary results are used to derive the time lags between chlorine activation events and initial suggestions of PSC based on temperature and measured when formation temperature thresholds are crossed. Finally, we present a set of results using Antarctic vortex edge calculations to determine how dynamics affects PSC formation and thereby stratospheric chlorine-chemistry over the Antarctic region.

**Poster 10 - “Geoquímica Isotópica das Rochas Vulcânicas da Península Fildes, Ilha King
George, Arquipélago Shetland do Sul, Antártida”**

Adriane Machado¹, T. Barata¹, F. Chemale Jr.², D. P. Almeida³

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Dados isotópicas de Rb-Sr e Sm-Nd de basaltos da Península Fildes foram obtidos visando à caracterização do tipo de fonte magmática envolvida na geração das rochas e visando avaliar a possibilidade de contaminação crustal. As razões iniciais de $^{87}\text{Sr}/^{86}\text{Sr}$ obtidas para basaltos variam de 0,7033 a 0,7037 e as razões de $^{143}\text{Nd}/^{144}\text{Nd}$ de 0,512959 a 0,512967. Os valores de ϵNd para $t = 55$ Ma estão entre + 6,52 e + 6,72. A assinatura isotópica e os dados geoquímicos de rocha total (elementos maiores, traços e terras raras) sugerem que as rochas vulcânicas da Península Fildes se formaram a partir da fusão parcial do manto superior num ambiente de subducção do tipo arco-de-ilhas. Os valores positivos de Nd indicam que não houve contaminação crustal, ou então, que a percentagem de contaminação crustal foi de pequena amplitude (< 2%), fato que não modificou a composição do magma fonte que deu origem às rochas. Os resultados das análises isotópicas aliados aos resultados dos padrões geoquímicos de alguns elementos-traços como os valores anômalos positivos de K, Rb, Ba e Sr em relação à baixa concentração de Nb e Ti, reforçam a hipótese de um ambiente geotectónico do tipo arco-de-ilhas na formação das rochas. O baixo teor de MgO, Ni, Cr e o enriquecimento de elementos terras raras leves em relação aos elementos terras raras pesados observados nas rochas, sugerem que o arco-de-ilhas é bem desenvolvido. A abundância dos teores de K, Rb, Ba e Sr é explicada através da introdução de fluídos, ricos nestes elementos, na cunha mantélica durante o processo de subducção. Os baixos teores de Nb e Ti são atribuídos a uma fase residual que continha rutilo e que consumiu grande quantidade de Nb e Ti.

Poster 11 - “Detecção remota da cobertura de neve na Península de Hurd (ilha Livingston, Antárctida) através do tratamento de imagens Landsat”

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A neve é uma componente essencial da criosfera e tem um papel determinante no regime térmico do solo. A baixa condutividade térmica da neve reduz as perdas de calor do solo para a atmosfera durante o Inverno e limita o aquecimento do solo na Primavera e no Verão. Este último efeito é ainda amplificado pelo elevado albedo e pelas transferências de calor latente de fusão (Zhang, 2005, Rees, 2006). O conhecimento da distribuição sazonal da neve é, por isso, fulcral para compreender o regime térmico do solo e tem sido usado como factor determinante em trabalhos de modelação e de predição do permafrost. Na Antárctida, devido ao seu remoto acesso, o conhecimento da cobertura nival é escasso. O tratamento de imagens de satélite permite preencher esta lacuna no conhecimento da distribuição da neve. No presente trabalho são utilizadas dez imagens Landsat que compreendem o período entre 1986 e 2009 durante os meses de Verão austral. De forma a inventariar a superfície coberta de neve são utilizados vários métodos de extracção automática: o Normalized Difference Snow Index (NDSI), Normalised Difference Snow and Ice Index (NDSII), R35 e R45. Os resultados permitem conhecer a distribuição espacial da neve no Verão e identificar as áreas na Península de Hurd onde a neve permanece no solo mais tempo, bem como aquelas em que a fusão ocorre mais cedo.

Poster 12 - “A comparison between thermal diffusivities measured in cores and estimated from heat conduction theory for P-G 1 Borehole of Livingston Island, maritime Antarctic”

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During the month of January of 2008 a borehole (Permamodel-Gulbenkian 1 - GP1) 26 meters deep was drilled on the top of Mount Reina Sofia (275 meters a.s.l.) near the Spanish Antarctic Base of Livingston Island, South Shetland Islands. The drilling process allowed obtaining cores from 1.5 m to about 26 m deep which were used for measuring several physical properties. Seven cores were selected to measure the thermal conductivity and the thermal diffusivity. Other physical properties such as heat production per unit volume, porosity, and density were also estimated. The measured values for the thermal conductivity vary from 2.56 W/mK to 3.28 W/mK while the measured values for the thermal diffusivity vary from $1.09 \times 10^{-6} \text{ m}^2\text{s}^{-1}$ to $1.58 \times 10^{-6} \text{ m}^2\text{s}^{-1}$. Inside the borehole several thermistors were installed to monitor temperature for as long as possible at several depths. This allows estimating the thermal diffusivity for different portions of the borehole and here we report the thermal diffusivities that were calculated assuming that heat transfer is only by conduction in the vertical direction. For the depth range 3.5 - 6 m the calculated thermal diffusivity is $2.2 \times 10^{-6} \text{ m}^2/\text{s}$, which is about the double of the values measured for depths between 3.5 and 6 m. Since the temperatures in that section of the borehole are lower than 0 degrees Celsius, the difference cannot be a result of thawing and freezing in that layer. The explanation must be looked for in the layers above 3.5 m and on the physical processes occurring in the active layer, i.e., in the energy balance that takes place at the surface of the ground.

Poster 13 - “Mapping surface features of ice-wedge polygons using high resolution aerial imagery and field data (Adventdalen, Svalbard)”

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Polygonal networks are widespread in the continuous permafrost in the lowlands of Svalbard, and are typical features of the permafrost environment in the High Arctic. The origin of the networks is linked to thermal contraction cracking during cold winter events. Melt water flows into the cracks and enables the growth of ice-wedges. Research in the framework of the project ANAPOLIS (PTDC/CTE-SPA/099041/2008) intends to contribute to the understanding of Martian polygonal networks by detailed analysis of comparable features on Earth. A test site in Adventdalen, Svalbard, is used for detailed characterization of the polygonal networks. The objectives are to characterize their geomorphological setting, surficial features and the topological relationships between polygons. Other research projects by UNIS focus on the morphogenesis of the same polygons, including monitoring of forcing factors and cracking. The ANAPOLIS approach includes: i) field survey of topography, polygon boundaries, polygon nodes, wedge width using DGPS, ii) field geomorphological survey of polygon characteristics (vegetation, water on surface, active layer thickness), iii) low altitude and very high resolution (6 cm) aerial photography with a remote controlled airplane (GEOKOLIBRI) and iv) high resolution (ca. 20 cm) aerial photography (visible and near infrared, Norwegian Polar Institute). Using this geospatial data we produced a detailed geomorphological map of the test site, which includes the geoecological characteristics of a group of 121 polygons, which were surveyed in detail. Mapping was conducted by supervised classification of the aerial photographs by fieldwork. Geomorphological features such as vegetated polygons, wet low-centered polygons, channels, mud-boils, small polygons and salt extrusion surfaces were mapped with very high detail. The characteristics of these features, as well as their geomorphic significance are summarised. The application of the model to other areas using similar input data is discussed with case studies from other parts of Adventdalen.

Poster 14 - “Analysis of the snow cover regime in Livingston and Deception Islands (Maritime Antarctic) using multi-temporal analysis of ASAR imagery”

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ASAR images from Envisat (WSW and IMM) are analyzed to study the snow cover regime of Deception and Livingston Islands (South Shetlands, Antarctic Peninsula) during 2009. The study is part of the projects PERMANTAR-2 focusing on monitoring and modeling the thermal regime of permafrost. For a GIS-based spatial modelling of snow cover distribution, spatially distributed data is required and the exploration of microwave remote sensing is the most suitable technique for mapping the snow cover characteristics and regime. This becomes especially true due to the long winter night and unstable weather conditions of the northern Antarctic Peninsula region. For this purpose a multitemporal ASAR imagery analysis was conducted in order to distinguish wet snow cover from snow free terrain using the absorption dependency of the radar signal on the liquid water content of the snow to set a threshold on the differential backscatter between scenes. Results of the analysis of the time-series show strong seasonal changes in the backscattering due to the variations of liquid water content in snow. Validation of the results obtained from the microwave imagery is done using ground truth data. This is derived from time-lapse cameras, ultra-sonic sensors of snow thickness and probes with snow temperature mini-loggers. Satellite imagery is provided by the European Space Agency in the framework of the Proposal Category-1: Snow cover characteristics and regime in the South Shetlands (Maritime Antarctic) - SnowAntar.

Poster 15 - “Identificação preliminar da deformação de terreno rico em gelo, nas Ilhas Shetlands do Sul (Antártica Marítima), com InSAR”

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Este trabalho descreve os objectivos e os primeiros resultados do projecto de Categoria-I da ESA, TIDefInSAR – identificação e caracterização da deformação do terreno induzida por gelo no solo, nas Ilhas Shetlands do Sul (Antártica), com InSAR. Aplica-se D-InSAR a imagens dos satélites ERS 1-2, ENVISAT e ALOS, cuja resolução espacial permite distinguir formas dinâmicas de média-escala relacionadas com a deformação de permafrost rico em gelo e com a reologia da camada activa. Pretende-se derivar valores de deslocação, com resolução centimétrica, para alguns processos geomorfológicos, tais como a deformação de glaciares rochosos, solifluxão e termocarso. Dois pares da missão Tandem ERS 1-2 de 1996 possuem elevada coerência nos terrenos actualmente não glaciados das ilhas Deception, Livingston e Rugged. Os arquivos de imagens dos satélites ERS (1996-2003) e ENVISAT (2008-2010) permitem obter interferogramas coerentes de base temporal entre dezenas de dias a cerca de 1 ano. Em alguns casos, obtém-se coerência com bases temporais de 2 anos. Com base numa lógica geológica-geomorfológica e na informação topográfica disponível, analisam-se 3 áreas separadamente: (i) a Península Byers da Ilha Livingston e a Ilha Rugged, (ii) as penínsulas Hurd e Mackay da Ilha Livingston e (III) a Ilha Deception. Utilizando altimetria SRTM 3-segundos-de-arco, bem como técnicas interferométricas de 3 e 4 passagens, outras áreas serão também estudadas. Uma vez que diferentes cinemáticas se manifestam em bases temporais distintas, explorar-se-á a presença de deformação em todos os pares coerentes de forma a derivar uma classificação para as taxas de actividade das formas dinâmicas identificadas.

Poster 16 - “Data Integration of Periglacial Polygonal Networks into a Geodatabase – A Case Study in Svalbard, Norway”

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Polygonal networks are very common on the Martian surface, and their location has been correlated with the presence of ice in the soil. The most accepted hypothesis for their origin takes into account their similarities to polygonal networks on Earth, which mostly occur in periglacial areas. Ice-wedge polygonal networks are being studied in Svalbard, Norway, in the framework of project ANAPOLIS. This project includes two main aspects: development of a methodology for automatic recognition of polygons on remote sensing images with high spatial resolution, and acquisition of ground truth data for validation of the automated algorithms. The field study and characterization of these structures involves the local detailed delineation of networks, namely through the accurate mapping of contours and polygon vertices, and assessing the surface expression of the wedges (width and depth of contours). The large amount and variety of data collected, and the fact that they require a common reference system, make the geodatabase (GDB) an adequate and unifying tool in the compilation of project data. The construction of a GDB for the Adventdalen data allowed linking the raster, vector and numeric data, making them available in an organized manner, offering a quick and intuitive access to the multidisciplinary teams involved in the project. The use of GDB has many advantages, for instance in the speed of aerial photo visualization, using the raster catalogs, and at the level of vector processing, benefiting from the topology rules that are available in the GDB management. Additionally, the use of CASE (Computer Aided Software Engineering) tools, thanks to UML (Unified Modeling Language) support, allows exporting the GDB to a logical model and visualizing the data organization through diagrams that show communication between the objects within the GDB. This interoperability has been of great value in the construction and updating of the GDB.

Poster 17 - “Random nature of geographic shift: difficulty in predicting the next polar locations”

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There is a great deal of tension that builds between the crust and core of the Earth during the week of rotation stoppage. This tension is released when the core breaks with the crust, and moves. The pole shift is therefore sudden, taking place in what seems to be minutes to humans involved in the drama. At first there is a vibration of sorts, as the crust separates from the core. Then there is a Slide, where the crust is dragged, to a new location, along with the core. During the slide, tidal waves move over the Earth along the coast lines, as the water is not attached and can move independently. The water tends to stay where it is, the crust moving under it, essentially. When the core finds itself aligned, it churns about somewhat, but the crust proceeds on. This is in fact where mountain building and massive earthquakes occur. It implies that a pole shift refers to the Earth's magnetic field reversing its polarity. According to the measurement during last 25 years, data on Earth's gravity field show evidence that mass shift began in 1998. There is a great tension that builds between the crust of the Earth and the core of the Earth during the week of rotation stoppage. This tension is released when the core of the Earth breaks with the crust, and moves. However, the core of the Earth drags the crust with it. It means that the pole shift is sudden and has a random nature. If the poles are relocated, climates everywhere will change dramatically. Thus, an exact prediction is important to minimize the catastrophic damages. In order to improve prediction accuracy, it is required to integrally study not only magnetic field theory but also astronomical clues.

Poster 18 - “Comparação entre feições periglaciares (hummocks) das superfícies Terrestre e Marcianas, baseado em hummocks na região de Adventdalen, arquipélago de Svalbard”

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O presente trabalho tem como objectivo identificar estruturas periglaciares designadas por hummocks na superfície de Marte, com base em análogos terrestres, isto é, com base em feições semelhantes na superfície terrestre, localizadas no vale de Adventdalen, na ilha de Sptisbergen, arquipélago de Svalbard. Pretende-se constituir um catálogo geo-referenciado destas estruturas em Marte, já detectadas em imagens MOC (Mangol, 2005) e estabelecer analogias e diferenças com hummocks da superfície terrestre, e determinar também qual ou quais os processos que os originaram. Para tal, recorrer-se-á a trabalhos de campo, de forma a estabelecer critérios de reconhecimento destas formas que possam constituir um ponto de partida no desenvolvimento de algoritmos de análise de imagens da superfície de Marte, nomeadamente a partir de imagens de maior resolução, imagens da HiRISE. Durante uma campanha de campo realizada em Advantdalen, em Junho de 2010, no âmbito do projecto ANAPOLIS (projecto financiado pela FCT, com o objectivo de analisar terrenos poligonais em Marte com base em análogos terrestres) foi efectuado o primeiro reconhecimento destas estruturas, tendo-se determinado parâmetros de forma, tamanho, granulometria, presença/ausência de fragmentos rochosos, e analisado as relações destas estruturas com terrenos poligonais (Machado et al., 2011) . Serão estes os critérios que irão ser utilizados no desenvolvimento automático de algoritmos de análise de imagem. Efectuaram-se também amostras de solos, a partir das quais estão a ser efectuadas análises de raios X, para identificar minerais primários e secundários. Está prevista uma segunda campanha de campo, em Junho de 2011, onde se pretende efectuar uma amostragem maior de solos, no sentido estender a amostragem a região mais vasta, e efectuar perfis geofísicos de resistividade, de modo a caracterizar, sob o ponto de vista hidrogeológico, estas estruturas.

Poster 19 - “Poles apart? An assessment of the acceptance and recognition of interdisciplinary research in polar science”

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Understanding how the earth system functions, where and in what ways climate change is impacting the environment, and what factors influence the complex dynamics of human-biosphere interactions requires researchers to engage in multidisciplinary and interdisciplinary studies such as those pursued during the International Polar Year (IPY). Although interdisciplinary research (IDR) and education are now believed to be good investments for students and society alike, several impediments within academia need to be overcome so that IDR projects and researchers will be given the credit often afforded those situated squarely within traditional academic disciplines. Thriving within an academic environment while conducting IDR is a considerable challenge for many researchers. Indeed, the traditional university structure is often not favorable, with college departments housed in different buildings or different sections on campus. Funding for IDR projects is often difficult to obtain, suggesting that scientific institutions and funding agencies remain deeply rooted in uni-disciplinary research paradigms and thus fail to recognize the academic merit and benefits of IDR to society. We present results from a survey of graduate students and early-career researchers which sought to better understand common characteristics and opinions regarding IDR among these stakeholders. Supported by the Association of Polar Early Career Scientists (APECS), the survey was created out of a New Generation of Polar Researchers workshop focused on integrating multidisciplinary research during IPY. Summary results from the more than 100 responses suggest a disparate set of backgrounds, objectives, and opinions on how IDR objectives and goals might best be achieved. We also highlight key characteristics of several large IDR efforts that can be viewed as examples for how future polar IDR endeavours and their associated educational components may be pursued.

Poster 20 - “Novo Portal Polar Português”

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Durante os últimos quatro anos, a ciência polar portuguesa tem verificado um grande aumento da sua dinâmica: crescimento significativo da massa crítica com alargamento a novas áreas de investigação; maior representatividade e consolidação internacional; reconhecimento nacional e internacional do esforço verificado pela comunidade científica em Portugal, não só ao nível da investigação polar como também na educação, divulgação e comunicação de ciência. É objectivo do grupo de trabalho de cientistas polares em Portugal alargar as suas colaborações internacionais, potenciar a adesão ao Tratado da Antártida que decorreu em Janeiro de 2010 e consolidar um programa polar nacional. O futuro da estrutura polar portuguesa, alvo de análise e discussão após a extinção do Comité Português para o Ano Polar Internacional, deverá integrar uma base comum de divulgação e comunicação capaz de responder às necessidades da comunidade científica, e ao alcance da sociedade no seu todo. Neste contexto é proposto um Novo Portal Polar, com uma apresentação diferente e maior facilidade no acesso e gestão de conteúdos; servindo ainda para apoiar as decisões resultantes de um esforço de trabalho conjugado na consolidação da ciência polar, proporcionando uma maior interação entre todos os envolvidos e interessados.

Poster 21 - “Linking Polar science Brazil and Portugal - Bringing polar scientists, educators and the new technologies together from the field: communication science using the world wide web!”

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Brazil and Portugal are amazing examples of countries that although being geographically far away from the Polar Regions became highly active educationally during the International Polar Year. The educators and polar scientists from these countries, in collaboration with the Association of Polar Early Career Scientists (APECS) and Education and Outreach working group of the IPY, make great efforts to promote the polar regions in polar and non-polar countries using new technologies, that were logically not applied in the previous IPYs. Indeed, this IPY has successfully gathered such a great number of polar scientists and educators using the world wide web (www). Here, we propose to assess the new technologies available to us today while performing educational activities from Polar Regions, with special attention paid to those available in non-polar countries and countries that still have more restricted availability to the www. We wish to evaluate the different ways that the www can be used from the Polar Regions and limitations of its use (e.g. skype works but not in all Antarctic research bases. Indeed there are research bases without www). Finally, we also aim to provide examples of educational events performed between Brazil, Portugal and other countries, including UK, Malaysia, USA, linking scientists in Antarctica with schools, events and conferences in the rest of the world, and quantify the E & O collaborations between these countries during IPY using the www in new exciting ways available to us today, such as live conferencing, phone calls, blogs, emails and skype calls.

Sessão Internacional

Internacional Session

15.00-15.10 - Introduction: the importance of polar international and interdisciplinary research

José C. Xavier

15.10-15.25 - The European Polar Board: Mission and relevance to Portuguese Polar Science

Gonçalo Vieira

15.25-15.40 - Antarctic Science and Policy Advice in a Changing World (keynote presentation)

Mike Sparrow

15.40-15.55 - Leading-edge Multi-disciplinary Research for a Greater Scientific Understanding of the Arctic Region (keynote presentation)

Volker Rachold

15.55-16.20 - Panel Discussion and Question & Answers Session

Introduction: the Importance of Polar International and Interdisciplinary Research

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Polar research has an impact both locally and across the planet. As the Polar Regions are in difficult to access, a great majority of research projects have an international component. Smaller countries, with less economical power, that conduct polar research, such as Portugal, must take advantage of mechanisms (e.g. integrating international and interdisciplinary research projects or organizations) that can allow it to produce high quality science. Before the 1990's Portugal polar research was carried out only by very few scientists. Prior to the International Polar Year (IPY) 2007-2009, a Portuguese Polar Committee for the IPY was created, gathering together various research teams, from 5 key research areas, across the country (Xavier et al. 2006). A polar research, and an educational and outreach, programs were created for the IPY, with very good results (e.g. Kaiser et al. 2010). After the IPY, Portugal continued being very active in polar research. The growth of the polar community was high. Presently, we are approximately 15 teams from various Universities and research institutes around the country, and more than 50 scientists. Today, it is essential to discuss and inform all the Portuguese Polar community on how the Portuguese teams (particularly the new) can establish themselves at an international level. The main objective of this session is to obtain information from key international polar organizations such as the Scientific Committee for Antarctic Research (SCAR), International Arctic Science Committee (IASC) and the European Polar Board (EPB) on how they can help Portuguese scientists in establishing new collaborations and/or integrating international and interdisciplinary research programs and organizations to achieve excellence.

The European Polar Board: Mission and Relevance to Portuguese Polar Science

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The European Polar Board (EPB) is Europe's strategic advisory body on science policy in the Polar Regions. It acts as a voice and high-level facilitator for cooperation between European national funding agencies, national polar institutes and research organizations. It has members from national polar operators and research institutes from 20 countries. Portugal joined the EPB through the Fundação para a Ciência e a Tecnologia (FCT) in 2008, following the development of national polar research during the 4th International Polar Year. The board takes a central role in the coordination and management of Polar initiatives at a European level and the major focus areas are: i) the implementation of a new Polar framework MoU, ii) the launching of joint research programmes, iii) the coordination of polar research infrastructures, and iv) policy issues in the framework of the European Research Area. The participation of the FCT in the EPB contributes to the promotion and consolidation of Portuguese Polar science and facilitates networking, while promoting international collaboration and opening new gateways of access to funding in joint research programmes. The participation within the EPB is part of the national strategy to consolidate the commitment to polar research. This presentation presents a brief outlook of the EPB aims and focus on the High Level Recommendations of the new EPB Strategic Position Paper "European Research in the Polar Regions: Relevance, strategic context and setting future directions in the European Research Area".

Antarctic Science and Policy Advice in a Changing World

Mike Sparrow

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The Scientific Committee on Antarctic Research (SCAR)'s mission is to be the leading non-governmental, international facilitator and advocate of research in and from the Antarctic region, to provide objective and authoritative scientific advice to the Antarctic Treaty and other bodies such as the Intergovernmental Panel on Climate Change, and to bring emerging issues to the attention of policy makers.

The aim of this talk is to show how SCAR provides a forum for international coordination, bringing together investigators from different countries and different disciplines to engage in coordinated and collaborative research activities. It enables research and links to international policy makers that would not be possible working solely through a single country and provides a medium for countries with less well-developed Antarctic Programmes to expand their activities.

Portugal became an Associate (non-voting) member of SCAR in 2007. Despite the modest size of its Antarctic Programme, Portugal has been an active member in the international scene, with Portuguese scientists involved in many SCAR groups and Programmes, such as the Evolution and Biodiversity in Antarctica Programme, and the Expert Group on Permafrost and Periglacial Environments.

SCAR recently finalized production of its next Strategic Plan 2011-2016, entitled "Antarctic Science and Policy Advice in a Changing World" (<http://www.scar.org/strategicplan2011/>), which stresses the dual missions of SCAR. This will also be the theme of the next SCAR Open Science Conference in Portland, Oregon (July, 2012), in which could be highly interesting to the Antarctic scientific community in Portugal.

Leading-edge Multi-disciplinary Research for a Greater Scientific Understanding of the

Arctic Region

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The International Arctic Science Committee (IASC) is a non-governmental, international scientific organization. The IASC mission is to encourage and facilitate cooperation in all aspects of Arctic research, in all countries engaged in Arctic research and in all areas of the Arctic region. To fulfill its mission, IASC promotes and supports leading-edge multi-disciplinary research in order to foster a greater scientific understanding of the Arctic region and its role in the Earth system.

IASC is an International Scientific Associate of the International Council for Science (ICSU) and has Observer status in the Arctic Council (AC). In recent years IASC has partnered with many major international players to enable and promote international scientifically and policy relevant research.

IASC was established in 1990, began operations in 1991 and today comprises 19 member countries. All countries engaged in Arctic research can become an IASC member. The membership implies that the appropriate national scientific body is a member of IASC and appoints a representative on the IASC Council. IASC is governed by this Council which sets priorities and guides the work of the organization.

The core elements of IASC are its five scientific Working Groups: Terrestrial, Atmosphere, Cryosphere, Social & Human and Marine. These international groups assist IASC in the implementation of its science mission by:

- Identifying and formulating science plans;
- Acting as scientific advisory boards to the Council;
- Encouraging and supporting science-led programs;
- Initiating conferences, workshops and events;
- Promoting future generations of arctic scientists.

IASC's annual Council meetings are held during the Arctic Science Summit Week (ASSW). The purpose of the summit is to provide opportunities for coordination, collaboration and cooperation in all areas of Arctic science, and to combine science and management meetings to save on travel and time.

Sessão APECS Portugal (Association of Polar Early Career Scientists)

APECS Portugal Session

17.00-17.10 - APECS International: Shaping the future of polar research...in Portugal!

Sílvia Lourenço and José C. Xavier

17.10-17.20 - Age and growth of *Electrona antarctica* (Günther, 1878) from the Scotia Sea (Southern Ocean)

Rui P. Vieira, , Sílvia Lourenço, Carlos A. Assis, Jorge M. S. Gonçalves, Martin Collins and José C. Xavier

17.20-17.30 - Physical properties from a Gulbenkian-Permamodel-2 borehole (Livingston Island, Maritime Antarctica)

Paulo M. Amaral, António Correia, Gonçalo Vieira and Miguel Ramos

17.30-17.40 - Polygonal patterns on Mars and Earth (Svalbard): A quantitative geometric and topologic comparison

Lourenço Bandeira, José Saraiva, Pedro Pina, Maura Lousada, Marco Jorge and Gonçalo Vieira

17.40-18.00 - Practical Activities for Teaching Polar Sciences: an Interdisciplinary Approach

Celeste Gomes, Teresa Barata, Adriane Machado and Isabel Abrantes

APECS International: Shaping the Future of Polar Research...in Portugal!

Sílvia Lourenço^{1,2} and J. C. Xavier^{1,3}

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The Association of Polar Earlier Career Scientists (APECS) is an international and interdisciplinary organization for early career scientists, University students in the beginning of their careers, Ph.D. students, post-doctoral researchers, educators, teachers and others interested in the Polar Regions and wide cryosphere. APECS aims to promote and stimulate interdisciplinary international collaborations between researchers and to develop effective future leaders in polar research, education and education and outreach.

Today, APECS focuses essentially on using the WWW (<http://apecs.is/>), either having monthly newsletters, or through organizing discussion panels in conferences, through organizing workshops focused on the development of early career scientists, by organizing virtual poster sessions online, in order to keep a wide network of students, scientists and teachers/educators all over the world 100% dedicated to science, education and outreach of the Polar Regions.

All members are invited to provide valuable input to the APECS website, which has valuable information about the Polar Regions, and their APECS members (including their science), student or job opportunities (e.g. MSc, Ph.D. or University positions), info on future conferences, between others. To become a member, just go to the website.

The role of national committees of APECS, such as APECS Portugal, is to make a positive contribution to APECS international by organizing activities and events nationally (or within the executive committee and/or the council), have a regular update of the polar activities to their members and encourage a constant new vision to promote excellence in polar science, education and outreach. In Portugal, APECS was created in 2005 and has provided a strong contribution to the establishment of APECS, to the active role if APECS during the International Polar Year. This talk aims to review what APECS international and APECS Portugal is doing now, what is its vision for the future and identify what opportunities are today to early career scientists in Portugal and internationally.

Age and Growth of *Electrona antarctica* (Günther, 1878) from the Scotia Sea (Southern Ocean)

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The Myctophidae are one of the most abundant fish groups in the Southern Ocean, with an estimated biomass ranging from 70 to 200 million tons. Their ability to store energy connects different trophic pathways, allowing a rapid transfer of energy to/from the deep layers. With their daily vertical migrations between the surface and 1000 m deep, myctophids are also an important source of energy to surface top predators, such as *Aptenodytes patagonicus* (king penguins) and *Arctocephalus gazella* (Antarctic fur seals). *Electrona antarctica* is a mesopelagic myctophid, whose knowledge in terms of biology and ecology is still rather scarce. Notwithstanding, due to its role in the food web structure, it has received much attention from the polar research community in the last few years. In this ongoing study, the population structure of *E. antarctica* was evaluated. The fish otoliths are excellent data loggers that record the information life cycle in their structure at different scales. The pattern of deposition of CaCO₃ associated with summer/winter cycle creates annual marks that determine the basic criteria of ageing. A sample of 405 individuals, ranging from 30 mm to 112 mm SL was used to assess age, through otolith analysis, and to estimate the parameters of the von Bertalanffy growth curve. Females dominated the sample (n = 287), presenting higher SL and number of annual marks (46-112 mm SL and 2-8 annual marks), while males (n = 94) ranged from 41 mm to 100 mm SL and presented 2-6 annual marks. The parameters of the von Bertalanffy growth curve were $L_{\infty} = 139.4$ mm, $k = 0.16$ year⁻¹ and $t_0 = -0.27$ year for both sexes.

Physical Properties from a Gulbenkian-Permamodel-2 borehole (Livingston Island, Maritime Antarctica)

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Time and space evolution of temperature as well as the freezing and thawing phenomena of the uppermost ground on periglacial environments, are controlled by ground thermal conductivity and thermal diffusivity. Their understandings help to describe the seasonal behavior of the active layer and the *permafrost* evolution. In order to estimate the heat flux density on Reina Sofia Mount (Livingston Island, Maritime Antarctica) several cores were collected from a borehole named Gulbenkian-Permamodel 2 (GP2), with 15 m deep. The thermal conductivity values and the thermal diffusivity values were measured on a laser TCS Lippmann & GbR equipment. Were also estimated values of dry density and porosity, which were obtained by saturation and hydrostatic weighing techniques. Through the determination of uranium, thorium and potassium concentrations by gamma-ray spectroscopy was estimated, for the borehole, the heat production, per unit average volume. Aiming to determine the evolution of temperature inside the borehole, i-type button temperature sensors were placed at various depths. The values of thermal conductivity on dry cores vary between 3.02W/m.K and 3.32 W/m.K; the values of the thermal diffusivity vary between $1.42 \times 10^{-6} \text{ m}^2\text{s}^{-1}$ and $1.64 \times 10^{-6} \text{ m}^2\text{s}^{-1}$; the average heat production for the entire borehole is $1,698 \mu\text{Wm}^{-3}$. Because thermal properties of rocks are highly dependent on porosity, this parameter was also measured, in the cores giving values that vary between 1.1% and 1.8% and the values of density between 2640 kg/m^3 e 2666 kg/m^3 . Since in the area where the borehole was made, there is freezing and thawing of soil, was also estimated the thermal conductivity of the cores, with the pores filled with water and ice.

Polygonal Patterns on Mars and Earth (Svalbard): A Quantitative Geometric and Topologic comparison

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The quantitative analysis of polygonal networks, based on geometric and topological characteristics, permits objective comparisons between terrestrial and Martian networks, thus providing clues to better understand their origin and the processes involved in their evolution. We present here some results of the analysis of a number of polygonal networks from a location on Earth (Adventdalen, Svalbard, Norway) that can be compared with a set of Martian examples, answering the question if there is any fundamental difference between their geometry and topology. The terrestrial networks were subject to field work in the Summer of 2010, and were analysed with recourse to aerial imagery recently acquired; they represent the surface expression of ice-wedges in a periglacial area. The Martian examples constitute a set that has been employed in a number of works dealing with the development of an automated procedure to identify and delineate the networks, and then collect quantitative data about their geometry (dimensions and shapes) and topology (number of neighbours). Their origin is not fully understood; some may correspond to ice or sand wedges, others may have different origins. For each network, we have computed and plotted relations between:

- (i) average number of neighbours and number of polygons in a network;
- (ii) polygon density d (number of polygons per unit area) and average longer axis ;
- (iii) experimentally determined Desch and Lewis parameters, λL vs. λD ;
- (iv) experimentally determined Aboav–Weaire parameter a and the second moment of the distribution of the number of neighbours μ^2 .

The diagrams tell us where the terrestrial networks stand relative to the Martian cases. Relating their position with other data acquired in the field (soil characteristics, active layer depth, etc.) can give us clues about the characteristics of the Martian examples that cannot be extracted from the remote images presently available.

Practical Activities for Teaching Polar Sciences: an Interdisciplinary Approach

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One of the goals in teaching is to promote the scientific literacy of the citizens that is considered as *“An individual’s scientific knowledge and use of that knowledge to identify questions, to acquire new knowledge, to explain scientific phenomena, and to draw evidence based conclusions about science-related issues, understanding of the characteristic features of science as a form of human knowledge and enquiry, awareness of how science and technology shape our material, intellectual, and cultural environments, and willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen.”* (OECD, 2009: 14). One of the important strategies for teaching and learning of Natural Sciences, since elementary education, is the development of practical activities such as laboratory and field work, which can be experimental or not, pencil and paper activities and computer-based activities. The main objective of this project is to increase the number of practical activities available for teaching the Sciences, at all grade levels, including the training of elementary and secondary education teachers. Several practical activities in the form of pencil and paper but also computer exercises, based on research work related with Polar Sciences, are being planned, designed and created in an interdisciplinary perspective. Therefore, scientific papers on the occurrence of different types of rocks and meteorites and interactions between and among living organisms were selected. These kinds of activities will give students the opportunity to analyse the data, interpret and discuss the results of a selected subject. These activities contrast with other practical activities, such as laboratory work, whose results are important for learning, although some of these results are based on analogies with the biological and geological processes. OECD (Organisation for Economic Co-operation and Development). 2009. PISA 2009 Assessment Framework – Key Competencies in Reading, Mathematics and Science. OECD, Paris.