

10th PORTUGUESE POLAR SCIENCES CONFERENCE

UNIVERSIDADE DE AVEIRO - AVEIRO, PORTUGAL

25 - 26 OCTOBER 2018

PROGRAM & ABSTRACT BOOK

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CONTACTS & INFORMATION

cesam-polarconference2018@ua.pt http://conferenciapolar.web.ua.pt/

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WELCOME

The **Portuguese Conference on Polar Sciences** is a unique forum where the most recent advances on the Portuguese Polar research are brought into debate. The first conference was held in 2008 with the main aim of promoting a lively interaction among the Portuguese research community as well as international collaborators investigating in Polar Regions. With the support of the **Portuguese Polar Programme (PROPOLAR)** and the **Portuguese Foundation for Science and Technology (FCT)** this community has been increasing, and this year's conference celebrates its 10th anniversary. The audience of the conference has been also steadily growing each year, comprising national and international researchers on **Polar Regions**, students and teachers, as well as a wider community with interest in the **global impact of Polar research**. The conference fosters a vivid debate among researchers dedicated to tackling the Polar scientific challenges, while supporting the definition of new strategies for scientific cooperation at national and international levels.

This year, the **10th Portuguese Conference on Polar Sciences** welcomes three renowned international researchers as keynote speakers. **Peder Roberts** from the **KTH Royal Institute of Technology (Stockholm)** will give a talk "Why does History matter to polar research today?". **Rafel Simó** from the **Spanish National Council for Scientific Research (Barcelona)** will speak about "Biosphere-Atmosphere exchanges in the Polar Oceans". **Kirstin Werner** from the **Helmholtz Centre for Polar and Marine Research (Germany)** will give a presentation on Polar Science communication specifically on the scope of the 9th Workshop of the **Portuguese Association of Polar Early Career Scientists (APECS -Portugal)**, which is traditionally joining the Conference. The overarching theme of the APECS-Portugal Workshop this year is "How to communicate science?".

The Conference comprises **four institutional talks**, **three invited keynote lectures**, **17 oral communications** organized in four different sessions, and **16 posters**. The speakers include both national and international researchers and cover a wide range of topics - from investigations about biological, chemical and physical systems to societal issues, education and outreach concerning Polar Regions.

The Conference is held at **University of Aveiro** with the institutional support of **Centre for Environmental and Marine Studies (CESAM)**, which has been actively encouraging research in Polar Regions since many years. The local organization committee has members from different Departments of the University (Biology, Chemistry and Physics), the majority being integrated CESAM members and developing research in Artic and/or Antarctica.

We would like to welcome you all to the University of Aveiro for this important occasion of the 10th Portuguese Conference on Polar Sciences. We are honoured for hosting such a multidisciplinary scientific community that has been strongly committed to the research, education and dissemination of the Polar Sciences both in Portugal and aboard.

The Head of the Organizing Committee, Joana Pereira

INVITED SPEAKERS

Peder Roberts is Docent and Researcher in the Division of History of Science, Technology and Environment at KTH Royal Institute of Technology in Stockholm, Sweden. Trained as a historian of science, his research explores how describing and understanding the polar regions has been (and still is) connected with decisions on how the polar regions should be managed. Peder is the author of a monograph (The European Antarctic: Science and Strategy in Scandinavia and the British Empire) and has coedited three other books. Currently he leads the European Research Council-funded project



Greening the Poles: Science, the Environment, and the Creation of the Modern Arctic and Antarctic, which runs from 2017-22, in addition to working in the NordForsk Centre of Excellence in Resource Extraction and Sustainable Arctic Communities.

Rafel Simó is a Research Professor at the Institute of Marine Sciences, Spanish National Council for Scientific Research (CSIC), in Barcelona. He is a marine biogeochemist interested in ocean biosphere-atmosphereclimate interactions, with a long-standing emphasis in the sulphur cycle. To these aims he makes use of a broad array of methodologies, from molecular biology techniques, through plankton ecology and photo-physiology, aerosol characterization, all the way up to satellite analyses of the global ocean and atmosphere.



He has published over 100 papers in SCI journals, including *Science*, *Nature*, *PNAS* and *TrEE*. He has conducted cruises to Antarctica, the Arctic, North Atlantic, tropical Pacific and Mediterranean Sea. He was member of the coordination team of the Malaspina 2010-2011 Circumnavigation Expedition, and project leader in the Antarctic Circumnavigation Expedition 2017. He also served (2009-2014) in the Scientific Steering Committee of SOLAS (Surface Ocean Lower Atmosphere Study).

Since 2016, **Kirstin Werner** is working in the International Coordination Office for the Year of Polar Prediction, based at Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research in Bremerhaven, Germany. Before that, she completed her PhD about long-term changes of ocean heat transport in the Arctic Ocean. Kirstin has spent several years as a postdoctoral fellow in the United States and completed her 'on-the-job' master studies in Science Marketing in 2017 at the Technical University Berlin.



2018 CONFERENCE PROGRAM

University of Aveiro | Rectory building (Sala de Atos Académicos), 25-26 October, 2018

OCTOBER 25th

08:15 - 11:00 Registration

08:15 - 11:00 Poster setup

09:00 - 09:30 **OPENING SESSION**

Rector of the University of Aveiro, *Paulo Jorge Ferreira* Scientific Coordinator of the Centre for Environmental and Marine Studies, *Ana Isabel Lillebø* Co-coordinator of the PROPOLAR – Portuguese Polar Programme, *José Xavier* Coordinator of the Polar Office of FCT - Foundation for Science and Technology, *Germana Santos* Head of the Conference Organizing Committee, *Joana Pereira*

09:30 - 10:30 INSTITUTIONAL TALKS

Chair: Irina Gorodetskaya, CESAM-UA

09:30 - 09:45 APECS Portugal and the Portuguese Young Career Polar Scientists *José Seco & José Queirós, APECS Portugal/UAveiro*

09:45 - 10:00 An overview of PROPOLAR - Portuguese Polar Program *Ana David and Maria Teresa Cabrita, PROPOLAR*

10:00 - 10:15 Polar office - Portuguese Foundation for Science and Technology *Germana Santos, FCT*

10:15 - 10:30 Challenges, priorities and opportunities in Polar research *Peder Roberts, Royal Institute of Technology, Stockholm, Sweden Rafel Simó, Spanish National Council for Scientific Research, Barcelona Kirstin Werner, Polar Prediction Office, Alfred-Wegener Institute, Germany*

10:30 - 11:10 Coffee break

11:10 - 11:50 **INVITED TALK**

Chair: Joana Pereira

Why does History matter to polar research today? *Peder Roberts*, *KTH Royal Institute of Technology, Stockholm, Sweden*

11:50 - 12:35 Session I: SOCIETAL ARENAS IN POLAR REGIONS

Chairs: Maria Teresa Cabrita & Ana Salomé David

11:50 - 12:05 Bringing Antarctic science into policy making: lessons learnt from developing noninvasive penguin monitoring programs to modelling future scenarios *José Xavier, MARE-UCoimbra*

11:05 - 12:20 How Team Adaptation Drives Performance in Extreme Environments: A Qualitative Study in Antarctica *Pedro Margues Quinteiro, WJCR-ISPA*

12:20 - 12:35 ESTEEM Antarctica - Education of Science, Technology, Engineering, and Mathematics *Nuno Pereira*, *IPBeja*

12:35 - 14:00 Lunch Break (Refeitório Crasto)

14:30 - 15:45 Session II: WIDE MONITORING EFFORTS IN POLAR REGIONS

Chairs: António Correia & Vasco Miranda

12:30 - 12:45 Biogeography of Arctic microbial communities across the Svalbard shelf *Catarina Magalhães, CIIMAR | FC-UPorto*

14:45 - 15:00 Mercury in the Southern Ocean: Pathway from primary producers to top predators *José Seco, CESAM-UAveiro | SOI/St.Andrews, UK*

15:00 - 15:15 Recent change detection of vegetation in Fildes Peninsula through multiscale remote sensing *Pedro Pina, CERENA/IST-ULisboa*

15:15 - 15:30 Evaluation of new remote sensing platforms for monitoring thermokarst ponds (Canadian Subarctic) *Pedro Freitas, CEG/IGOT-ULisboa*

15:30 - 15:45 LATA (Loadings and Tectonics of Antarctica peninsula) – Status report *Machiel Bos, SEGAL-UBI/IDL, Covilhã*

15:45 - 16:00 SPEED POSTER PRESENTATIONS

Chair: José Alves

16:00 - 16:30 Coffee break

16:30 - 17:30 Session III: POLAR REGIONS IN THE GLOBAL CLIMATE SYSTEM

Chairs: Sandra Mogo & Diogo Luís

16:30 - 16:45 Changes in the long-term pattern of moisture transport for precipitation associated with Arctic sea ice melting *Luis Gimeno, EphysLab-UVigo, Spain*

16:45 - 17:00 Atmospheric river events and associated precipitation patterns during the ACLOUD campaign at Svalbard *Carolina Viceto, CESAM - UAveiro*

17:00 - 17:15 Impact of stratospheric circulation on the moisture balance of the Arctic region and connection to tropical circulation *Rui Pedro Silva, CESAM - UAveiro*

17:15 - 17:30 Atmospheric rivers and intense precipitation over the Southern Ocean and Antarctica: New insights from ship-borne and coastal measurements *Irina Gorodetskaya, CESAM - UAveiro*

17:30 - 18:30 POSTER SESSION

- Viagem à Antártida Introducing the Polar Science in the Portuguese Curriculum. *Marta E. Santo, AVE Ruy Luis Gomes*
- Investigating probable gender discrimination in Polar research teams. *Pedro Marques Quinteiro, WJCR-ISPA*
- Educational resources to enhance awareness on the impacts of Climate Change on the Ocean. *Daniela de Figueiredo, CESAM-UAveiro*
- Extensive mapping of sorted stone circles with ultra-high resolution imagery: Preliminary results from the 2018 field campaign in Barton Peninsula, King George Island. *Vasco Miranda*, *CERENA/IST-ULisboa*
- Erosion in permafrost coasts: new results of the very high-resolution UAV surveys of the Yukon coast, Canada. *Pedro Pina*, *CERENA/IST-ULisboa*
- Monitoring coastlines in the Canadian Arctic through remote sensing. *Pedro Pina, CERENA/IST-ULisboa*
- Geoelectric study to delineate the geoelectrical structure of the aquifer that provides water to the Peruvian Antarctic Station of Machu Picchu. *António Correia*, *ICT-UÉvora*
- Geoelectrical survey to study permafrost distribution near the Korean Antarctic Station in King George Island. *António Correia, ICT-UÉvora*
- ARs over the Arctic Ocean: trend in the anomalous moisture uptake. *Raquel Nieto, EphysLab-UVigo, Spain*
- Application of image analysis techniques to the study of atmospheric aerosols captured in an arctic region. *Sandra Mogo*, UBI-Covilhã
- Research on aerosols, clouds, and water vapour in Polar Regions. Sandra Mogo, UBI-Covilhã
- Environmental Risk Assessment in Antarctica: field actions and preliminary results of the project ReACT. *Ruth Pereira*, *UPorto*
- Phytoplankton community indicators of exposure to volcanic-mercury in Deception Island waters (Antarctica). *Maria Teresa Cabrita*, *CEG/IGOT-ULISBOA*
- Characterization of toll-like receptors gene family evolution in Antarctic notothenioid fish. *Cármen Sousa, CCMAR-UAlgarve*
- Expression and immunohistochemical localization of ion-transport proteins in the gills of Antarctic fish at different salinities. *Pedro Guerreiro, CCMAR-UAlgarve*
- Seal Occurrence and Habitat Use during Summer in Petermann Fjord, Northwestern Greenland. *Kate Lomac-MacNair, CCMAR, UAlgarve*

19:30 Meeting @Rossio for the Moliceiro experience (Largo do Rossio, 3800-209, Aveiro)

20:00 Dinner @Olaria (Cais da Fonte Nova, 3810-200, Aveiro)

2018 CONFERENCE PROGRAM

University of Aveiro | Rectory building (Sala de Atos Académicos), 25-26 October, 2018

OCTOBER 26th

09:00 - 09:40 INVITED TALK

Chair: Irina Gorodetskaya

Biosphere – Atmosphere exchanges in the Polar Oceans *Rafel Simó*, Institute of Marine Sciences, Spanish National Council for Scientific Research, Barcelona

09:40 - 10:55 Session IV: CHARACTERIZING BIOLOGICAL RESPONSES IN POLAR REGIONS

Chairs: Pedro Guerreiro & Guilherme Jeremias

09:40 - 9:55 Metabolic adaptations in phytoplankton continuously exposed to volcanic-mercury in Deception Island waters (Antarctica) *Maria Teresa Cabrita, IPMA | CEG/IGOT-ULISBOA*

09:55 - 10:10 Unicellular grazers in the Arctic plankton: combined morphological and molecular studies on heterotrophic dinoflagellates from Disko Bay (Greenland) *Sandra Craveiro, GeoBioTec-UAveiro*

10:10 - 10:25 First data about intertidal meiobenthos from Deception Island (Antarctica). It is Heaven and Hell *Marcos Rubal García, CIIMAR-UPorto*

10:25 - 10:40 Transcriptomic profiling of immune response of Notothenia coriiceps to endotoxin *Cármen Sousa, CCMAR-UAlgarve*

10:40 - 10:55 From hot to cold waters: habitat and trophic ecological patterns of Southern Ocean squid as juveniles and adults *José Queirós, UAveiro | MARE-UCoimbra*

10:55 - 11:30 Coffee break

11:30 - 11:45 CONFERENCE CLOSING and OPENING APECS WORKSHOP

Executive Director of PROPOLAR, **Maria Teresa Cabrita** Head of the Conference Organizing Committee, **Joana Pereira** Member of the APECS Portugal Executive Committee, **José Seco**

11:45 - 18:30 Workshop APECS - Portugal: S(t)ay Polar - How to communicate Science?

SUMMARY OF SESSIONS AND COMMUNICATIONS

SESSION I • Societal arenas in Polar regions

ORAL COMMUNICATIONS I

How Team Adaptation Drives Performance in Extreme Environments: A Qualitative Study in Antarctica.

[Pedro Marques Quinteiro, WJCR-ISPA]

- Bringing Antarctic science into policy making: lessons learnt from developing non-invasive penguin monitoring programs to modelling future scenarios. [José Xavier, MARE–UCoimbra]
- * ESTeEM Antarctica Education of Science, Technology, Engineering, and Mathematics. [Nuno Pereira, IPBeja]

POSTER COMMUNICATIONS I

- Viagem à Antártida Introducing the Polar Science in the Portuguese Curriculum. [Marta Espírito Santo, AVE Ruy Luis Gomes]
- Investigating probable gender discrimination in Polar research team [Mariana da Costa Amorim, UFG, Brasil]
- * Educational resources to enhance awareness on the impacts of Climate Change on the Ocean

[Daniela de Figueiredo, CESAM–UAveiro]

SESSION II • Wide monitoring efforts in Polar regions

ORAL COMMUNICATIONS II

- Biogeography of Arctic microbial communities across the Svalbard shelf * [Catarina Magalhães, CIIMAR | FC-UPorto]
- Mercury in the Southern Ocean: Pathway from primary producers to top predators [José Seco, CESAM-UAveiro | SOI/St.Andrews, UK]
- Recent change detection of vegetation in Fildes Peninsula through multiscale remote sensing [Pedro Pina, CERENA/IST-ULISBOA]
- Evaluation of new remote sensing platforms for monitoring thermokarst ponds (Canadian Subarctic)

[Pedro Freitas, CEG/IGOT-ULISBOA]

 LATA (Loadings and Tectonics of Antarctica peninsula) – Status report [Rui Fernandes, SEGAL-UBI/IDL, Covilhã]

POSTER COMMUNICATIONS II

- Extensive mapping of sorted stone circles with ultra-high resolution imagery: Preliminary results from the 2018 field campaign in Barton Peninsula, King George Island [Vasco Miranda, CERENA/IST-ULISBOA]
- Erosion in permafrost coasts: new results of the very high-resolution UAV surveys of the Yukon coast, Canada

[Pedro Pina, CERENA/IST-ULISBOA]

- Monitoring coastlines in the Canadian Arctic through remote sensing [Pedro Pina, CERENA/IST-ULISBOA]
- Geoelectric study to delineate the geoelectrical structure of the aquifer that provides water to the Peruvian Antarctic Station of Machu Picchu [António Correia, ICT-UÉvora]
- Geoelectrical survey to study permafrost distribution near the Korean Antarctic Station in King George Island

[António Correia, ICT-UÉvora]

SESSION III • Polar regions in the global climate system

ORAL COMMUNICATIONS III

- Atmospheric river events and associated precipitation patterns during the ACLOUD campaign at Svalbard [Carolina Viceto, CESAM-UAveiro]
- Changes in the long-term pattern of moisture transport for precipitation associated with Arctic sea ice melting [Luis Gimeno, EphysLab-UVigo, Spain | UAveiro]
- Impact of stratospheric circulation on the moisture balance of the Arctic region and connection to tropical circulation [Rui Pedro Silva, CESAM-UAveiro]
- Atmospheric rivers and intense precipitation over the Southern Ocean and Antarctica: New insights from ship-borne and coastal radiosonde measurements [Irina Gorodetskaya, CESAM–UAveiro]

POSTER COMMUNICATIONS III

- ARs over the Arctic Ocean: trend in the anomalous moisture uptake [Raquel Nieto, UVIGO, Spain]
- Application of image analysis techniques to the study of atmospheric aerosols captured in an arctic region

[Sandra Mogo, UBI-Covilhã]

- Research on aerosols, clouds, and water vapour in Polar Regions [Sandra Mogo, UBI-Covilhã]
- Environmental Risk Assessment in Antarctica: field actions and preliminary results of the project ReACT

[Ruth Pereira, CESAM–UAveiro]

SESSION IV • Characterizing biological responses in Polar regions

ORAL COMMUNICATIONS IV

- Metabolic adaptations in phytoplankton continuously exposed to volcanic-mercury in Deception Island waters (Antarctica) [Maria Teresa Cabrita, IPMA, CEG/IGOT-ULISBOA]
- Unicellular grazers in the Arctic plankton: combined morphological and molecular studies on heterotrophic dinoflagellates from Disko Bay (Greenland) [Sandra Craveiro, GeoBioTec-UAveiro]
- First data about intertidal meiobenthos from Deception Island (Antarctica). It is Heaven and Hell.

[Marcos Rubal García, CIIMAR-UPorto]

- Transcriptomic profiling of immune response of Notothenia coriiceps to endotoxin [Cármen Sousa, CCMAR-UALG]
- From hot to cold waters: habitat and trophic ecological patterns of Southern Ocean squid as juveniles and adults

[José Queirós, UAveiro | MARE-UCoimbra]

POSTER COMMUNICATIONS IV

 Phytoplankton community indicators of exposure to volcanic-mercury in Deception Island waters (Antarctica)

[Maria Teresa Cabrita, IPMA | CEG/IGOT-ULISBOA]

- Characterization of toll-like receptors gene family evolution in Antarctic notothenioid fish [Cármen Sousa, CCMAR-UALG]
- Expression and immunohistochemical localization of ion-transport proteins in the gills of Antarctic fish at different salinities [Pedro Guerreiro, CCMAR-UALG]
- Seal Occurrence and Habitat Use during Summer in Petermann Fjord, Northwestern Greenland

[Kate Lomac-MacNair, CCMAR-UALG]

How Team Adaptation Drives Performance in Extreme Environments: A Qualitative Study in Antarctica

Pedro Marques-Quinteiro¹, Walter Eppich², Jan Schmutz³, Mirko Antino⁴, Travis Maynard⁵

pquinteiro@ispa.pt

1 William James Center for Research, ISPA- Instituto Universitário, Lisboa, Portugal

2 Northwestern University Feinberg School of Medicine, Chicago, USA

3 Department of Communication Studies | ATLAS Lab, Northwestern University, Chicago, USA

4 Departamento de Psicobiología y Metodología en Ciencias del Comportamiento, Facultad de Psicología, Universidad Complutense de Madrid, Espana

5 Management Department, College of Business, Colorado State University, USA

Purpose: Working in Antarctica has challenges regular teams never experience. These factors elevate the importance of identifying which individual and collective psychological features contribute to teamwork effectiveness during Antarctica missions. In this research we are particularly interested in understanding how Science Teams conduct field research in Antarctica, and how they maintain and restore team performance during campaigns.

Method: We are using constructivist grounded theory. Participants were 23 individuals enrolled in the 2017-2018 Antarctica summer campaign. Individual interviews and field observations happened between February 23rd and March 8th, at King Sejong Station, Base Escudero, Great Wall Station, Ardley Island, Maxwell Bay, and Punta Arenas. Data collection and analysis are proceeding iteratively, and data are analysed using constant comparison. Key themes were identified from analysis and their relationships are being critically examined.

Results: Our preliminary findings generally suggest that during summer campaigns, Antarctica Science Teams face a variety of stressors from which sudden and unpredictable weather changes, and logistic related incidents are the most common. Although data collection and data analysis are ongoing, up to this point we might tentatively say that Antarctica science teams maintain and restore performance during campaigns because they engage in team adaptation. In Antarctica, science teams' adaptation seems to be driven by individual factors such as "keeping a positive mind set" or "being patient", and collective factors such as "adapting to multiple stressors by changing between tasks", or "collaborating with scientific or/and logistic teams".

Conclusion: Through our research we are beginning to demonstrate that the main vehicle to ensure the success of research campaigns is through the promotion of the conditions that will enable team adaptation. Data analysis continues.

Bringing Antarctic science into policy making: lessons learnt from developing noninvasive penguin monitoring programs to modelling future scenarios

José C. Xavier^{1,2}, José Abreu¹, Filipe R. Ceia¹, Danijela Dimitrijevic¹, Joana Fragão¹, Hugo Guimaro¹, Julian Gutt³, Ana Hilário^{4,5}, José Queiros¹, Ricardo Matias¹, Vitor Paiva¹, Jorge M. Pereira¹, Patricia Pescadinha¹, José Seco^{1,5,6}, Jaime A. Ramos¹

jxavier@zoo.uc.pt

1 Marine and Environmental Sciences Centre, Department of Life Sciences, University of Coimbra, 3001-401 Coimbra

2 British Antarctic Survey, Natural Environment Research Council, High Cross, Madingley Road, Cambridge, CB3 0ET, United Kingdom

3 Alfred Wegener Institute, Hemholtz Centre for Polar and Marine Research, PO Box 120161, 27515 Bremerhaven, Germany

4 Departamento de Biologia, Universidade de Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal

5 CESAM, Universidade de Aveiro, Aveiro, Portugal

6 School of Biology, University of St Andrews, St Andrews KY16 9ST, UK

It has been recognized recently that communicating Antarctic scientific findings to policy makers is crucial to establish actions that politically need to be executed, under the framework of the Antarctic Treaty System. In this presentation, we review the most recent findings from our 2018 papers on key research areas relevant to the development of policies. Under a climate change scenario, Gentoo penguins Pygoscelis papua and Chinstrap penguins Pygoscelis antarctica breeding in Antarctic Peninsula can feed on different niches in successive years suggesting a strategy to avoid competition, despite both feeding on an important fishery targeted species, the Antarctic krill Euphausia superba (Dimitrijević et al. 2018). Similarly, a study during the much less studied Antarctic Winter, nonbreeding Gentoo penguins in South Georgia waters highlighted the sensitivity of these penguins to cope badly with abnormal environmental conditions affecting considerably their diet and the commencement of their following breeding season (Xavier et al. 2018a). In terms of conservation, various methods to assess the diet (using conventional methods, DNA methods, stable isotopic methods) applied to penguins, albatrosses and squid can provide vital information for monitoring programs (Dimitrijević et al. 2018, Pereira et al. 2018, Queirós et al. 2018, Xavier et al. 2018a, Xavier et al. 2018b, Xavier et al. 2018c, Xavier et al. 2018d). Finally, modelling possible scenarios for Antarctica, based on the Intergovernmental Panel for Climate Change low emissions (i.e. RCP 2.6) and high emissions (i.e. RCP 8.5) suggest that even in the low emissions scenario it requires ambitious action to limit greenhouse gas emissions and to establish policies to reduce anthropogenic pressure (i.e. the climate will continue to warm but at a lesser rate) (Rintoul et al. 2018) and the development of future policies are needed (Gutt et al. 2018, Hughes et al. 2018).

References

Dimitrijević D, et al. (2018) Polar Biology • Gutt J, et al. (2018) Marine Genomics 37:1-17 • Hughes KA, (2018) Environmental Science & Policy 83:86-95 • Pereira JM (2018) Marine Biology 165:55 • Queirós JP, (2018) Polar Biology • Rintoul SR, (2018) Nature 558:233-241 • Xavier J, (2018a) Polar Biology 41:2323-2335 • Xavier JC, (2018b) Marine Biology 165:93 • Xavier JC, (2018c) Polar Biol 41:1937-1949 • Xavier JC, (2018d) Polar Biol 41:2275-2287.

ABSTRACTS • ORAL COMMUNICATIONS • SESSION I : Societal arenas in Polar regions

ESTEEM Antarctica - Education of Science, Technology, Engineering, and Mathematics

Nuno Pereira¹, Sandra Saúde¹, Ana Rodrigues¹, Aldo Passarinho¹, Fátima Carvalho¹, Mariana Regato¹, Gabriel Goyanes², Rui Anastácio¹, Filipe Silva¹, João Afonso¹

nuno.pereira@ipbeja.pt

1 Polytechnic Institute of Beja, Portugal 2 IGOT - CEG, University of Lisbon, Portugal

STEM education is now a priority as we move to an increasingly technology-dependent society. On the other hand, issues of environment pollution and sustainable development should be at the top of the list of topics addressed by educators at all levels of teaching. This project intends to address these topics in the context of Antarctica, and using Antarctica as a means to start the debate with students and educators. In the 2018-19 campaign, three projects will be implemented under the designation ESTEEM Antarctica: ViRAL (Virtual Reality Antarctica Laboratory), Antarctuino (Physical Computing in Antarctica with the Arduino), and ARC (Antarctica Robotics Challenge). As a STEM education project, the objective is twofold: (i) to promote coding-related activities, engaging students and educators in project-based learning, either with robotics or physical computing (topics of the utmost priority and importance for the future educational framework, namely, digital literacy, in particular coding skills), and (ii) to increase the awareness of society about topics related to Antarctica, namely, the conservation of wildlife, pollution, and the impact of human activity at a global scale (to promote public engagement, in particular the new generations, in the discussion of solutions and pathways for sustainable development). In this communication we will briefly cover the results from the previous campaign (2017-18) in the Bulgarian Antarctic Base, where the precursor project was successfully implemented, and present the work plan of the next campaign, in particular, the physical computing sub-projects, the upgrade of ViRAL, and the activities under development for the ARC, in cooperation with Portuguese schools and the network of schools from the Camões Institute of Sofia, in Bulgaria. The project ESTeEM Antarctica is supported by Fundação para a Ciência e Tecnologia (FCT), I.P./MCTES through national funds (PIDDAC,) and the Portuguese Polar Program (PROPOLAR).

ABSTRACTS • ORAL COMMUNICATIONS • SESSION II : Wide monitoring efforts in Polar regions

Biogeography of Arctic microbial communities across the Svalbard shelf

Catarina Magalhães^{1,2}, António Sousa^{1,2}, Maria Paola Tomasino¹, João P. Santos¹, Pedro Duarte³, Luís Torgo^{2,4}, Philipp Assmy³

cmagalhaes@ciimar.up.pt

1 CIIMAR– Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Terminal de Cruzeiros do Porto de Leixões, Av. General Norton de Matos s/n, 4450–208, Porto, Portugal

2 Faculty of Sciences, University of Porto, Rua Campo Alegre s/n, 4169-007, Porto, Portugal

3 Norwegian Polar Institute, Fram Centre, N-9296 Tromsø, Norway

4 LIAAD - Laboratory of Artificial Intelligence and Decision Support, INESC Technology and Science, Porto, Portugal

Global warming and climate change have been manifested in the decrease of Arctic sea ice extent and thickness. The thinner sea-ice regime has significant implications for Arctic primary productivity and biogeochemistry. It is therefore necessary to improve our understanding of microbial dynamics that ultimately drive productivity and the strength of the biological carbon pump in order to better predict future trends in Arctic biogeochemistry. In this study we present a comprehensive analysis of the biogeographic patterns of Arctic prokaryote and eukaryotic protist diversity and distribution along two oceanographic transects in late July 2016 crossing fjord, shelf and oceanic domains along the western (Kongsfjorden) and northern (Rijpfjorden) coast of Svalbard. A total of 11 stations were sampled at three depths (surface, chlorophyll maximum and above the seafloor) and amplification of 16S rRNA and 18S rRNA genes was performed and sequenced in Illumina MiSeq with a sequence depth of about 100 thousand read-pairs. The prokaryotic and eukaryotic protist data set comprises highly complex and diverse microbial communities with a marked biogeographic pattern. Strong links were identified between bacterioplankton and phytoplankton/picophytoplankton distribution driven by environmental and biogeochemical factors that will help to unravel the role of microbial pathways in supporting Arctic Ocean primary productivity and system integrity.

Mercury in the Southern Ocean: Pathway from primary producers to top predators

José Seco^{1,2}, José C. Xavier^{3,4}, João P. Coelho⁵, Bárbara Pereira¹, Geraint Tarling³, Miguel A. Pardal⁶, Paco Bustamante⁷, Gabriele Stowasser³, Andrew Brierley², Maria E. Pereira¹

jseco@ua.pt

1 Department of Chemistry and CESAM, University of Aveiro, 3810-193 Aveiro, Portugal

- 2 Pelagic Ecology Research Group, Scottish Oceans Institute, University of St Andrews, St Andrews KY16 8LB, UK
- 3 British Antarctic Survey, NERC, High Cross, Madingley Road, CB30ET Cambridge, UK
- 4 MARE—Marine and Environmental Sciences Centre, Departamento das Ciências da Vida, Universidade de Coimbra, 3000-456 Coimbra, Portugal
- 5 Department of Biology and CESAM, University of Aveiro, 3810-193 Aveiro, Portugal
- 6 CFE Centre for Functional Ecology, Department of Life Sciences, University of Coimbra, Calça da Martim de Freitas, 3000-456 Coimbra, Portugal
- 7 Littoral Environnement et Sociétés (LIENSs), UMR 7266 CNRS-Université de La Rochelle, 2 rue Olympe de Gouges, 17000 La Rochelle, France

Although Antarctica is seen as the remote and pristine continent, the levels of contaminants in the Southern Ocean have increased significantly. Mercury is one of the pollutants that it's found in higher concentration than expected in Antarctic waters. With this study, we aim to better understand the concentration of mercury and its pathway along the Southern Ocean marine trophic web.

Samples were collected along several taxonomic groups from microalgae, crustacean, fish, cephalopods and top predators, between 2015 to 2017 on the Scotia Sea, one of the most productive areas of the Southern Ocean. Plankton and nekton were collected around South Georgia and South Orkneys. Predator samples were collected by colleagues in the islands.

This presentation will be focused in the path that mercury since it gets absorbed in the micro algae to the levels that it reaches in the long living top predators, using stable isotopes analyses as proxy for trophic level. Establishing the base levels of mercury in the Southern Ocean food web is crucial to better understand how this pollutant will may affect the Antarctic ecosystems.

Recent change detection of vegetation in Fildes Peninsula through multiscale remote sensing

Pedro Pina¹, Sandra Heleno¹, Gonçalo Vieira², Vasco Miranda¹, Carla Mora²

ppina@tecnico.ulisboa.pt

1 CERENA, IST, University of Lisbon 2 CEG, IGOT, University of Lisbon

The vegetated surfaces in the Antarctic Peninsula (AP) are experiencing an accelerated dynamic strongly related to the warming trend since the second half of the last century. Remote sensing, due to the repeatable and extended coverage of the surfaces with multispectral imaging, is the only way to map and evaluate these multitemporal changes in large scale. But the nature of the vegetation surfaces in the AP, mainly constituted by relatively small and sparse patches of lichens and mosses, leads to observations in satellite imagery in many areas with relative low levels of certitude due to the indeterminate degree of spectral mixing with other surfaces (soils, rocks, water, snow, ice). A methodology that incorporates in the procedure intermediate scales of observation between ground and satellite levels is developed to remove most of the associated incertitude and consequently to produce more reliable thematic maps of the vegetation. The approach is tested with the combination of multiplatform imagery (UAV-Unmanned Aerial Vehicle and satellite) together with field work verification from a test site in Fildes Peninsula, King George Island. The ultra-high resolution of the imagery captured by surveys with an UAV (3-5 cm) during the PROPOLAR field campaign in 2017 and the construction of high quality products (ortophotomaps and digital elevation models) allows the precise delineation of vegetation patches, the identification of their type (moss or lichen) and also their textural characteristics (dense, semi-dense and sparse). The incorporation of these objects and respective features with the lower spatial resolution but higher spectral information of WorldView2 and QuickBird satellites imagery (2.0-2.4 m) allows classifying with higher accuracy the different surface classes. The changes detected on vegetation surfaces in Fildes Peninsula between 2006 and 2017 are accurately quantified and their results discussed.

Evaluation of new remote sensing platforms for monitoring thermokarst ponds (Canadian Subarctic)

Pedro Freitas^{1,2}, Gonçalo Vieira ^{1,2}, João Canário³, Warwick F. Vicent^{4,5}

pedro-freitas@campus.ul.pt

1 Institute of Geography and Spatial Planning, University of Lisbon, Portugal

2 Center of Geographical Studies, University of Lisbon, Portugal

3 Department of Chemical Engineering/Instituto Superior Técnico, University of Lisbon

4 Dépt de biologie – Université Laval

5 Centre d'études nordiques

On the Eastern side of the Hudson Bay, in the Canadian Subarctic, fast changes are affecting the thermal regimes of permafrost and the active layer, with implications on the terrestrial ecosystems, due to a set of complex feedback mechanisms, mostly associated to the Arctic Amplification effect. Changes in snow and see-ice patterns, along with increasing temperature and precipitation, have led to rapid permafrost degradation, creating thermokarst lakes and ponds. These new dynamics are affecting Greenhouse Gas (GHG) emissions to an extent that still needs to be fully integrated in Global Climate Models. Few considerations have been given waterbodies below 10 000 m2, yet these are known to be biogeochemically more active than larger lakes. Variations in the optical properties of these small thermokarst lakes and ponds provide insights into their capacity for greenhouse gas emissions and can potentially be assessed via different Remote Sensing platforms in combination with statistical approaches and Geographical Information Systems. We undertook field surveys in lakes and ponds in the region of Kuujjuarapik-Whapmagoostui using an Unmanned Aerial Vehicle with a Sequoia multispectral camera and developed very high resolution (13 cm) orthomosaics and digital surface models. The data was used as ground truthing for lake spectral characteristics to evaluate the potential use of Landsat 8 and Sentinel-2 satellite imagery for research of small lakes and ponds characteristics dynamics. The methodology allowed to evaluate the capacity of very high-resolution imagery (Sequoia, WorldView 2 e WorldView 4) for the detection of thermokarst ponds, and of high-resolution images (Landsat 8 and Sentinel-2) for monitoring variability of their spectral characteristics. The results show that Sentinel-2 imagery, offers the highest correlations with ground truthing data, introducing new possibilities for monitoring the spectral characteristics of thermokarst lakes and ponds with over 350 m2.

ABSTRACTS • ORAL COMMUNICATIONS • SESSION II : Wide monitoring efforts in Polar regions

LATA (Loadings and Tectonics of Antarctica peninsula) – Status report

Rui Fernandes¹, Machiel Bos¹, Pedro Almeida², Bento Martins¹, Gabriel Goyanes³, Claudio Matko⁴

msbos@segal.ubi.pt

1 SEGAL (UBI/IDL), Covilhã, Portugal

2 GEOBIOTEC (UBI), Covilhã, Portugal

3 CEG/IGOT / Universidade de Lisboa, Portugal

4 Instituto Antártico Argentino, Argentina

The LATA (Loadings and Tectonics of Antarctica peninsula) is a long-term project, funded by ProPolar, to investigate the accuracy of ocean tide models and the tectonic plate motions within and around of Antarctica Peninsula using Global Navigation Satellite System (GNSS). To achieve its objectives, a permanent GNSS station (including a weather station) was installed on the Argentinian base Primavera on the Antarctic Peninsula in January 2016. In 2018 the missing ancillary equipment was installed to acquire the GNSS data the whole year round.

Ocean Tidea Loading (OTL) is the weight of the ocean tides deforming the ocean floor and surrounding coastal areas which can be observed with GNSS. At the Primavera station, the differences between the predicted OTL using various ocean tide models can reach several millimeters due to large uncertainties in the ocean tide models. Therefore, GNSS observations will improve our knowledge of the ocean tides in this area. Next, the Antarctica Peninsula has been considered to be located on the Antarctica tectonic plate, which is divided in two major geological provinces with the Antarctica Peninsula being one of the major terranes of West Antarctica. However, there are significant differences (up to 5mm/yr) between the predictions when angular velocities of different tectonic models are used, highlighting the need for more observations at more locations. Finally, recent studies have also raised concern on ice sheet melting rates and rapid bedrock uplift in the Antarctica Peninsula stressing the need for further continuous observation of the vertical component.

Here we present the two years of GNSS observations at Primavera and what we can conclude from them so far. Furthermore, we will present our plans for our campaign at Primavera in 2019 when we will carry out a tidal gravimetry and tide gauge campaign at this station. This campaign will be funded by the Portuguese ProPolar with support of the IAA (Instituto Antártico Argentino).

Atmospheric river events and associated precipitation patterns during the ACLOUD campaign at Svalbard

Carolina Viceto^{1,2}, Mario Mech³, Susanne Crewell³, Annette Rinke⁴, Alfredo Rocha^{1,2}, Irina Gorodetskaya^{1,2}

carolinaviceto@ua.pt

1 Department of Physics, University of Aveiro, Aveiro, Portugal

2 CESAM - Centre for Environmental and Marine Studies, University of Aveiro, Aveiro, Portugal

3 Institute for Geophysics and Meteorology, University of Cologne, Cologne, Germany

4 Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Potsdam, Germany

Recently, Arctic has experienced a remarkable increase in the near-surface air temperature, exceeding the global warming. The consequences of this Arctic amplification extend beyond the Arctic, with far-reaching impacts on global weather patterns. Significant increase in the atmospheric moisture content over the Arctic might be due to the decrease in Arctic sea-ice causing the increase in local evaporation and/or stronger poleward heat and moisture transport from lower latitudes, with atmospheric rivers (ARs) being its strongest manifestation.

Here we present a comparison of two anomalous water vapour transport events identified during the ACLOUD campaign (Arctic Cloud Observations Using airborne measurements during polar Day), which took place from May 22 to June 28, 2017, along Svalbard. We explore their temporal and spatial evolution by means of Integrated Water Vapour (IWV) and Integrated Vapour Transport (IVT), and the associated precipitation patterns, using ECMWF's ERA-Interim reanalysis product. Reanalysis-based estimates are compared with the measurements from the AWIPEV research station (Ny-Ålesund) and with satellite-borne measurements of IWV.

Preliminary results show that on May 29-30, an anomalous water vapour transport event, identified as an AR, extended from Western Siberia, with IVT and IWV up to 200 kg m-1 s-1 and 12 kg m-2, respectively, in Ny-Ålesund. This event was accompanied by intense snowfall along the AR track, with weaker precipitation reaching Svalbard. Later, on June 6, another AR was identified, with IVT and IWV peaking up to 120 kg m-1 s-1 and 16 kg m-2, in Ny-Ålesund. Despite having a similar moisture source, this event was associated to precipitation confined to Southern Svalbard, mainly in the form of rain. Precipitation phase (rain or snow) is important for the local surface mass and energy balance leading to different radiative feedback mechanisms due to changes in surface albedo.

ABSTRACTS • ORAL COMMUNICATIONS • SESSION III : Polar regions and global patterns

Changes in the long-term pattern of moisture transport for precipitation associated with Arctic sea ice melting

Luis Gimeno¹, Luis Gimeno-Sotelo², Raquel Nieto¹, Marta Vázquez¹

l.gimeno@uvigo.es

1 Environmental Physics Laboratory (EphysLab), Universidade de Vigo, Ourense, Spain

2 Departamento de Matemática, Universidade de Aveiro, Aveiro, Portugal

In this study we use the term moisture transport for precipitation for a target region as the moisture coming to this region from its major moisture sources resulting in precipitation over the target region (MTP). We have identified changes in the pattern of moisture transport for precipitation over the Arctic region, the Arctic Ocean, and its 13 main subdomains concurrent with the major sea ice decline that occurred in 2003.

The pattern consists of a general decrease in moisture transport in summer and enhanced moisture transport in autumn and early winter, with different contributions depending on the moisture source and ocean subregion.

The pattern is statistically significant and consistent with changes in the vertically integrated moisture fluxes and frequency of circulation types. The results of this paper also reveal that the assumed and partially documented enhanced poleward moisture transport from lower latitudes as a consequence of increased moisture from climate change seems to be less simple and constant than typically recognised in relation to enhanced Arctic precipitation throughout the year in the present climate.

Impact of stratospheric circulation on the moisture balance of the Arctic region and connection to tropical circulation

Rui P. Silva¹, Carlos A. F. Marques¹, José M. Castanheira¹

ruipedrosilva@ua.pt

1 CESAM - Centre for Environmental and Marine Studies, University of Aveiro, Aveiro, Portugal

In this study we analyse the meridional transport of sensible heat and water vapour, based on the ERA-Interim reanalysis data for the period between January 1979 to December 2012.

The obtained results show that the input of moisture into the Arctic region is conditioned by the strength of the stratospheric polar vortex, with positive anomalies in water vapour transport occurring after strong vortex episodes.

Moreover, the statistical connection between the occurrence of Stratospheric Sudden Warmings (SSWs) and the phase of the Quasi-biennial Oscillation (QBO) as well as the El Niño Southern Oscillation (ENSO) phases suggest a possible mechanism for the influence of the equatorial/tropical atmospheric circulation on the Arctic moisture balance.

Atmospheric rivers and intense precipitation over the Southern Ocean and Antarctica: New insights from ship-borne and coastal radiosonde measurements

Irina Gorodetskaya¹, Annick Terpstra², Tiago Silva³, Iris Thurnherr⁴, Pascal Graf⁴, Franziska Aemisegger⁴, Heini Wernli⁴, F. Martin Ralph⁵

irina.gorodetskaya@ua.pt

- 2 Geophysical Institute, University of Bergen and Bjerknes Centre for Climate Research, Bergen, Norway
- 3 University of Innsbruck, Institute for Atmospheric and Cryospheric Sciences, Innsbruck, Austria

4 Institute for Atmospheric and Climate Science, ETH, Zurich, Switzerland

5 Center for Western Weather and Water Extremes at Scripps Institution of Oceanography, University of California at San Diego, California, La Jolla, USA

Intensification of the global hydrological cycle has been linked with increased precipitation in mid latitudes and polar regions. Increased precipitation over Antarctica affects the ice sheet mass balance and its contribution to global sea level rise. At the same time, more precipitation over the Southern Ocean causes its freshening with important consequences for ecosystems and ocean dynamics. During individual events, the partitioning of precipitation between the ocean and the ice sheet depends strongly upon several atmospheric and air-sea interaction processes. These include the underlying large- and meso-scale atmospheric dynamics, evaporation rates from the surrounding ocean surface, and the intensity of the water vapor flux within an atmospheric river.

Properties and evolution of atmospheric rivers extending towards Antarctica are examined in this study for two precipitation events during austral summer season, for which special observations are available. Unique ship-borne radiosonde measurements were collected during the Antarctic Circumnavigation Expedition for the first event that brought intense precipitation over the Southern Ocean. Analysis is presented showing the thermodynamic profile evolution and changes in the enhanced water vapor transport layer height when the atmospheric river passed over the ship's position. The other event reached the East Antarctic coast bringing an anomalous amount of snowfall to its escarpment zone. For this event analysis of radiosonde measurements from the coastal stations are presented. A distinct moisture inversion was observed at higher altitudes in accordance with the isentropic analysis showing that the majority of the water vapor transport reaches the ice sheet coast via (pseudo-) isentropic upgliding associated with a warm conveyor belt. Comparison of the ERA-Interim reanalysis with the radiosonde data showed that the reanalysis struggles with representation of these intense water vapor transport events.

¹ CESAM - Centre for Environmental and Marine Sciences, Dept Physics, University of Aveiro, Aveiro, Portugal

Metabolic adaptations in phytoplankton continuously exposed to volcanic-mercury in Deception Island waters (Antarctica)

Bernardo Duarte¹, Maria Teresa Cabrita^{2,3}, Tânia Vidal⁴, Joana Luísa Pereira⁴, Mário Pacheco⁴, Patrícia Pereira⁴, João Canário⁵, Fernando J.M. Gonçalves⁴, Carlos Cordeiro⁶, Marta Sousa Silva⁶, Andreia Figueiredo⁷, Ana Rita Matos⁷, Rui Rosa⁸, João Carlos Marques⁹, Isabel Caçador¹ and Carla Gameiro^{1,3}

tcabrita@campus.ul.pt

- 1 Marine and Environmental Sciences Centre (MARE), Faculdade de Ciências da Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal
- 2 Centro de Estudos Geográficos (CEG), Instituto de Geografia e Ordenamento do Território (IGOT), Universidade de Lisboa, Rua Branca Edmée Marques, 1600-276 Lisboa, Portugal.
- 3 Instituto do Mar e da Atmosfera (IPMA), Rua Alfredo Magalhães Ramalho, 6, 1495-006 Algés, Portugal
- 4 Department of Biology & CESAM Centre for Environmental and Marine Studies, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal
- 5 Centro de Química Estrutural (CQE), Instituto Superior Técnico, Universidade de Lisboa, Av. Rovisco Pais, 1, 1049-001 Lisboa, Portugal
- 6 FT-ICR-Lisboa Laboratório de FT-ICR e Espectrometria de Massa Estrutural, Faculdade de Ciências, Universidade de Lisboa.
- 7 Biosystems and Integrative Sciences Institute (BioISI), Plant Functional Genomics Group, Departamento de Biologia Vegetal, Faculdade de Ciências da Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal
- 8 Marine and Environmental Sciences Centre (MARE), Laboratório Marítimo da Guia, Faculdade de Ciências da Universidade de Lisboa, Avenida Nossa Senhora do Cabo 939, 2750-374 Cascais, Portugal
- 9 Marine and Environmental Sciences Centre (MARE), c/o Departamento de Zoologia Faculdade de Ciências e Tecnologia, Universidade de Coimbra, 3000 Coimbra, Portugal

Antarctica remote location and hostile environment makes permanent human colonization unappealing, leaving this polar area relatively unharmed. Nevertheless, besides the natural contamination of metals and metalloids associated with high submarine activity [e.g. mercury (Hg)], signs of anthropogenic pollution have also been recently detected. Moreover, due to high submarine volcanic activity, an additional natural source of metals and metalloids contamination should be considered, being this is more evident for mercury (Hg). Samples collected from Deception Island (DI) volcano (located in the South Shetland Islands archipelago), confirmed that emissions of natural volcanic Hg are comparable to those found in other areas of the globe with volcanic activity. Hence, DI is an ideal field laboratory to investigate the physiological adaptations driven from chronic Hg exposure at the community level. DI volcanic vents lead to a continuous chronic exposure of the phytoplankton community to potentially toxic Hg concentrations. Samples collected from Hgcontaminated sites and from areas with low Hg levels, revealed similar phytoplankton communities, but with very different physiological profiles. At the photochemical level, phytoplankton from Hgcontaminated sites seemed to be more efficiently processing solar to chemical energy. Phytoplankton fatty acid profiles indicated a lipid modulation of the cellular membranes and lipid storage, as possible adaptation mechanisms. The application of high-resolution metabolome profiling contributed to identify key metabolites altered and to elucidate cellular processes associated with the adaptations to chronic exposure. We argue that these features, not observable in culture conditions, even under Hg exposure, are signs of metabolic adaptation, driven from chronic exposure. These changes observed allow phytoplankton communities to maintain high levels of primary productivity, under unfavourable conditions, such as those prevailing in DI.

Unicellular grazers in the Arctic plankton: combined morphological and molecular studies on heterotrophic dinoflagellates from Disko Bay (Greenland)

Sandra C. Craveiro^{1,2}, António J. Calado^{1,2}, Andreas Altenburger³, Øjvind Moestrup⁴, Nina Lundholm³

scraveiro@ua.pt

1 Department of Biology, University of Aveiro, Aveiro, Portugal

2 GeoBioTec Research Unit, University of Aveiro, Aveiro, Portugal

3 Natural History Museum of Denmark, University of Copenhagen, Copenhagen, Denmark

4 Marine Biological Section, Department of Biology, University of Copenhagen, Copenhagen, Denmark

Arctic phytoplankton communities develop a single bloom during spring, accounting for more than 50% of the annual primary production. The bloom is made up mainly of diatoms that are grazed by e.g., copepods, ciliates and heterotrophic dinoflagellates. In order to evaluate the diversity of dinoflagellates in this community and their role in the Arctic marine ecosystem, a sampling campaign was conducted during late spring-early summer 2016 in Disko Bay, Greenland. Phytoplankton was collected by net tows from the upper 30 meters of several locations near Qegertarsuag and examined by light microscopy at ca. 0-2°C in a low-temperature facility. Single cells were videorecorded and isolated into PCR tubes for sequencing of nuclear-encoded ribosomal DNA. Several of the most diverse samples were prepared for scanning electron microscopy (SEM). Single cells of specific taxa were processed for transmission electron microscopy (TEM). Phylogenetic analyses based on LSU and/or SSU rDNA sequences gave a general view of the diversity of dinoflagellates in those samples, including some hitherto unidentified species. The heterotrophic dinoflagellates observed were, in general, relatively large cells, some with very particular features and behaviour. One interesting species of "naked" dinoflagellates showed the unusual ability to strongly contract in response to sudden water agitation. Another species, or complex of species (Proterythropsis sensu lato, Warnowiaceae), possesses a single ocelloid or eye-like structure, several large special ejectile organelles called nematocysts, and a curved, tentacle-like cytoplasmic extension; these complex structures are believed to be used in the feeding process, but details are unknown. A third, smaller species, with a small epicone and a very distinct yellow colour seems not to match any previously described species. Ultrastructural observations revealed several internal cell components that have never been described from dinoflagellates.

First data about intertidal meiobenthos from Deception Island (Antarctica). It is Heaven and Hell

Marcos Rubal^{1,2}, Puri Veiga^{1,2}, Mariano Lastra^{3,4}, Jesús López^{3,4}, Jesus S. Troncoso^{3,4}

mrubal@ciimar.up.pt

1 CIIMAR, Matosinhos, Portugal

2 University of Porto, Porto, Portugal

3 University of Vigo, Vigo, Spain

4 ECIMAT, Vigo, Spain

Nowadays our knowledge about the diversity and structure of intertidal meiobenthic assemblages in Antarctica is very scarce. The aim of this study is to explore the diversity and structure of intertidal meiobenthic assemblages on four different sandy beaches of Deception Island. At each beach, two sites, separated by 10s of metres, were sampled and at each site, two tidal levels (high and low) were considered. A total of four cores (10 cm2) were collected at each site and tidal level. The environment of the four intertidal beaches was very different, with beaches of gravel sands and a wide range of temperature from 4.5 °C to 40 °C. Results showed a relative low diversity with only 12 different taxa and very low abundance, only 591 individuals were found in a total of 64 samples. In general nematodes were the dominant group with 370 individuals followed by harpacticoids (70 individuals), tubelarians (48 individuals), nauplii (40 individuals) and rotifers (28 individuals). The other seven taxa showed total abundances lower than 10 individuals. This poor diversity and abundance contrast with the meiobenthic structure of intertidal sandy beaches on other latitudes but, are in concordance with previous results in Antarctica. We did not find significant differences on the meiobenthic assemblage structure among the studied beaches or tidal levels. Moreover, no significant relationship between meiobenthic assemblage and the studied environmental variables was found, suggesting that other ecological drivers such as food availability may be the responsible of the observed distribution patterns. This study provides valuable baseline information about the diversity and structure of intertidal meiobenthic assemblages in an area poorly studied.

Transcriptomic profiling of immune response of Notothenia coriiceps to endotoxin

Cármen S.V. Sousa¹, Pedro M. Guerreiro¹, Bruno Louro¹, Deborah M. Power^{1,2}, Liangbiao Chen², Adelino V.M. Canário^{1,2}

csvsousa@ualg.pt

1 CCMAR - Centro de Ciências do Mar, Universidade do Algarve, 8005-139 Faro, Portugal

2 College of Life Science and Fisheries, Shanghai Ocean University, China

Fish rely significantly on innate immune response which is extremely important for survival in an aquatic environment, potentially rich in bacteria, parasites, fungi and viruses. Antarctic notothenioid fish evolved around 25 million years ago in a very cold and stable environment through adaptive radiation from a single benthic ancestral, likely developing specific responses and host-parasite interactions. Little is known about the functioning and adaptability of their immune system, as climate change scenarios can lead to occurrence of novel pathogens or disruption of microbial balance in the Antarctic Ocean.

Experiments with *N. coriiceps* were performed in Great Wall Station in King George Island, during the Antarctic summer of 2017. The experimental design included three groups kept at 2°C (non-injected, saline-injected and lipopolysaccharide (LPS)-injected), one tank per group (n=8). Several tissues involved in the immune, stress and metabolic processes were collected, and laboratory analysis are currently in progress. RNA sequencing and transcriptomic analysis were performed in immune-related tissues in identify the gene networks involved and to understand the fish response to bacteria exposure.

The tissues primarily selected were head-kidney, the major hematopoietic organ in fish and skin and intestine, lymphoid-associated tissues with an important immune role as defence barriers. Evaluation of gene sequences showed the interference of different signalling pathways related to the immune system evoked by LPS challenge in all these tissues, being the head-kidney and intestine most responsive.

Acknowledgments

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From hot to cold waters: habitat and trophic ecological patterns of Southern Ocean squid as juveniles and adults

José P. Queirós^{1,2}, Ana Hilário^{1,3}, David R. Thompson⁴, Filipe R. Ceia², Graeme Elliott⁵, Kath Walker⁵, Yves Cherel⁶, José C. Xavier^{2,7}

josequeiros@ua.pt

1 Departamento de Biologia, Universidade de Aveiro, Campus Universitário de Santiago, 3810–193 Aveiro, Portugal 2 MARE – Marine and Environmental Sciences Centre, Departamento das Ciências da Vida, Universidade de Coimbra, 3000–456 Coimbra, Portugal

3 CESAM, Universidade de Aveiro, Aveiro, Portugal

4 National Institute of Water and Atmospheric Research Ltd., 301 Evans Bay Parade, Hataitai, Wellington 6021, New Zealand

5 Albatross Research, 549 Rocks Road, Nelson 7011, New Zealand

6 Centre d'Etudes Biologiques de Chizé, UMR 7372 du CNRS-Université de La Rochelle, 79360 Villiers-en-Bois, France

7 British Antarctic Survey, NERC, High Cross, Madingley Road, CB3 0ET, Cambridge, UK

Cephalopods play an important ecological role in Antarctic marine ecosystems. Despite their ecological importance, very little is known about their habitat and trophic ecology through different stages of an individual's life. Applying a stable isotopic analysis of δ 13C and δ 15N in squid's lower beaks (tip of the rostrum and wing), collected from the diet of Antipodean wandering albatrosses (Diomedea antipodensis antipodensis and D. a. gibsoni) breeding at Antipodes and Adams Island respectively (South Pacific), and known to forage in the Pacific sector of the Southern Ocean, we determined the habitat and trophic ecology of 12 squid species as juveniles and adults and searched for patterns. Values of δ 13C (from -25.0‰ to -19.0‰ in both life-stages) suggest that Southern Ocean squid species are distributed from Antarctic waters near the continent to Subtropical waters. Also, differences between δ 13C values on juvenile (from -23.1‰ to -19.0‰) and adult (from -25.0‰ to -19.9‰) show that individuals change their habitat during their lifetime, with adults showing smaller values suggesting a pattern in which most of the studied squid species move towards South, crossing the Antarctic Polar front, somewhere during their life-cycle. Values of δ 15N (from 3.4‰ to 13.7‰ in both life-stages) show that most of the species increase the trophic level from juvenile (from 3.4‰ to 11.0‰) to adult (from 6.7‰ to 13.7‰), except for two species (Cycloteuthis sirventi and Octopoteuthis cf. megaptera) that present similar δ 15N values in the both life-stages. Discussions on the implications this pattern from an ecological perspective is discussed.

Viagem à Antártida - Introducing the Polar Science in the Portuguese Curriculum

Marta Espírito Santo¹

espiritos1@gmail.com

1 Agrupamento de Escolas Ruy Luis Gomes, Portugal

In Portugal, the Natural Sciences curriculum of the 5th and 6th grades doesn't mention how important the study of the polar regions is. Since it is in these regions that climate change is felt more quickly, it is extremely important to work with students of 9 to 12 years old group, making them active citizens in changing behaviors and attitudes. The "Viagem à Antártida" Project arises with the purpose of introducing the study of Antarctica in the curriculum of Natural Sciences in basic education, through the development, in the classroom, of two didactic sequences. In order to share knowledge with the largest number of people, this project sought to know Antarctica, its characteristics and biodiversity; understand the main changes in the continent resulting from climate change; raise awareness among students and citizens of the problems affecting Antarctica and its global consequences; recognize Antarctica as a continent that needs to be preserved and relate scientific knowledge to technological development.

Participants in this study were 25 students from a 6th grade group who carried out guided researches and selected pertinent information for the creation of three didactic games.

ABSTRACTS • POSTER COMMUNICATIONS • SESSION I : Societal arenas in Polar regions

Investigating probable gender discrimination in Polar research teams

Mariana da Costa Amorim¹, Pedro Marques-Quinteiro²

mari_amorim_gyn@hotmail.com

1 Universidade Federal de Goiás, Brazil

2 William James Center for Research, ISPA - Instituto Universitário, Lisboa, Portugal

For a long time, women were forbidden to go to Antarctica. In the 50's, most countries did not allow women to work in Antarctica and there were only a few female polar scientists. In the past decades, there has been a breakthrough and the presence and impact of female scientists in the polar regions has increased rapidly. Recently, women have played an important and influential role in this field, publishing several key articles on Antarctic science in the past ten years. Nevertheless, we must problematize: what price do women scientists pay to be included in polar research? What forms of gender discrimination do they face? Is it possible that chauvinism, historically ingrained in our civilization, has been eradicated in the slightest behaviors? Or does it remain masked, finding subtle forms of reproduction? How should such issues affect scientific production, local organizational climate, and women well-being? In this project, we will interview female scientists working in the polar regions to check for gender inequality evidence in their reports and group relationships, as well as for other hurdles in the field of work arising from the condition of "being a woman" and from hierarchical relations. Mapping the hurdles that women scientists might find in the polar regions will lead to the creation of actions and psychoeducational strategies to reduce the stressors in the organizational climate of polar teams, to improve work environment and to avoid negative impacts on work related. Several stressors are naturally found in work stations located in the polar regions. Thus, chauvinistic behaviors add to other adversities faced by women and sum up to the daily challenges that are typical of polar expeditions. If understanding such distresses is paramount for the planning of polar missions, and for the prevention and promotion of factors with the aim to provide a successful psychosocial adaptation, the impacts of gender prejudice must also be addressed.

Educational resources to enhance awareness on the impacts of Climate Change on the Ocean

Daniela de Figueiredo¹

dfigueiredo@ua.pt

1 Dep. Biology & CESAM, University of Aveiro, Portugal

The impacts of Climate Change are being witnessed worldwide and these are already leading to adaptive changes on the behaviour of citizens. The younger ones must be aware of those changes in order to better understand them and be prepared for a more severe Climate scenario in the future. The understanding of how these climate alterations impact the ecosystems and their biodiversity can be a powerful educational tool. Therefore, schools must make a considerable effort in widely discussing Climate Change topics. In order to assist teachers in their important awareness role, the EduCO2cean project developed several educational resources concerning the impacts of Climate Change on the Ocean, explaining its causes and impacts. Global Warming and Polar Ice Melting were highlighted horizontally across those resources. Videos and an e-book discussing Climate Change and the Ocean were made available through the project website (http://www.educo2cean.org/), with the collaboration of Universities, Environmental Associations and Schools from different European countries. The project engaged more than 5000 students, teachers, scientific researchers and general public on the performed activities.

Acknowledgments

This project was financed by ERASMUS+, with ASPEA as coordinator and partners from scientific and educational organisations from Portugal, Spain, Poland and UK. http://www.educo2cean.org/

ABSTRACTS • POSTER COMMUNICATIONS • SESSION II : Wide monitoring efforts in Polar regions

Extensive mapping of sorted stone circles with ultra-high resolution imagery: Preliminary results from the 2018 field campaign in Barton Peninsula, King George Island

Pedro Pina¹, Sandra Heleno¹, Gonçalo Vieira², Carla Mora², Vasco Miranda¹, Soon-Gyu Hong³ vasco.miranda64@gmail.com

1 CERENA, IST, University of Lisbon, Portugal

2 CEG, IGOT, University of Lisbon, Portugal

3 KOPRI - Korean Polar Research Institute, South Korea

Sorted stone circles are the most common type of patterned ground in Barton Peninsula of King George Island (Maritime Antarctica) being found in many clusters at all altitudes above 60 masl. Their study, performed through ultra-high resolution imagery acquired by UAV-Unmanned Aerial Vehicles, can provide a full 3D characterization of each individual circle and respective clasts in extended areas covered by these circular patterns. This more detailed description and the evaluation of possible correlations with other characteristics (altitude, presence/absence of vegetation in the neighbourhood) can contribute to improve their importance as a paleoclimatic indicator. We present some preliminary results obtained after a field campaign developed during the summer of 2018 in Barton Peninsula in the frame of a PROPOLAR project. Aerial surveys with an UAV were developed in almost every area of the peninsula that contains clusters of stone circles, with the exception of those within ASPA 171 which were not surveyed. In addition, each of the 20 sites surveyed is constituted by 1 to 2 hundred circles of metric size. The double-grid flights developed at low height (10 m) allowed acquiring images with 2-3 mm of spatial resolution, while the 80% overlapping between adjacent rows permitted deriving elevation models with a resolution of 2-3 cm. Image mosaics and the respective digital elevation models were elaborated for each site after 500 to 700 individual images with structure-from-motion techniques. These products are used to extract the dimensional and geometric features of the circles and respective clasts whose relation with the altitude between 60 and 240 masl is discussed.

Erosion in permafrost coasts: new results of the very high-resolution UAV surveys of the Yukon coast, Canada

Gonçalo Vieira¹, Pedro Pina², Dustin Whallen³, François Malenfant³, Samnuel Stettner⁴, Justus Gimsa⁴, Anna Irrgang⁴, Carla Mora¹, Pedro Freitas¹, João Canário⁵, Hugues Lantuit⁴

ppina@tecnico.ulisboa.pt

1 CEG/IGOT, University of Lisbon, Lisbon, Portugal

2 CERENA/IST, University of Lisbon, Lisbon, Portugal

3 Natural Resources Canada, Geological Survey of Canada–Atlantic, Dartmouth, Nova Scotia, Canada

4 Alfred Wegener Institute, Potsdam, Germany

5 CQE/IST, University of Lisbon, Portugal

Climate models indicate the highest warming rates for the high latitudes, especially for the Arctic. Recent estimates indicate that the release of previously frozen organic carbon and its transformation into greenhouse gases may push global climate warming above the 1.5 °C targeted in the COP21 Paris Agreement. Despite efforts to include carbon fluxes from permafrost degradation in climate models, the lateral fluxes of organic matter from land to sea are still not accounted for. Arctic permafrost coasts are major carbon (Schuur et al., 2015) and mercury pools and represent about 34% of Earth's coastline, with large sectors affected by significant erosion rates. Year-round reduction in Arctic sea ice is forecasted and by the end of the 21st century, models indicate a decrease in sea ice area ranging from 43 to 94% in September and from 8 to 34% in February. An increase of the sea-ice free season duration will expose coasts to wave action, extending the erosion into the shoulder seasons. Changing climate will also modify the contribution of terrestrial erosion, e.g. thermokarst, gully erosion and retrogressive thaw slumps.

Following previous research by the Geological Research of Canada and the Alfred Wegener Institute, in July-August 2018, we resurveyed several long-term monitoring sites from the Canada-US border to King Point: Border, Clarence, Nunaluk, Herschel's slumps A, B, C, D and Tina's, Stokes West, Kay Point and King Point. Traditionally the repeat surveys were conducted using a DGPS survey along fixed transects that cross-cutted each site. In 2018, we have partially repeated the DGPS surveying and surveyed all sites with a SenseFly RTK ebee UAV with a S.O.D.A. camera and a Trimble R4 base station, allowing for preliminary model accuracies of ci. 10 cm. This research is integrated in the H2020 EU project Nunataryuk - Permafrost thaw and the changing Arctic coast, science for socioeconomic adaptation and PROPOLAR.

ABSTRACTS • POSTER COMMUNICATIONS • SESSION II : Wide monitoring efforts in Polar regions

Monitoring coastlines in the Canadian Arctic through remote sensing

Nuno Matos¹, Carla Mora², Pedro Pina³, Gonçalo Vieira²

ppina@tecnico.ulisboa.pt

1 IST, University of Lisbon, Portugal

2 CEG/IGOT, University of Lisbon, Portugal

3 CERENA/IST, University of Lisbon, Portugal

Coastal erosion in the Arctic is currently a serious environmental issue closely related to the release of previously frozen organic carbon and its transformation into greenhouse gases. It is originated by several factors whose importance is growing every year, namely, the action of ocean waves in longer sea-ice free seasons or the effects of permafrost degradation, among others. The detection and quantification of the changes on these coastlines is very important to better understand the processes involved in its modification and consequently better predict future erosion rates and derived environmental impacts. This monitoring can be adequately performed with the help of multispectral satellite imagery, but current procedures mainly involving manual delineations are preventing detailed inter- and intra-annual quantifications along extended Arctic coastlines. To overcome this issue, a methodology to automatically delineate coastlines on satellite imagery is presented. It is based on image segmentation and object-based classification procedures and applied to the multispectral bands of Landsat satellites (4, 5, 7 and 8). The evaluation of the approach is performed in the Yukon coast in the Canadian Arctic with a dataset constituted by images acquired between 1986 and 2017. This work is inserted in 'Nunataryuk' a project from programme H2020 of the European Commission.

Geoelectrical survey to study permafrost distribution near the Korean Antarctic Station in King George Island

Antonio Correia¹, Pedro Mendes¹, Kwan Soo Ki², Hyeon Tae Ju², Soon Gyu Hong², Joohan Lee²

correia@uevora.pt

1 Institut of Earth Sciences, University of Evora, Evora, Portugal

2 KOPRI, Korean Polar Institute, Seoul, Republic of Korea

Under the framework of the Project Hydrotomo of the Portuguese Polar Program and the Korean Polar Program of the Korean Polar Institute, a geoelectrical study was started in January 2018 near the Korean Antarctic Station King Sejong to study the possible influence of permafrost and active layer dynamics in the evolution of mosses and lichens. The study area is located in the Barton Peninsula of King George Island of the South Shetland Islands archipelago. Four geophysical methods were used: georadar, electromagnetic surveys, electrical resistivity imaging, and multichannel analysis of surface waves (MASW); however, in the presentation only the results of the electrical resistivity imaging will be presented and discussed. The study area has a rectangular shape of 40 m long and 6 m wide and all the geoelectrical profiles were carried out along the largest side of the area; furthermore, to try to detect any permafrost and active layer thickness time variation, two times a week, during three weeks, three parallel electrical resistivity profiles, spaced by three meters each, were carried out. In each electrical resistivity tomography 40 active electrodes separated by one meter were used in a Wenner configuration. A Lippmann LG High Power equipment was used to measure the apparent electrical resistivity (electrical resistivity pseudosections) along each profile, and the RES2DINV software was used to process the electrical raw data and obtain real electrical resistivity profiles of the study area. The geoelectrical survey allowed detecting the top of the permafrost as well as water zones in the study area. Even preliminary, the obtained results appear to indicate that there is a relationship between high electrical resistivity zones with zones lacking mosses or lichens and vice-versa. Hopefully, the data obtained will allow constructing in the near future three dimension models of the subsurface electrical resistivity distribution.

Geoelectric study to delineate the geoelectrical structure of the aquifer that provides water to the Peruvian Antarctic Station of Machu Picchu

António Correia¹, Wai Long Ng Cutipa², Luis Cerpa Cornejo², Esteban Abelenda Falcón³

correia@uevora.pt

1 Institute of Earth Sciences, University od Evora, Evora, Portugal

2 Instituto Geológico Minero y Metalúrgico - INGEMMET, Lima, Peru

3 Instituto Antártico Uruguayo, Ministerio de Industria, Energía y Minería, Uruguay

Under the framework of the Project Hydrotomo, and the Peruvian Polar Program, the Portuguese Polar Program, and the Uruguayan Antartic Program, a geoelectrical study was started in January 2018 in the Peruvian Antarctic Station of Machu Picchu to try to delineate the geoelectrical structure of the aquifer that provides water for domestic use to the station. The Machu Picchu Antarctic Station is located in Admiralty Bay of King George Island of the South Shetland Islands archipelago. The main objective of the work is to try to find the aquifer's lateral and depth extensions so that a better exploration and exploitation plan can be devised. Furthermore, the work also aims at identifying areas of possible saline intrusion. As a matter of fact, Machu Picchu Station is a temporary station that is open during the antarctic summer only; however, there are plans to transform it into a permanent station which implies a more rigorous aquifer management. The study area (about 90,000 m2) presents glacial, alluvial-glacial, alluvial, alluvial-fluvial, and marine sediments (mostly sandy gravels with some silty gravel layers); the area where the aquifer is believed to exist was covered by several electric resistivity tomographies with lengths that varied from 100 to 300 m long. Hydrogeologic data were obtained from piezometers located within the area where electrical resistivity tomographies were carried out. Preliminary processing of the geoelectric data indicates that several tomographic profiles crossed the aquifer which appears to be several meters deep; the bedrock is deeper than 60 m. The aquifer formation presents electrical resistivity values that range from about 100 to 400 Ω .m. Water samples from the piezometers present electrical resistivity values ranging from 25 to 50 Ω .m.

ABSTRACTS • POSTER COMMUNICATIONS • SESSION III : Polar regions and global patterns

ARs over the Arctic Ocean: trend in the anomalous moisture uptake

Marta Vázquez¹, Jorge Eiras-Barca¹, Iago Algarra¹, Alex Ramos², Raquel Nieto¹, Luis Gimeno¹

rnieto@uvigo.es

1 Universidade de Vigo

2 Instituto Dom Luiz, Universidade de Lisboa, 1749-016 Lisboa, Portugal

The Arctic region has been suffering from important changes in recent decades, being the decrease in sea ice extent one of the most important observed processes. Several causes have been suggested for this decline, and the moisture transport is one of the most relevant and of special interest in recent years. Atmospheric rivers (ARs) represent one of the main mechanisms of moisture transport from the tropics to mid-latitudes and despite having been shown especially relevant to the link between lower and higher latitudes, its effect over the Arctic has not been deeply investigated. In this work, the ARs entrance areas to the Arctic over the Atlantic and the Pacific Ocean and their changes in the last two decades are investigated. For this purpose, an ARs database based on IVT is employed in order to analyze the number of ARs reaching the Arctic región and their trend over the period 1997-2014. Moreover, the Lagrangian particle dispersion model FLEXPART was used to study the anomalous moisture uptake associated with ARs over their trajectories. From this Lagrangian methodology, the areas showing significant trends in the moisture contribution to the ARs development were identified for every month and entrance area. From the results, a remarkable positive significant trend is observed over the Atlantic ocean in February associated with the Atlantic entrance area. Due to the great extent of the positive significant trend (reaching most of the North Atlantic Ocean), a more detailed analysis is realized for this area and month. From de results, investigating both ARs characteristic (number, IVT...) and moisture availability (moisture contribution to ARs, evaporation over the Ocean), it seems like the positive trend on moisture contribution to the ARS is more related with evaporative processes than with the number or characteristics of the ARs traveling toward the Arctic.

ABSTRACTS • POSTER COMMUNICATIONS • SESSION III : Polar regions and global patterns

Research on aerosols, clouds, and water vapour in Polar Regions

D. Mateos¹, V. E. Cachorro¹, S. Mogo^{1,2,3}, C. Toledano¹, C. Velasco-Merino¹, R. González¹, A. Berjón¹, C. Guirado¹, R. Román¹, J. C. Antuña¹, M. Herreras¹, E. Rodríguez⁴, E. Asmi⁴, A. Calle¹, A. M. de Frutos¹

sipmogo@gmail.com

1 Grupo de Óptica Atmosférica, Universidad de Valladolid, Paseo Belén 7, CP 47011, Valladolid, Spain

2 Universidade da Beira Interior, Dep. De Física, Covilhã, Portugal

3 Instituto Dom Luiz (IDL), Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal

4 Finish Meteorological Institute, Helsinki, Finland

The determination of atmospheric components in Polar regions, which is essential for improving our knowledge on climate change and its impact on such areas, has some peculiarities, derived from the obvious geographical considerations, that make it more difficult to accomplish than in other regions. The project POLARMOON (Aerosols, Clouds and Water Vapour in Polar Regions: emphasis in nocturnal photometry) aims to establish long-term datasets of the main atmospheric factors.

The Atmospheric Optics Group (GOA) of University of Valladolid installed in June'2017 one solar-skymoon CIMEL-318T photometer in the Arctic Base of Ny-Ålesund (79°N, Svalbard) by a joint effort with the German Alfred Wegener Institute for Polar and Marine Research (AWI). In January'2018, one solar-sky-moon CIMEL-318T photometer and one all-sky camera were installed in the Argentinian Antarctic Base of Marambio (64°S), in the northern Antarctic Peninsula, in a collaboration with the Finish Meteorological Institute and Argentinian Meteorological Service. Together with these observations, an ultraviolet pyranometer was set up in the Spanish Antarctic base of "Gabriel de Castilla" (63°S). GOA-UVa is also carrying out long-term observations since 2002 in the Subarctic site of Andenes (69°N, Norway) in collaboration with the Andoya Rocket Range and the Norwegian Institute for Air Research (NILU).

This study presents the preliminary results of atmospheric aerosol properties, water vapour column, and solar radiation in Polar Regions, including some extraordinary episodes of high turbidity conditions when pollution from remote areas, such as big forest fires in Canada can reach the European Arctic.

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Application of image analysis techniques to the study of atmospheric aerosols captured in an arctic region

S. Mogo^{1,2,3}, A. Barroso¹, V. E. Cachorro², A. M. de Frutos², R. Monteiro¹

sipmogo@gmail.com

1 Universidade da Beira Interior, Dep. de Física, Covilhã, Portugal

2 Grupo de Óptica Atmosférica, Universidad de Valladolid, Valladolid, Spain

3 Instituto Dom Luiz (IDL), Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal

This study presents the methods used to study individual aerosol particles in the Arctic using images obtained by electronic microscopy. For each image obtained by the microscope, the particles are analysed for their size, morphology and chemical composition.

The aerosols were acquired by impaction in policarbonate filters and the collection took place at ALOMAR, the Arctic Lidar Observatory for Middle Atmosphere Research, located in the Andøya island close to the town of Andenes (69°16'N, 16°00'E, 380 m a.s.l.), ~300 km north of the Arctic Circle. After the collection of the particles, the filters are given a proper treatment and covered with a conductive layer, which makes the aerosols visible for the electronic microcopes. A scanning electron microscope is used for the micrometric particles and a transmission electron microscope is used for the micrometric particles.

The analysis of individual particles with these techniques provides information that can not be obtained otherwise. However, this is a time consuming process and several technical problems prevent its automation. In this work we discuss these problems and propose some solutions to solve them. Always with a view to automating and increasing the speed of data processing.

The results obtained from the data collected in situ during this work are essential for improving our knowledge on climate change and its impact on remote areas. They can also be used to improve the results of global models to determine the contribution of the aerosols to climate change.

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Environmental Risk Assessment in Antarctica: field actions and preliminary results of the project ReACT

Guilherme de Abreu Jeremias^{1,2}, Ruth Pereira^{3,4}, Tânia Vidal^{1,2}, Anabela Cachada^{1,3}, Patrícia Pereira^{1,2}, João Canário⁵, Sofia Guilherme^{1,2}, Mário Pacheco^{1,2}, Fernando J.M. Gonçalves^{1,2}, Joana Luísa Pereira^{1,2}

ruth.pereira@fc.up.pt

1 CESAM – Centre for Environmental and Marine Studies, University of Aveiro, Portugal

2 Department of Biology, University of Aveiro, Portugal

3 CIIMAR – Interdisciplinary Centre of Marine and Environmental Research, University of Porto, Portugal

4 Department of Biology, Faculty of Sciences, University of Porto, Portugal

5 Department of Chemical Engineering/Instituto Superior Técnico – University of Lisbon, Portugal

Site-specific Environmental Risk Assessment (ERA) is accepted worldwide as a reliable tool to appropriately frame decision making regarding the most adequate management towards environmental protection and/or remediation strategies. The project ReACT is a follow-up to preliminary studies denoting environmental contamination by major and trace elements and linked environmental hazardous potential in Fildes Peninsula, King George Island, Antarctica. ReACT capitalizes on these preliminary studies and on the recognised need for a better support of the major challenge of the Protocol on Environmental Protection to the Antarctic Treaty, i.e. the planning of human activities to minimize impacts upon the Antarctic environment and ecosystem. A field campaign was held in February-March 2018 and we collected 20 soil samples in Fildes Peninsula (plus two likely references in Ardley Island and Nelson Island) for numerous analyses that will feed all the three Lines of Evidence (LoE) integrating ERA frameworks: the chemical LoE with soil physicochemical parameters, as well as trace element and polycyclic aromatic hydrocarbon contents; the ecological LoE with microbial community activity and structural diversity, as well as collembolan abundance; the ecotoxicological LoE with direct toxicity tests with soil organisms and tests with the bioavailable fraction of contaminants with freshwater organisms. So far, we completed the soil general physico-chemical characterisation. While soil density was found very similar among sampling sites, there are noticeable differences in pH, conductivity and organic matter content that may relate to existent gradients of contamination. Ongoing work includes chemical quantification and ecotoxicological testing, the ultimate goal of the project being to robustly integrate information from the three LoE to deliver feasible risk estimations for the focused area.

Phytoplankton community indicators of exposure to volcanic-mercury in Deception Island waters (Antarctica)

Maria Teresa Cabrita^{1,2}, Bernardo Duarte³, Tânia Vidal⁴, Joana Luísa Pereira⁴, Mário Pacheco⁴, Patrícia Pereira⁴, João Canário⁵, Fernando J.M. Gonçalves⁴, Ana Rita Matos⁶, João Carlos Marques⁷, Isabel Caçador³, Carla Gameiro^{1,3}

tcabrita@campus.ul.pt

1 Instituto do Mar e da Atmosfera (IPMA), Rua Alfredo Magalhães Ramalho, 6, 1495-006 Algés, Portugal 2 Centro de Estudos Geográficos (CEG), Instituto de Geografia e Ordenamento do Território (IGOT), Universidade de Lisboa, Rua Branca Edmée Marques, 1600-276 Lisboa, Portugal.

3 Marine and Environmental Sciences Centre (MARE), Faculdade de Ciências da Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal

4 Department of Biology & CESAM – Centre for Environmental and Marine Studies, University of Aveiro, Campus Universitário de Santiago, 3810-193 Aveiro, Portugal

5 Centro de Química Estrutural (CQE), Instituto Superior Técnico, Universidade de Lisboa, Av. Rovisco Pais, 1, 1049-001 Lisboa, Portugal

6 Biosystems and Integrative Sciences Institute (BioISI), Plant Functional Genomics Group, Departamento de Biologia Vegetal, Faculdade de Ciências da Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal

7 Marine and Environmental Sciences Centre (MARE), c/o Departamento de Zoologia Faculdade de Ciências e Tecnologia, Universidade de Coimbra, 3000 Coimbra, Portugal

Deception Island, located in the South Shetland Islands (Antarctica), is an active volcano with a large collapsed and flooded caldera, harbouring a large number of fumaroles and hydrothermal vents. Recent studies have shown that volcanic activity appears to be the main source of mercury (Hg) in the island, at levels equivalent to other volcanic areas worldwide. This makes this location the ideal field laboratory to investigate the changes at the phytoplankton community level, driven by chronic Hg exposure. Phytoplankton collected within the flooded caldera (Port Foster Bay), in the proximity and at a significant distance to the hydrothermal activity, disclosed communities with relatively high biomass and species composition, comparable to other productive coastal systems. This suggests possible phytoplankton adaptation driven from Hg chronic exposure and multigenerational evolution. However, some differences were detected between the two phytoplankton communities. Variation of biomass and species abundance in the phytoplankton community collected from waters situated closer to hydrothermal activity, and thus under higher Hg impact, supported the possibility of Hg being a promoting factor shaping the phytoplankton community composition. Phytoplankton with higher cell Hg-content (close to hydrothermal activity) responded essentially through a decrease in biomass and a shift in the microalgae composition towards species potentially less susceptible to Hg. The increased abundance of some individual phytoplankton taxa in this community suggests that these species may be suitable indicators of Hg enhancement in the water column, in Deception Island.

Expression and immunohistochemical localization of ion-transport proteins in the gills of Antarctic fish at different salinities

Sandra Silva¹, Jonathan M. Wilson², Luis Vargas-Chacoff³, Bruno Louro¹, Adelino V.M. Canário¹, Pedro M. Guerreiro¹

pmgg@ualg.pt

1 CCMAR - Centro de Ciências do Mar, Universidade do Algarve, 8005-139 Faro, Portugal

2 Wilfrid Laurier University, Waterloo, Canada

3 Universidad Austral de Chile y IDEAL, Valdivia, Chile

The gills are critical for ion exchange with the environment, as they can constitute up to 95% of the fish's surface in contact with the surrounding water. Chloride cells are responsible for mediating those exchanges according to the external salinity, by modifications in the expression, mobilization or activity of a suite of ion transporters, or by changes in the permeability of the branchial tissue. Little is known about the functionality and responsiveness of these mechanisms in nototheniods, some of which may experience alterations in salinity by the melting of ice in enclosed shore waters.

Fish, *Notothenia rossii* and *Harpagifer antarticus*, were collected in shore waters from King George Island and maintained in groups in recirculation circuits. Fish groups were exposed to decreasing salinities by gradual addition of fresh water in recirculating tanks for a week before sampling. Blood samples were used for determining osmolality and ion-contents, and gills were preserved in SEI Buffer for the determination of NaK-ATPase activity, in RNAlater for gene expression by RealTime qPCR, and in Bouin for histology and fluorescence immunohistochemistry (FIHC).

The data show that the Antarctic fish tested are responsive to salinity, but fail to maintain complete integrity of the internal parameters, showing significant decreases in plasma osmolality, mainly due to reduction in sodium and chloride levels. These changes are accompanied by a reduction of the gill NaK-ATPase activity and by changes in the expression of genes coding for ion-transporters (NKA, NKCC, CFTR, NHE), water channels (Aquaporins) and tight junction membrane barrier proteins (Claudins). FIHC shows these fish present a typical distribution of chloride cells in the gill filament, with abundant levels of NaK and NKCC in sea- and brackish water, but do not appear to efficiently upregulate NHE in brackish water.

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Characterization of toll-like receptors gene family evolution in Antarctic notothenioid fish

Cármen S.V. Sousa¹, Pedro M. Guerreiro¹, Bruno Louro¹, João C. Cardoso¹, Deborah M. Power^{1,2}, Liangbiao Chen², Adelino V.M. Canário^{1,2}

csvsousa@ualg.pt

1 CCMAR - Centro de Ciências do Mar, Universidade do Algarve, 8005-139 Faro, Portugal

2 College of Life Science and Fisheries, Shanghai Ocean University, China

Toll-like receptors (TLRs), pathogen-associated molecular sensors in sentinel cells involved in innate immune response (IIR), are phylogenetically ancient, well preserved in vertebrates and may be subject to strong selective pressure by extreme conditions. Notothenioid fish, over hundred species, evolved recently (25Myrs) from a single ancestor. Despite studies on TLR activity, function and specific properties in temperate fish, information is scarce for Antarctic fish.

Notothenia coriiceps were collected near Great Wall station, King George Island, and maintained at 2°C (n=7/group). Fish were injected with saline or bacterial lipopolysaccharide (LPS). Upon 8 days, head kidney, skin and intestine were collected into RNAlater. Total RNA was extracted for deep sequencing. Transcriptomics, including the sister species *N. rossii*, were used to identify responsive gene networks and understand the reaction to bacterial infection. Comparative in silico analysis was carried out to characterize TLR gene family and assess if and how extreme conditions modulate gene evolution.

We found the presence of 5 of 6 TLR families, as occurs in other fish, with 14 TLRs in *N. coriiceps* and 12 in *N.rossii*. Surprisingly LPS had no effect on TLRs expression. Since LPS is known to stimulate TLR activation in fish, this may constitute a single feature of notothenioids. If this affects the efficacy of IIR is not known. Conversely, analysis of vertebrate genomes indicates TLRs genes evolved independently of temperature in each taxa, suggesting a specificity of functional/regulatory mechanisms rather than differences in gene background of notoheniod TLRs.

Further characterization of the proteins' conformation, stability, affinity and activity in polar, temperate and tropical fish species is underway.

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Seal Occurrence and Habitat Use during Summer in Petermann Fjord, Northwestern Greenland

Kate Lomac-MacNair¹, Martin Jakobsson², Jose Pedro Andrade¹, Eduardo Esteves¹

klomacmacnair@gmail.com

1 Center of Marine Sciences (CCMAR) University of Algarve, Gambelas Campus, 8005-139 Faro, Portugal

2 Department of Geological Sciences, Stockholm University, SE-106 91, Stockholm, Sweden

Ice-associated seals are considered especially susceptible and are potentially the first to modify distribution and habitat use in response to physical changes associated with the changing climate. Petermann Glacier, part of a unique ice-tongue fjord environment in a rarely studied region of northwestern Greenland, lost substantial sections of its ice tongue during major 2010 and 2012 calving events. As a result, changes in seal habitat may have occurred. Seal occurrence and distribution data were collected in Petermann Fjord and adjacent Nares Strait region over 27 days (2 to 28 August) during the multidisciplinary scientific Petermann 2015 Expedition on the icebreaker Oden. During 239.4 hours of dedicated observation effort, a total of 312 individuals were recorded, representing four species: bearded seal (Erignathus barbatus), hooded seal (Crystophora cristata), harp seal (Pagophilus groenlandicus), and ringed seal (Pusa hispida). Ringed seals were recorded significantly more than the other species ($\chi 2 = 347.4$, df = 3, p < 0.001, n = 307). We found significant differences between species in haul-out (resting on ice) behavior ($\chi 2 = 133.1$, df = 3, p < 0.001, n = 307). Bearded seals were more frequently hauled out (73.1% n = 49), whereas ringed seals were almost exclusively in water (93.9%, n = 200). Differences in average depth and ice coverage where species occurred were also significant: harp seals and bearded seals were found in deeper water and areas of greater ice coverage (harp seals: 663 ± 366 m and $65 \pm 14\%$ ice cover; bearded seals: $598 \pm$ 259 m and 50 \pm 21% ice cover), while hooded seals and ringed seals were found in shallower water with lower ice coverage (hooded seals: 490 ± 163 m and $38 \pm 19\%$ ice cover; ringed seals: 496 ± 235 m, and $21 \pm 20\%$ ice cover). Our study provides an initial look at how High Arctic seals use the rapidly changing Petermann Fjord and how physical variables influence their distribution in one of the few remaining ice-tongue fjord.

