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- NF-POGO Alumni Network for Oceans -

NF-POGO Alumni E-Newsletter – Volume 13, December 2017

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NF-POGO Alumni E-Newsletter – Volume 13, December 2017

This issue:

From the Editorial Board

I am greatly honoured to present the 13th issue of the NANO Newsletter. This issue covers a short introduction to the academic background, research interests, expectations and perspectives of the 9th cohort of NF-POGO CofE scholars (2017-2018), at the Alfred Wegener Institute for Polar and Marine Research (AWI), Germany. This issue also introduces the scholars who attended the NF-POGO-NUIG Ocean and Climate Regional Training programme held in Ireland, provides reports on the graduation day of the 8th NF-POGO programme in AWI, and on the Third International Ocean Colour Science Meeting in Portugal. The Newsletter continues with research communications by NF-POGO alumni. The 13th issue of the NANO News is dedicated to the memory of Helen Soares, beloved member of NF-POGO family year 8 (2016-2017), and part of the NANO Network, who suddenly passed away in November, 2017. She will be sorely missed by her NANO friends and colleagues.

I would like to thank the editorial board of the NANO News 13th issue, Annette Wilson, Babette Tchonang, Olga Shatova, Lilian Krug and Sophie Seeyave for their hard work, help, and reviews during the development of this issue. On behalf of the editorial board, I would like to thank all friends and colleagues who helped us with making the present issue of the newsletter by sharing their information and scientific achievements. A special thanks go to Dr. Victoria Cheung, for five years of dedication and hard work as scientific coordinator in the POGO Secretariat, and particularly for her support of the Centre of Excellence and NANO.

We would like to express our sincere gratitude to all members of the NF-POGO Alumni Network for Oceans for their joint contributions and past and current hard efforts in the monitoring and understanding of the World Ocean. Last, but not least, we are deeply grateful to all the supports from NANO friends from all over the world, and to the Nippon Foundation for their continued financial support.

"The sea, the great unifier, is man's only hope. Now, as never before, the old phrase has a literal meaning: we are all in the same boat."

Jacques Yves Cousteau, Oceanographer (1910-1997)

Forough Fendereski

Editor-in-chief

Meet the new Pogonians

Pogonians year 9 (2017 - 2018)

*Alumni profiles available at https://nf-pogo-alumni.org/programs/centre-of-excellence/cofe-1718/

Shahasrakiranna Sambodjo (Indonesia)

Shahasrakiranna is from Indonesia. In 2011, she started her bachelor-master programme in Earth Science (Physical Oceanography) at the Institut Teknologi Bandung (ITB) when she became a candidate for fast-track programme (5 year bachelor-master programme). Her bachelor thesis (2015) entitled "Tsunami Modelling in West Sumatra Based on Accumulated Potential Slip since 1797 and 1833 Earthquakes" and her master thesis (2016) was on "Tsunami Inundation Model in Padang City by Considering Spatially Varied Manning Roughness Coefficient". During her bachelor and master's programme, Shahasrakiranna made tsunami models. During her study in ITB, she also took part, as coordinating assistant, in several courses, such as Tsunami and Extreme Waves, Introduction to Engineering Design, and Ocean Waves Dynamics. After her sophomore year, she joined the Partnerships for Enhanced Engagement in Research (PEER) project for Integrated Local Emergency Operation and Response Policy Improvement and Capacity Building for Advance-Early Warning System In The Face Of Near-Field Tsunami Risk. She was also working as a research assistant during which time she was helping students to collect field survey data and creating tsunami numerical models for hazard measurement. In early 2017, Shahasrakiranna became an intern at the Marine Research Centre, Ministry of Maritime Affairs and Fisheries Republic of Indonesia under the supervision from Dr. Ing. Semeidi Husrin, where she continued her work in tsunami modelling. She is now participating in the NF-POGO Centre of Excellence programme on Helgoland, where she has the opportunity to broaden her international network and widen her knowledge in interdisciplinary ocean science. She hopes to learn more about coastal hazards and disaster management problems during the NF-POGO CofE programme.

Kamal Aldien Alawad (Sudan)

Kamal, a proud representantative of Sudan, holds a BSc in Meteorology from Juba University, Sudan (2009) and a MSc in Physical Oceanography from Geophysical Institute, Bergen University, Norway (2012). Currently, he is doing his PhD in Marine Physics at King Abdulaziz University, Saudi Arabia. His PhD project is about variability of sea level in the Red Sea and Gulf of Aden in relation to the large-scale tropical and polar climate modes using long-term data derived from diverse sources such as the backward forecast, reanalysis, satellite and available observations. His goal is to identify multiscale interactions between the sea level and different modes with dominant signals, and to identify physical mechanisms. During his studies in Saudi Arabia, he was involved in a bimonthly monitoring programme in Sharm Obhur (eastern coast of the Red Sea), where he was mainly monitoring physical parameters. Kamal has been working at the Sudan Meteorological Authority as Weather Forecaster since 2009. Hence, besides Oceanographic studies, he has experience in weather forecasting for public and aviation sectors, and he is familiar with weather map and satellite image interpretation. Kamal aims to pursue his career in Marine Physics. He is confident that his participation in the NF-POGO CofE programme will improve his understanding of all disciplines in oceanography and his plan is to transfer what he is learning during the NF-POGO programme to the next generation of oceanographers in his country.

Felipe de Luca Lopes de Amorim (Brazil)

Felipe has a Bachelor's degree in Oceanography from the Federal University of Santa Catarina (2008-2013). During his bachelor studies, he collected and analysed data to evaluate water masses and hydrodynamics in Arvoredo Marine Reserve, south Brazil. He holds a Master's degree in Ocean Engineering from the Federal University of Rio de Janeiro (2013-2016), where he studied "Near-Inertial Oscillations in the Southwest Atlantic using ADCP current data and simulation results of the HYCOM model". Between 2015 and 2016, during his Master's programme, Felipe worked in a mooring line project, through which he was dealing with suppliers and managing logistics, while he was also participating in field works, collecting data





Left to right: Sharaskarikanna, Kamal, Felipe, Ajin and Marwa

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Pogonians Year 9 (2017-2018)

and launching/recovering mooring lines. In 2017, Felipe started working in the SIMCosta project, where he helped deploy a monitoring buoy in the coast of Santa Catarina State, south Brazil. During the project, he accomplished tasks related to buoy maintenance and downloaded data. He has experience working with long time series of satellite images (chl-a, SST and SSS) and reanalysis data (wind) to observe changes in oceanographic variables in the Brazilian continental shelf. He has also experience in data collection and analysis, programming in MatLAB, FORTRAN, and C++, and has knowledge in numerical models, remote sensing and GIS.

He is expecting that by the end of the NF-POGO programme, he will have improved his knowledge in observational oceanography and data analysis, as well as his scientific writing skills, while he is improving his English and German, and preparing himself for a PhD. Felipe hopes he will develop good relations and friendships, keep in contact with his colleagues, and build a broad network.

Ajin Madhavan (India)

Ajin is from India. He is a PhD student in marine science at the Cochin University of Science and Technology, School of Marine Science, Kerala, India. He completed his Master's in marine biology in 2012. His Master's thesis was on "Characterisation of blooming algae and bloom associated changes in the water quality parameters of traditional Pokkali cum prawn fields along the south west coast of India", published in the journal of Environmental Monitoring and Assessment (EMAS) in 2016. After his Master's programme, Ajin worked as a project fellow in an Indo-European research programme, entitled INDO-MARECLIM, at the Nansen Environmental Research Centre, India, (NERCI) from 2012 to 2014. The objective of the project was to use and extend joint research facilities for scientific cooperation between India, European Union member states and associated countries in the areas of monsoon climate variability, marine ecosystems and coastal management, including the impact on society. He undertook work on secondary and primary data collection, monitoring physico-chemical parameters, primary production and other biological observations, such as monitoring harmful algal blooms. He has actively participated in several regional cruises and learned about different ocean sampling techniques and analyses. Currently, he is doing his PhD in marine science. His PhD research topic is "Intertidal ecosystems and biodiversity along the south west coast of India". His work aims to identify and to understand the dynamics of different intertidal ecosystems and the macro benthic diversity along the southwest coast of India. He has participated and presented his research in different conferences and training programmes, in order to interact with researchers and to increase his attendance in ocean scientific research. His long term career goal is to study possible solutions to address major threats to marine ecosystems. He believes that the NF-POGO training programme will help him to set a good scientific base in oceanography and will give him more focus for his future career in oceanographic research.

Marwa Baloza (Egypt)

Marwa's research interests lie primarily in the area of geomicrobiology. She is particularly interested in cultivating the "uncultivable" microorganisms to better understand their roles in mediating ocean biogeochemical cycles. Marwa graduated from her BSc in Oceanography and Chemistry in 2009 from the Oceanography Department of Alexandria University, Egypt. Her undergraduate project was entitled "Macrofaunal community in Alexandria's Eastern Harbour at the Mediterranean Sea". For her Bachelor's project, she was studying sediment samples using microscopy to identify and enumerate the benthic community from different stations along Alexandria's Eastern Harbour. During her Bachelor's programme, Marwa independently familiarised herself with the subject and became acquainted with biometric measurements of bivalves and data processing.

In 2011, she started her Master's degree in Biological Oceanography at the same department. Her Master's thesis focused

Left to right: Yet, Sarker, Gay, Josselin and Willy

on production and use of novel marine lactic acid bacteria as probiotics for improving growth and immunity response of farmed tilapia in Egypt. The lack of previous records in her area of study required additional effort to carry out a detailed investigation during her Master's project and screening along marine microbial diversity of Mediterranean and Red Sea coasts in Egypt, investigating their potential usage as probiotics. As a graduate researcher in two different research areas, Marwa enhanced her research experience repertoire. The first project was dealing with the sanitary quality of the Alexandria Mediterranean coast using microbial indicators. The second involvement was a Joint Egyptian Japanese Scientific Cooperation. She worked on isolating lactic acid bacteria from the Mediterranean Sea and the Nile River for the production of optically pure lactic acid. She has conducted experiments on the identification and characterisation of selected isolates, which gave her hands-on experience in cultivation.

In 2016, Marwa was awarded a travel fellowship from the Agouron Institute to participate in the course "Ecology and Diversity of Marine Microorganisms" (ECODIM), hosted by the Marine Biological Station of the Department of Oceanography at the University of Concepcion, Chile. She also had a chance to work in a small research project associated with the oxygen minimum zone along the Chilean coast of the South Pacific Ocean. The main objective in that project was to find suitable substrates to cultivate macrobacteria in order to know their role in the sulfur cycle.
In 2017, Marwa got another travel fellowship from the Agouron Institute to travel to Namibia and participate in the 4th African Research Discovery Camp on Microbial and Geochemical Oceanography in Upwelling Ecosystems, organised by the Sam Nujoma Research Centre of the University of Namibia. There, she worked on a project on the enrichment of aerobic and anaerobic nitrifying bacteria from Thiomargarita and Beggiatoa Sheaths. One of Marwa's expectations from the NF-POGO programme is to meet active scientists in the field of geomicrobiology, who will teach her how microbes function and interact in their natural environment and how one can learn more by isolating them using different techniques. More specifically, she expects to learn how to identify microbes and their abilities by cloning and genomic approaches and to measure isotopes in the sediment and in the enrichment medium. In addition, she expects to work in a stimulating and motivated team which she believes will enable her to develop new scientific ideas and, at the same time, make her acquainted with different research cultures. Finally, she expects to immerse herself amongst students with similar intentions and pioneers in the field of geomicrobiology.

Yet Yin Hee (Malaysia)
Yet Yin is a marine biogeochemist with research interests mainly on biogeochemical cycling in fresh, estuarine and marine waters. She did her BSc and MSc in Analytical and Environmental Chemistry at the University Malaysia Terengganu (UMT). Following a short period of working for a pharmaceutical company as a R&D Analyst, Yet Yin returned to UMT to start her PhD in marine biogeochemistry accomplished in February 2017. During the last year of her undergraduate project and during her Master's project, she established the nutrient levels and investigated the annual nutrient cycling and the dynamics of organic nutrients in Malaysian rivers. Her PhD project extended her Bachelor's and Master's work to Malaysia's coastal area of the southern parts of the South China Sea. Her PhD research improved the understanding of the physical and biogeochemical processes controlling primary production in this region. At the NF-POGO CofE, she expects to continue to develop her skills and understanding of marine biogeochemical cycling, to enrich her perspectives on a variety of different oceanographic disciplines, while developing networks and seeking future opportunities and collaborations.

Sarker, Md. Monzer Hossain (Bangladesh)
Sarker holds Bachelor's (2008) and Master's degrees (2010) from the Environmental Science Institute of Forestry and Environmental Science, University of Chittagong in Bangladesh. He also holds an Erasmus Mundus Master's degree on Maritime Spatial Planning (2017) from the University of Veneza (Italy), University of Azores (Portugal) and University of Seville (Spain). After finishing his Bachelor's, Sarker worked as a research assistant (March 2007 to June 2009) at the Institute of Forestry and Environmental Sciences, University of Chittagong, Bangladesh, USDA funded project (BG-ARS-124), under the supervision of Professor Dr. Mohammed Al Amin. During that period, he collected topic-related literature from the internet and assisting scientific papers writing with obtained data and literature. He did his Master's research on "Land cover change detection in the Sundarbans after SIDR using GIS and Remote Sensing" as a part of this project, which was published as a chapter in the project report. Sarker was also a Research Fellow (2008-2009) at the Ministry of Science and Information, Communication & Technology, Government of Bangladesh. He started his full time career as an Environmental Expert in DBL Group in June 2010 and as a Faculty Member in the Department of Environmental Science, Stamford University Bangladesh in August, 2011. He also worked as a Consultant of Integrated Management System for different industries in Bangladesh, along with his academic career. During his academic and professional journey, Sarker developed some articles published in different national and international journals and he has attended several international conferences.

Sarker is interested in GIS, RS, statistics application in modelling studies and indicator database development, land-sea in-

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teractions, coastal dynamics, and ecosystem and hydrological modeling. He is also interested in learning more about modelling approaches including tools and techniques to understand how humans benefit from the coastal and marine ecosystem, how they can be influenced by natural and/or anthropogenic factors, and how this knowledge contributes to better management. Sarker looks forward to learning about ocean dynamics, atmosphere-ocean interactions and how these processes affect climate, pelagic productivity, oceanic uptake of anthropogenic carbon and the carbon budget in general. Moreover, he aims to gain experience and master the different time-series computational and lab-based methodologies, as well as field operations, data analysis and modelling techniques.

Pogonians with Dr Eva-Marie and Dr Annete Wilson, respectively coordinator and assistant coordinator of CofE AWI

Gay Amabelle Go (Philippines)

Gay has a Bachelor's degree in Marine Biology from the Xavier University-Ateneo de Cagayan, Philippines (2002-2006). After her bachelor studies, she worked as a research assistant at the McKeough Marine Center, Xavier University (2006-2010). During this period, she was involved in various projects, such as 'Support System for Sustainable Seaweed Farming in Northern Mindanao, Philippines', which aimed to address the causes of sporadic collapse of cultured seaweed stocks, which many coastal communities rely on as an alternative livelihood. At the same time, she was involved as a researcher in a programme aiming to assess the status of coastal resources in Macajalar Bay, Northern Mindanao Philippines. She also worked as an Information and Education Campaign (IEC) Coordinator in an advocacy programme aiming to spread awareness of marine conservation to the community through the youth. Between 2010 and 2014, Gay worked as research associate in a Japan-Philippines collaborative project funded by JICA-JST. The project aimed to develop a supporting basis for coastal ecosystems conservation and an adaptive management at the Marine Science Institute, University of the Philippines. Gay then did her Master's degree in Marine Science with a major in Marine Biology at the Marine Science Institute, University of the Philippines (2011-2017). For her Master's, she studied the impacts of eutrophication from fish farming on the seagrass community. During her Master's, she was also working as a senior science research specialist at the University of the Philippines (Training Center for Applied Geodesy and Photogrammetry; 2014-2017) on Phil-LiDAR 2 project entitled "Aquatic Resources Extraction from LiDAR Surveys", where she was mapping economically important coastal resources using LiDAR and other remotely sensed data, such as Landsat and Worldview. She hopes to learn more about the changing ocean during the NF-POGO programme, expand her network, and to fortify her future goals as a marine scientist in the field of marine ecology and coastal management with maximising the utilisation of science and technology.

Josselyn Nathaly Contreras Rojas (Chile)

Josselyn comes from Concepción, Chile. She obtained her BSc degree in Geophysics in 2016 and finished her professional habilitation in 2017 at the University of Concepción. To obtain her professional habilitation, she collected and modeled data to characterise the circulation, and then simulate the pollution patterns, of coastal parts of Arauco's Gulf. At the same time, she worked as a junior researcher in the recently established Chilean Integrated Ocean Observatory System (CHIOOS), which aims to develop an oil dispersion model. Because of her love of marine environments, Josselyn's interests lie in modelling projects that help the conservation and sustainability of the coastal ocean. She believes the NF-POGO CofE will help her to become a better modeller by expanding her oceanographic and computational knowledge and help to define her next academic step. She is very happy with the programme, and her new friends, and is excited for the things to come.

Willy Karol Abouga Bodo (Cameroon)

Willy studied fisheries sciences (Oceanography) at the University of Cameroon (2011-2016). In 2016, he received a scholarship from the Institute of Research for Development (IRD), International Chair in Mathematical Physics and Applications of UNESCO, Paul Sabatier University (Toulouse III), to start a Master's programme in Physical Oceanography and Applications in Benin. During his Master's, Willy woked with Dr. Ariane KOCH-LARROY (LEGOS/MERCATOR/France), Prof. Moacyr ARAUJO (UFP/ LEGOS/ Brazil), and Dr. Abdelali El MOUSSAOUI (MERCATOR/France) on "Extension of Oxygen Minimum Zones (OMZs) in the tropical Atlantic using *in situ* data (REVIZEE), climatology (WOA) and, Mercator-ocean simulation". One of the highlights of his Master's work was the detection of the OMZ of the Benguela system reaching the Brazilian coast in the tropical Atlantic ocean in 1998 at 400 metres depths. Now, he wants to verify this result with other data available (e.g., PIRATA and AMANDES) and to identify the mechanisms that explain this extension of the Benguela OMZ to the Brazilian coast. Willy is very excited to be one of the 2017-2018 NF-POGO CofE scholars at the Alfred Wegener Institute. He has found the modules he has already attended at Helgoland very interesting and systematic, and he believes the teachers were very helpful and approachable. Willy is also eager to learn German through courses offered by AWI.

CofE Regional Training 2017: Meet the scholars

NF-POGO-NUIG Ocean & Climate Scholars Programme, Ireland

Alumni profiles available at https://nf-pogo-alumni.org/programs/regional-training-programmes/ireland-2017/

Ahmed Saif Aldein Alsaid Ibrahim (Sudan)

Ahmed holds a PhD (2017) in marine chemistry (dissertation: "Biogeochemistry of Selenium in the Red Sea") from King Abdulaziz University, funded by the Ministry of Higher Education in Saudi Arabia. He graduated with a BSc in Chemistry from Sudan University of Science and Technology (2008; dissertation: "Determination of Dissolved Lead in the Battery Factory Wastewater") and obtained his MSc degree (2012; dissertation: "Seasonal and Interannual Variations of Surface Nutrients and Hydrography in the Norwegian Sea") in Chemical Oceanography from the University of Bergen, in collaboration with the University of Red Sea in Sudan, sponsored by the NOMA programme in Norway. From 2008 to 2014, he worked at the Sudan University of Science and Technology as a teaching assistant and lecturer. Since 2013, he has been working at the Ministry of Environment, Natural Resources and Physical Development at the Higher Council of the Environment, Urban and Rural Promotion as a marine chemist inspector, where he is monitoring and assessing the environmental impacts of natural water resources and wastewater treatment plants. He is interested in studying trace metal biogeochemistry in seawater, nutrient cycles, chlorophyll-a, trace metal speciation, desalination plant wastewater, carbon chemistry, and ocean acidification. He is eager to contribute to developing marine chemistry research in Sudan. He is in complete agreement with NF-POGO's vision to initiate and support a strong network linking marine scientists worldwide.

Chijioke David Eke (Nigeria)

Chijioke is a PhD student at Coventry University, UK. His research is focusing on assessing the spatiotemporal variability of key environmental parameters (e.g., flow, velocity profile, suspended sediment, CTD profile, etc.) for oil spill modelling in the Humber River estuary. Outputs of his research include a hydrodynamic and sediment transport model for characterisation of the process regime of the Humber River estuary. Furthermore, his research will contribute to effective pollution and response in the estuary. The NF-POGO-NUIG Ocean & Climate Scholars Programme II gave Chijioke an opportunity to engage in fieldtrips and practical exposure on key aspects of environmental systems interaction, including atmospheric–oceanic interface with coastal systems, human impacts in coastal channels, governance, and marine pollution management.

Ana Paula Piazza Forgiarini (Brazil)

Ana is a postgraduate student in Geological Oceanography at the Federal University of Rio Grande (FURG) in Brazil. She graduated from her Bachelor's degree in Oceanology from the same university in 2017. During her Bachelor's degree, she was working with physical coastal models to study the impacts of storm surges in an erosional beach system. Her work focused on the erosion associated with coastal structures. For her Master studies, Ana is studying coastal evolution using Shoreface Translation Model (STM). This model simulates morphological changes in coastal zones based on sediment budget and sea level rise data. Her study will project morphological changes in an urbanised coastal area in the years 2030 and 2070. She is also intending to understand the influence of coastal structures, such as seawalls, on the local erosion and flooding and compare them with non-urbanised areas that are naturally protected by well-developed dune fields, with the aim to subsidise future coastal management plans for urban areas along the coast. The NF-POGO experience was an opportunity for Ana to make contact with other scientists who are involved in similar work. On the other hand, sharing personal interests with other participants gave her the chance to learn from different points of view. Learning from people with brilliant careers and great relevance in the scientific community is a boost for Ana to pursue her scientific career.

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Atul Kumar Yadav (India)

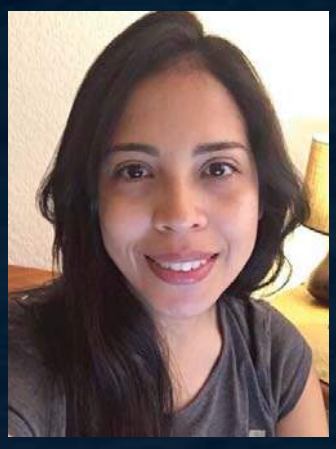
Atul is a PhD student at GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany, within the Emmy Noether-Young Investigators Group AVeSH (A New Threat to the Stratospheric Ozone Layer from Anthropogenic Very Short-lived Halocarbons), since November 2016. For his PhD project, he is analysing the impact of seaweed farming on atmospheric chemistry and climate via Regional Ocean modelling of halocarbon tracer transport. Atul holds a Master's degree in Climate Science and Technology from the Indian Institute of Technology Bhubaneswar (2014). For his master thesis, Atul studied the variability of the Antilles current, in the North Atlantic, forced by in situ and NCEP-NCAR reanalysis winds. For his Bachelor's degree in Information Technology (Gautam Buddha Technical University, India), Atul worked with radio frequency identification (RFID) tags. He was one of the NF-POGO CofE at AWI, Germany - year 2 (2014-2015) scholars, where he learned new ways to observe the oceans from biological, chemical, physical perspectives, as well as from space. Atul attended NF-POGO-NUIG Ocean & Climate Scholars Programme II, where he learned about tools and techniques for modelling, measuring and observing changes in the ocean, anthropogenic impacts on ocean ecosystems, ocean governance, climate policy, economic value and marine management. For his future career, Atul wants to join a research institute in his country, as well as in participate on global projects and collaborations with scientists from different countries. Apart from this, he likes to do community work and sports. He also intends to help underprivileged children by providing them with basic education, so that they can get better opportunities in their futures.

Daniela Belén Risaro (Argentina)

Daniela is doing her PhD in physical oceanography at the University of Buenos Aires. Her doctoral thesis is focusing on understanding physical forcing that may be related to changes in SST within the last 35 years. She believes that we are in a changing world, where a changing climate is key to understanding how the ocean reacts to modifications in the climate systems. She finished her Master's studies in physical oceanography in 2015 on ''Long-term trends of the sea surface temperature on the Patagonian Shelf of the Argentinean Sea''. Daniela has been working as a teaching assistant at the University of Buenos Aires since 2014. She teaches Dynamics of the ocean, Theoretical oceanography, Ocean circulation, and other different courses. She has had opportunities to work on CTD measurements on board an Argentinean and German vessels. The climate change course in Ireland was an amazing opportunity for Daniela to learn different aspects of climate change and how to manage and study it. Daniela is looking forward to applying all that she learnt during the programme in her country.

Seema Rani (Bangladesh)

Seema is doing her PhD in Marine Affairs at the Coastal and Ocean Management Institute, Xiamen University, China. Her PhD is funded by the Chinese Marine Government. Her PhD research deals with the Ecological and Environmental Risk Assessment of the northern Bay of Bengal. She holds a Master's in Oceanography from the University of Dhaka and is working as a research associate at the International Centre for Ocean Governance under the faculty of Earth and Environmental Sciences, University of Dhaka, Bangladesh. Seema is also involved in different environmental research projects. Currently, she is working on biogeochemical interactions in the Bay of Bengal. She is very interested in studying carbon and nutrient cycling in the face of climate change in the northern Bay of Bengal. She is working on nutrient and pollution influx from the Ganges, Meghna and Bhrahmaputra River system into the coastal ocean. Attending the NF-POGO-NUIG Ocean and Climate Scholars Programme 2017 was a great experience in Seema's personal life and a useful practical experience for her further research. In the near future, Seema intends to build up her career as an oceanographer.



Maryory Sarria-Dulcey (Colombia)

Maryory is a PhD student at the University of Bristol, working as part of the British Antarctic Survey since October 2016. Her PhD project, funded by the University of Bristol and Colciencias-Colombia, is entitled “The effect of climate change on Southern Ocean benthic calcifiers”. Before she started her PhD, Maryory was an assistant professor in Medellin, Colombia between November 2014 and June 2016. During this period, she taught General Biology, General History, History Didactics, and Science Didactics. During her Master’s degree (2013-2014; Universidad de Salamanca, Spain), she worked on Micropaleontology subjects. Maryory has Bachelor’s degrees in History (2002-2008) and Biology (2004-2010), both from Universidad del Valle, Colombia. Her undergraduate studies in History focused on World History, Ancient History, Medieval History, Contemporary History, and Colombian History. Her second undergraduate degree in Biology was focusing on Zoology, Conservation, Ornithology, Microbiology, and Genetics. During her undergraduate studies, she won several scholarships for best performance in her studies. Maryory has five years of teaching experience at middle school and high school, where she taught History, Biology, Chemistry, and Political Sciences. She loves teaching and she hopes to continue teaching in the future. Maryory believes that education is one of the principal foci of society and we need to invest more in this part, especially in developing countries, where having access to a proper education is difficult due to money issues or poor opportunities. Maryory loves swimming, playing piano, reading, and travelling.

Maryory was happy to be a part of the Ocean and Climate training in Galway and to become a part of the NF-POGO alumni network. The programme gave her the opportunity to have a big picture about what is happening in the ocean and the different sectors that are involved. Maryory hopes to have more collaboration in future with the NANO alumni!

Schery Umanzor (Costa Rica)

Schery is a PhD student in marine ecology. She works with seaweeds, and currently she is measuring their bioengineering outcomes at different scales. She is also working on seaweed aquaculture from an ecological perspective. Schery recently received a grant from the Rufford Foundation to start a small-scale kelp reforestation project in Baja California, Mexico. She hopes that this initiative can eventually help to restore or create underwater forests, as many people depend on the goods and services that kelp forests provide. Participating in the NF-POGO Regional CofE 2017 programme has broadened her understanding of the implications due to the climate. She feels more engaged and truly convinced that the only way in which coastal communities from developing countries can deal with the present and future environmental conditions is to develop and apply mitigation/adaptation efforts at a local level.

Yohanes Risky Shellen Ginting (Indonesia)

Yohanes has been conducting his Master’s programme in Applied Climatology at Bogor Agricultural University since 2015. For his Master’s project, he studies sedimentation and soil carbon accumulation rates in mangrove forests and their response to sea level rise on the east coast of North Sumatra, Indonesia. He applied a constant rate of supply (CRS) model to assess sedimentation and soil C-acc rates due to the activity of lead isotope (210Pb). He analysed sediment cores in Laboratory of Isotope and Radiation at National Nuclear Energy Agency of Indonesia from February to May 2017. His Master’s project is a part of the Sustainable Wetlands Adaptation and Mitigation Programme at the Center for International Forestry Research (CIFOR), where he also works as a research intern. Yohanes’s undergraduate work (BSc (Hons) in Forestry, University of Sumatera Utara, Indonesia) focused on the analysis of mangrove forests degradation based on vegetation index using Landsat 7 and 8 data. The 2017 NF-POGO-NUIG Ocean and Climate Scholars Programme, held in Galway, Ireland, gave Yohanes a better and deeper perspective on climate, such as climate systems, current climate issue and policy. He believes these topics will be helpful for his Master’s thesis and its outcoming publication.

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Third International Ocean Colour Science Meeting

Lilian Krug

PhD student, Centre for Marine and Environmental Research, University of Algarve, Portugal

Alumnus profile: https://nf-pogo-alumni.org/profile/Lica+Krug/

International Ocean Colour Science Meeting 2017

Advancing Global Ocean Colour Observations

The third International Ocean Colour Science (IOCS) meeting took place in Lisbon, Portugal, between the 15th and the 18th May, 2017. Organised by the International Ocean Colour Coordinating Group (IOCCG), the meeting was an opportunity for ocean colour scientists to discuss their research with peers as well as to communicate views, ideas, concerns and issues with satellite agencies.

The IOCS programme included lectures, talks, breakout workshops, community discussions, poster sessions and town halls by space agencies. A total of 344 participants from 41 countries participated in the four-day meeting vividly collaborating with the theme of the meeting which was "Exploring New Capabilities for Global Ocean Colour Observations".

Throughout the meeting, break-out sessions and invited keynote speakers gave presentations on various subjects regarding the importance of continued time series observations for gaining insights in climate variability and change and the latest advancements in the field, including developments of new products, use of satellite LIDAR, hyperspectral and high resolution optical sensors, and challenges of phytoplankton in situ measurements and ocean colour of coastal and land waters.

Among NANO Friends present in the meeting was Dr. Venetia Stuart, IOCCG Scientific Coordinator and organiser of the event. Dr. Stuart is an enthusiastic friend of NANO since its very beginning, as she also attended the meeting that initiated the development of the network in 2010. Several alumni members also attended the IOCS 2017, and presented their work in the poster sessions. Dr. Ana Dogliotti, a Latin American NANO member was one of the invited keynote speakers. Dr. Dogliotti, from the University of Buenos Aires, Argentina, spoke on the research and applications of ocean colour radiometry in the very turbid waters of the Río de la Plata river. Concluding her talk, Dr. Dogliotti highlighted the importance of the capacity building effort from the ocean colour community. As a young student, she had received support to attend international training courses (including the NF-POGO Visiting Professorship in Brazil, 2006) which provided her with an opportunity to learn from leaders in this research field, as well as acquiring hands-on experience and fostering regional and international connections with other participants. Ana Dogliotti also mentioned the positive impact of NANO in promoting joint research in Latin America together with the Antares Network.

All lectures, presentations and poster abstracts presented during the meeting are available at the IOCS website at: http://iocs.ioccg.org/programme/conference-materials/.

Alumnus Sanjiba Baliarsingh Olive activities during his doctoral research period included rescue of sea turtles at the east coast of India. Here: Glimpses of "arribada", egg laying, entanglement of hatchlings in plastic and creeping vegetation, rescue of the hatchlings and making their way to sea. Read more on page 26.

Graduation report

by Forough Fendereski

The NF-POGO Centre of Excellence (CofE) in Observational Oceanography has been hosted by the Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, in Germany, since 2013. The programme covers different disciplines in oceanography, such as Food webs, Fisheries, Marine Biology, Physical and Chemical oceanography, Remote Sensing, Time-series and Statistics, and includes theoretical courses as well as field and lab experiments. Each year, ten scholars from ten different countries attend the programme. At the 2016-2017 CofE, participants were Ahmed Abdalazeez (Sudan), Forough Fendereski (Iran), Sonia K. M. Gueroun (Tunisia), Onur Karakus (Turkey), Jaya Kelvin (Indonesia), Md Masud-Ul-Alam (Bangladesh), Helen Aparecida Soares De Souza (Brazil), Babette Christelle Tchonang (Cameroon), Sudheesh Valliyodan (India) and Zerihun Senbeto Woldeyohannes (Ethiopia). The 8th year of the NF-POGO CofE training (4th year in Germany) finished on 24th July with the ten scholars presenting their individual research projects for their supervisors from different institutes in Germany and more than fifty scientists and students of AWI in Helgoland. Dr. Victoria Cheung (POGO Scientific Coordinator), Prof. Dr. Karin Lochte (Director of AWI, Bremerhaven), and Prof. Gotthilf Hempel (Co-Founder and first Director of AWI, Bremerhaven) and his wife were among the audience. The graduation presentations started at 14:00 in the afternoon in two sections. The first section started with the presentation from Ahmed on “Stable or unstable: simulated millennial-scale climate variability during Marine stage Isotope 3”. After Ahmed, Babette (“Seasonal inflow of Warm Deep Water (WDW) in the continental shelf in the Filchner Rhone ice shelf”), Forough (“Drivers of spatial and temporal variability of phytoplankton phenology in the Caspian Sea”), Helen (“Irradiance-carbon dioxide relationship on the growth rate of *Geminigera cryophila* (Cryptophyta), a phytoplankton species from the Southern Ocean”), and Kelvin (“Sea levels along Indonesian coasts: TRENDS & extreme values”) presented their work. After a coffee break, Masud gave his presentation on “Important drivers for the massive bloom of *Mediopyxis helysia* Kühn at Helgoland Roads”, followed by Onur (“Testing the role of grazing on primary production and carbon export with global biogeochemical model RecoM-2”), Sonia (“Seasonal effect of the invasive ctenophore Mnemiopsis leidyi on the structure and function of the Sylt-Rømø Bight ecosystem, Northern Wadden Sea”), Sudheesh (“Elemental homeostasis: Selective retention and excretion of element in a metazoan grazer *Acartia tonsa* (Calanoida, Copepoda) in response to food quality and temperature”), and Zerihun (“Bacterial growth assessment to copepod *Acartia tonsa* grazing on *Rhodomonas salina*: implications for DOM nutrient cycling”). After the presentations, scholars took a group photo with the audience.

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In the evening of the graduation day, AWI held a ceremony with the NF-POGO scholars, scientists from AWI of Helgoland, and guests who had come to the island for the graduation. During the party, Babette sang a beautiful song of goodbye, while photos of the “POGOs” during their 10 month of staying together in the programme were displayed. Farewell talks by Prof. Karen Wiltshire (Vice-Director of the AWI of Sylt and Helgoland), Dr. Victoria Cheung (Scientific Coordinator of POGO), who also talk on behalf of Mr. Kentaro Ogiue San (Chief Manager of the Maritime Affairs Department of the Nippon Foundation), and Prof. Hempel were followed by the delivery of the graduation certificates.

Scenes of the NF-POGO CofE (Year 8 - 2016-2017) Graduation day. Image credits: Uwe Nettleman, AWI

Origin and characteristics of deep sea turbidites from the abyssal basin of the Eastern Equatorial Atlantic

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Introduction

The origin and characteristics of turbidites in the Eastern Equatorial Atlantic (EEA) is poorly known, although the proposed mechanisms of their source and sink into deeper waters have been reported in many regions. The sedimentary record from a 170 cm long sediment core (DY26III-Nig-S71-GC8), collected within the EEA offshore of Nigeria revealed material deposited by gravity-driven processes. Turbidity currents are one of the most important mechanisms responsible for the rapid transportation of terrigenous sediments from continental margins to the deep sea. With reference to the classical sequence stratigraphy models, turbidity deposition occurs predominantly during sea level low stands and rapid transgressions but, with reduced activity, can also occur during sea level high stands. Moreover, further research has proven that turbidity deposition does occur during transgressions and high stands. Although many studies have already been performed on turbidites in different parts of the world ocean, the origin and characteristics of turbidites in the EEA are poorly understood. In this study, we present geochemical and sedimentological records of the DY26III-Nig-S71-GC8 core (Fig. 1) to study the deposition of sediments and provide deeper insights into provenance, sedimentary environment and climatic conditions with emphasis on turbidity deposition discovered in our location.

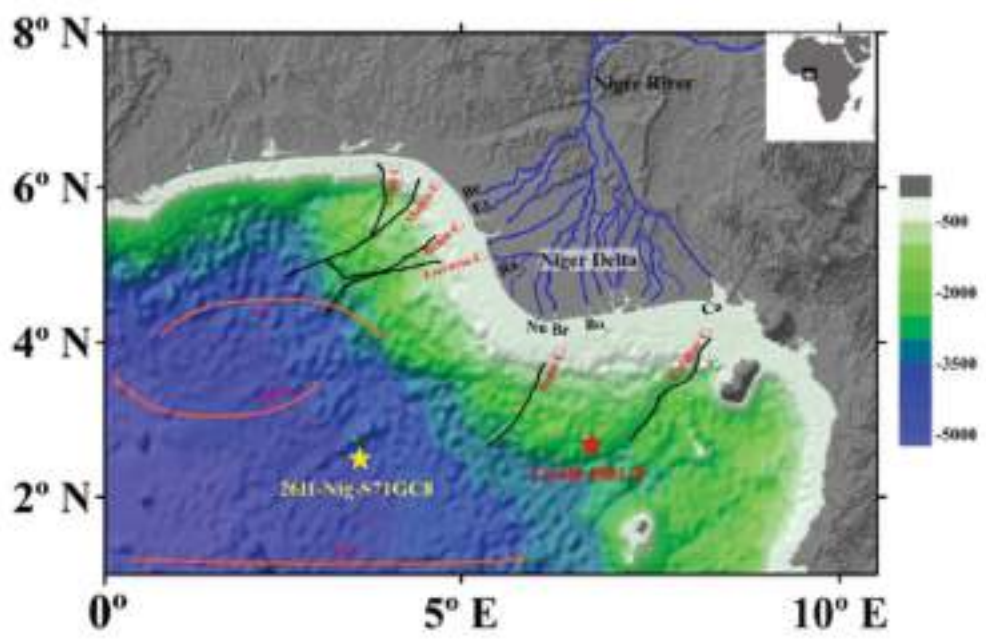

Figure 1 - Map of Gulf of Guinea and regional tropical Equatorial Atlantic showing the bathymetric contour, distribution of submarine canyons on the Nigerian continental margin, Niger Delta and its estuaries adapted from Allen, 1964; Deptuck et al., 2007; Olabode and Adekoya, 2008. The study area is indicated by the yellow star and the red star is the reference point used in the study (adapted from Adegbie, 2001)

Materials and methods

DY26III-Nig-S71-GC8 is a 170 cm long sediment core collected from the abyssal basin of the EEA (3°47.959'E, 2°23.031'N; water depth 4066 m; Fig. 1) during the DY26III cruise onboard RV Da Yang Yi Hao in August 2012. The core was laterally divided into two: the first half was sampled in the spacing of 1 cm for oxygen and carbon isotope analysis, age dating and grain size, while the other half was used for non-destructive XRF elemental analysis using ITRAX micro-XRF core scanner. A total of 156 subsamples were taken for micro-paleontological work. The samples were dried in the oven at 40°C, weighed, washed and sieved through a mesh of 63µm and dried again at 40°C. Fourteen specimens of planktonic foraminifera *Globigerinoides sacculifer* with their size range from 300-360µm were picked under microscope SMZ 1500 for $\delta^{18}O$ isotope measurement. Species of G. *sacculifer* and G. *ruber* of planktonic foraminifera with sizes >250µm of ca. 1000 specimens were handpicked for ^{14}C dating using ^{14}C Accelerator Mass Spectrometry (AMS).

The $\delta^{18}O$ analysis of G. *sacculifer* was performed on a Finnigan-MAT-252 mass spectrometer at the State Key Laboratory of Marine Geology, Tongji University, China. Mean external precision was 0.08‰ for $\delta^{18}O$ values. AMS measurements were performed using Beta Analytic Inc, Miami, U.S.A. Analytical procedures (Nadeau et al., 1997). The ^{14}C ages were corrected for reservoir effect of 400 years (Lewis et al., 2008) and converted to calendar years using CALIB 7.0.4 calibration software (Stuiver and Reimer, 2017) with the marine calibration based on MARINE 13 dataset. The ages are reported here as years before present, abbreviated as yr BP, and "present" = AD 1950. The elemental composition of the core was obtained using ITRAX micro-XRF core scanner at the Second Institute of Oceanography, State Oceanic Administration (SIOSOA), Hangzhou, China. This device allows non-destructive extraction of near-continuous records of variations in element concentrations from sediment cores with minimum analytical effort. Measurements were performed at 2 mm resolution in a counting time of 20 sec and acceleration intensities of 10 kV, 30 kV and 50 kV. Elemental profiles, such as Ca, Fe, K, Rb, and Sr, as well as optical image were acquired. The precision of the measurement is based on correction for variety of physical and operational factors that may affect count rates, including changes in grain size, water content and other sample heterogeneities. A detailed description of the ITRAX instrument is provided by Croudace et al. (2006).

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Grain size of carbonate material-free terrigenous particles in the range of 0.04-2000 µm was analysed using a Malvern auto-sampler 2000 apparatus at SIOSOA, Hangzhou, China. Prior to the analysis, siliciclastic sediment fraction was isolated by dissolving carbonate and organic matter using ca. 0.5 ml HCl on the bulk sediment samples. Samples were then dispersed by soaking for 24 hr in 200 ml distilled water, to which 50 ml of 10% sodium hexametaphosphate (calgon) was added. To sort sediment sub-populations that represent different sources or dispersal processes, grain-size distribution of each sample (N = 86) was analysed on the siliciclastic sediment. The grain size result was modelled using end-member modelling algorithm. The model generates Grain Size Distributions (GSDs) from which end-members (EMs) are required for a satisfactory approximation of the data. GSDs of the same properties fall under the same EM. The measured grain-size distributions of the core DY26III-Nig-S71-GC8 can be expressed as relative proportion of the constant-sum of the EMs:

EM1+EM2+EM3+n…=1 Equation 1

The methodology resolves the number of granulometric end-members (sub-populations) mixed within the sediments and assesses the GSD of each sub-population. It also quantifies the proportion of each EM through time. Individual quartz grain samples (N=208) from different depths within the sand layer of the core were selected for micro texture analysis. A total of 50 grains were selected randomly from top to bottom of the core at depths 101.5 cm, 103.5 cm, 105.5 cm and 58 grains were gathered from the depth of 111.5 cm. Their micro textures were analysed using Leica M205C stereo microscope in the laboratory at the SIOSOA, Hangzhou, China. Quartz grain surface micro-texture classification methods are based on studies of Helland and Holmes (1997) and Strand et al (2003).

Results and conclusion

The sedimentary record from a 170cm long sediment core DY26III-Nig-S71-GC8, collected from offshore Nigeria revealed that material is deposited by gravity-driven process. Medium-bedded, medium-grained terrigenous sands were found at depths up to 90 cm in the core, suggesting the possibility of turbidites deposit. Constraining provenance characteristics of these terrigenous sands, the XRF-scanning element data, grain size distribution, end-member modelling, and the surface features on quartz grains bracketing the interval of interest were analysed under stereo microscope. The end-member classification based on modal grain size and further evidences such as higher sphericity on quartz grains (Fig. 2), fining upward sequence of laminated sands overlain by laminated silts, and homogenous mud (Fig. 3) are suggestive of turbidites deposit. A proximal shelf source was inferred for the turbidites with age ranging from 33-43ka (Fig. 4). This timing was determined by stable oxygen isotope and accelerator mass spectrometry radiocarbon dated using foraminifera assemblages (Fig. 5). Turbidites originate at the Nigerian continental margin, whose source material is located at the shelf edge near heads of canyons along the margin. The material was probably remobilised during rapid transgression from significant earthquakes that occurred in West Africa in the late Pleistocene. These events triggered sea-level rise during MIS 3, which led to the material transported downslope through the canyons.

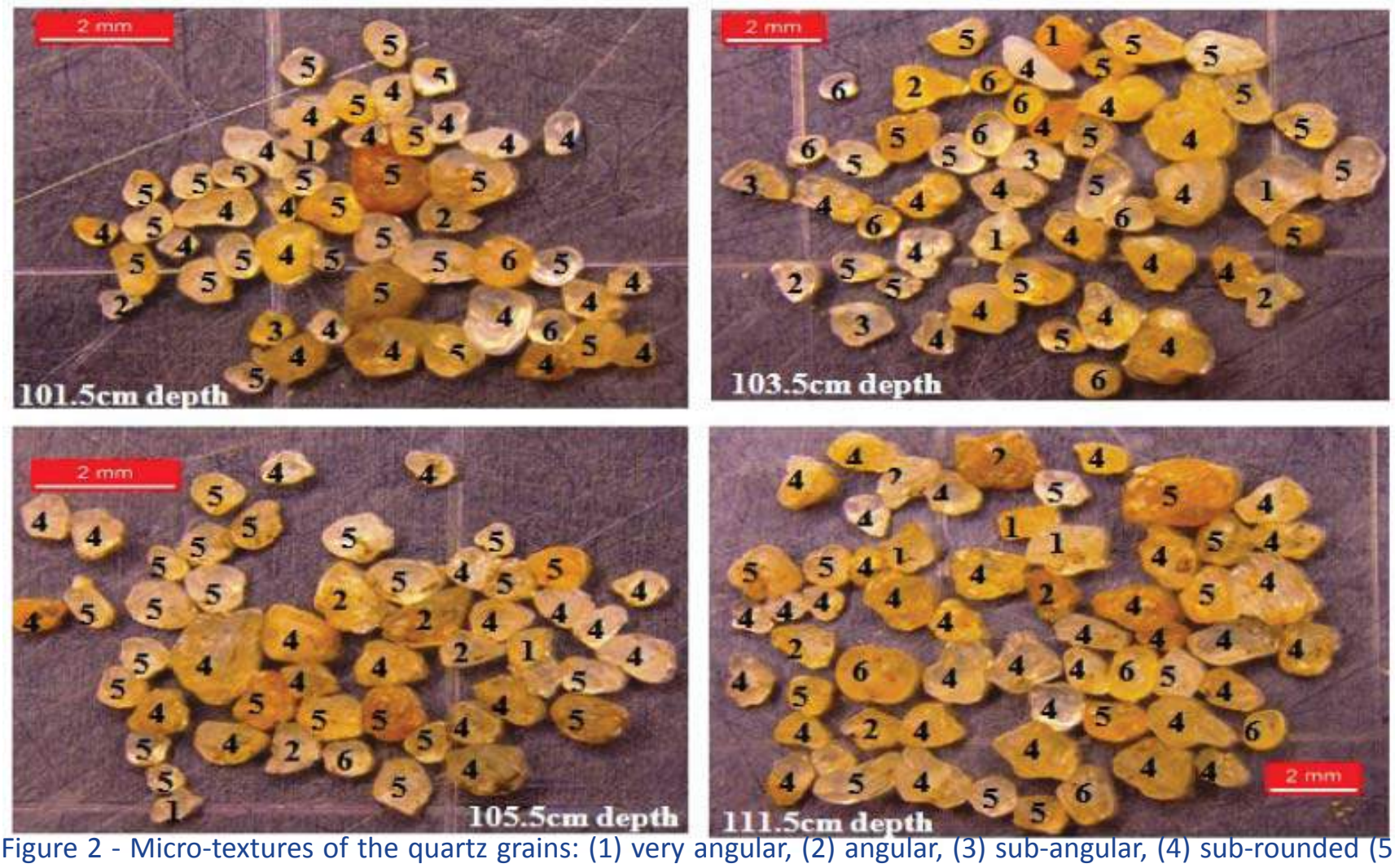

Figure 2 - Micro-textures of the quartz grains: (1) very angular, (2) angular, (3) sub-angular, (4) sub-rounded (5) rounded and (6) well rounded.

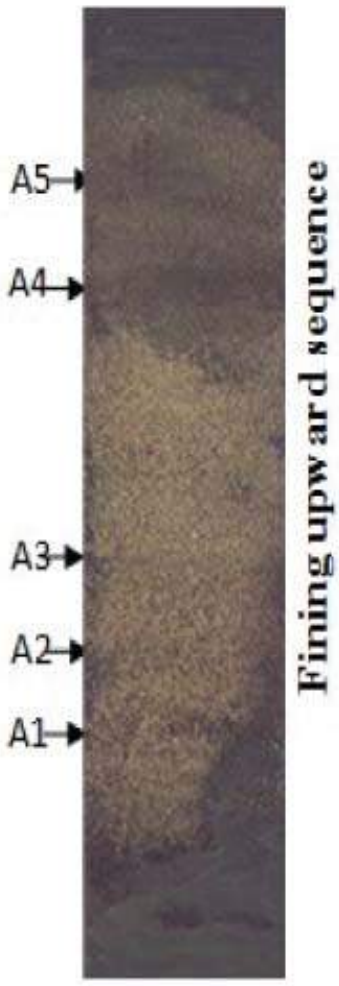

Figure 3 - The sand layer within 26111-Nig-S71-GC8 core. A1-A5 represents the clay intercalations.

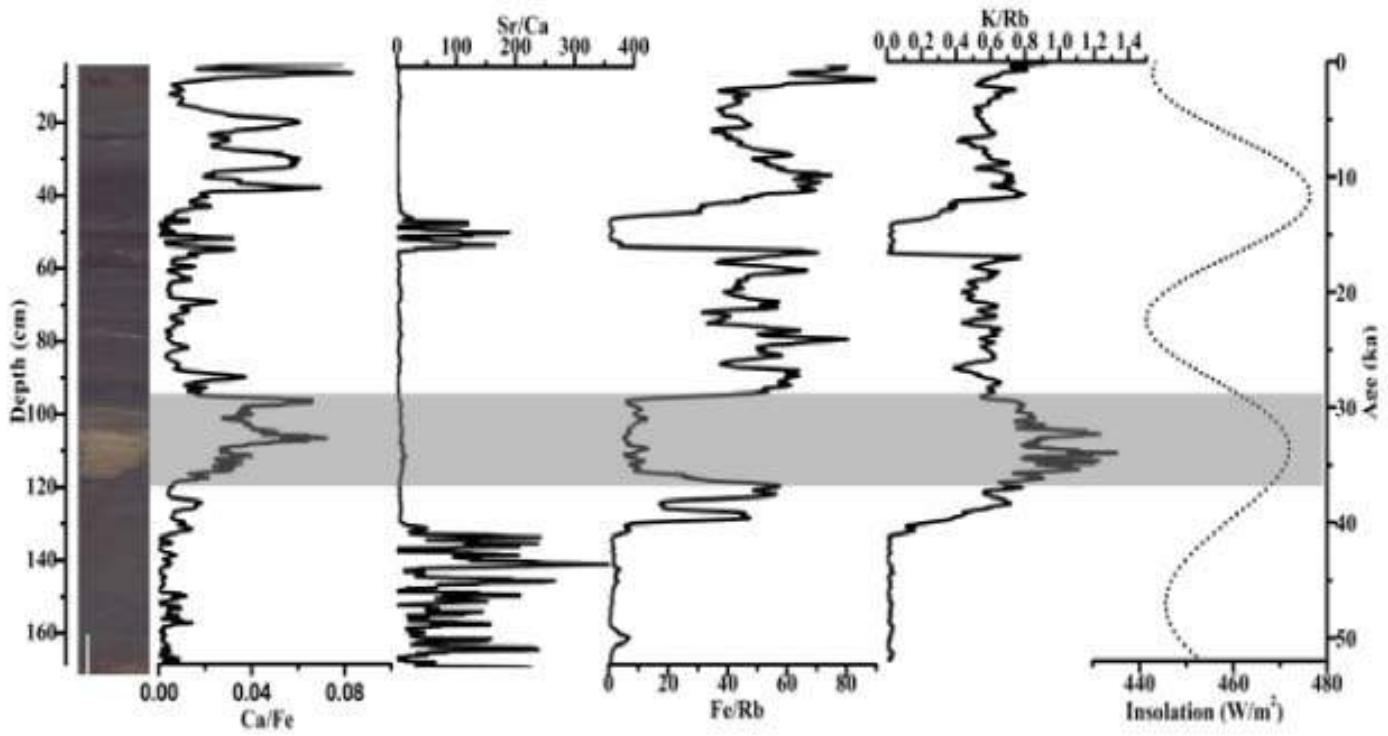

Figure 4 - The core and the elemental input ratio parameters for 26111-Nig-S71-GC8 core. Note: The grey bar represents the sand layer zone.

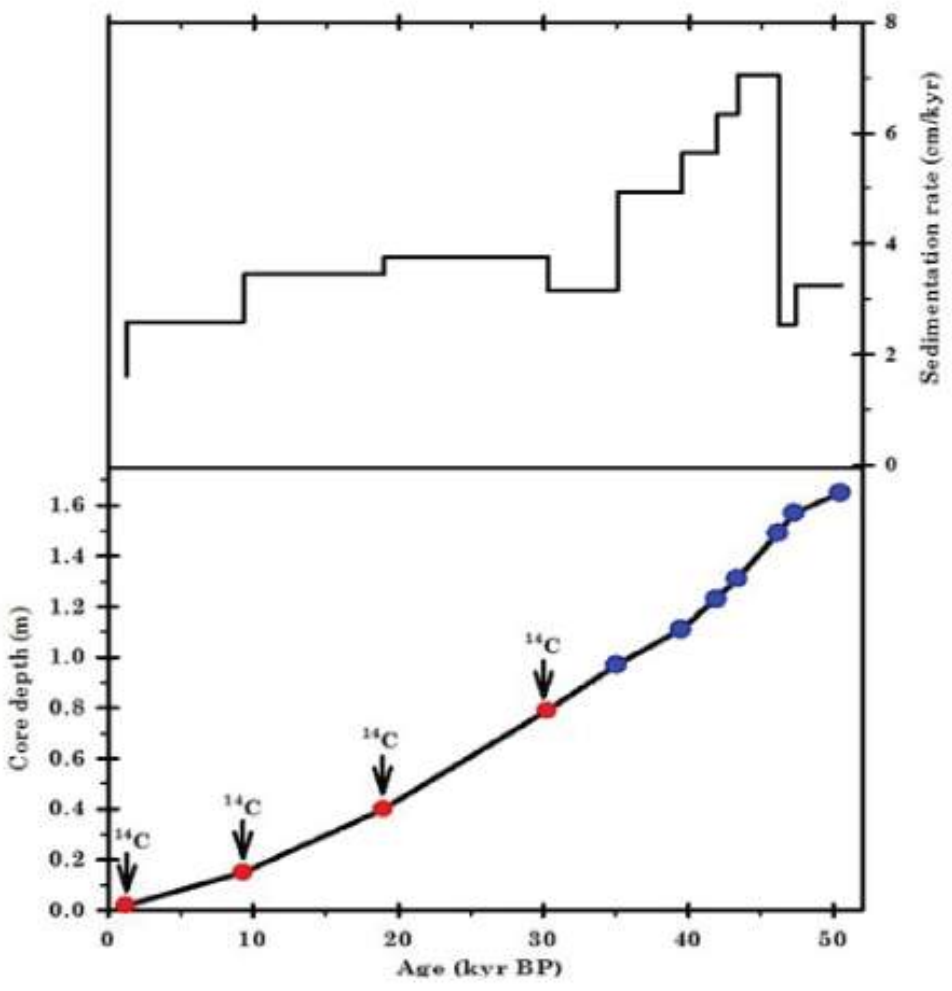

Figure 5 - Sedimentation rates and age depth relation of the sediment core DY26III-Nig-S71-GC8. Age-depth model linear interpolation plot was based on ^{14}C calendar ages (red dot points) and visual matching with GeoB4901-8 *G. sacculifer* $\delta^{18}O$ data (blue dot points) between the stratigraphy age points. Radiocarbon ages were calibrated using the CALIB 4.3 software (Stuiver and Reimer, 2017) ages were corrected for reservoir effect of 400yr (Lewis et al., 2008).

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Seasonal inflow of Warm Deep Water (WDW) in the continental shelf in the Filchner Ronne ice shelf

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Abstract

The Antarctic Slope Front (ASF) is important for limiting the Warm Deep Water (WDW) getting onto the continental shelf. The objective of this project is to study the seasonal inflow of the WDW into the continental shelf in the Filchner Rhone ice shelf and potential role of eddies on this inflow. Three years (1989, 2009, and 2010) of daily output of Finite Element Sea-ice Ocean Model (FESOM) were used for this study. Five sections were defined: two on the coastal part and three far away from the coast, on which we examined the temperature, salinity, horizontal velocity, buoyancy frequency, vertical shear and Richardson number. The analyses based on the sections of temperature and salinity showed that during the westward progression along the continental shelf, more WDW is getting into the continental shelf. However, there is more WDW on the shelf in summer than in winter. The resolution of the model was not sufficient to track eddies. Nevertheless, our hypothesis was that the intense eddy activity across the ASF plays a potential role in the seasonal inflow of warm water onto the continental shelf, which is stronger in summer compared to winter. We then looked at the background field by calculating the buoyancy frequency, vertical shear and Richardson number. The analyses showed that the change from surface intensified shear in the narrow continental shelf to bottom intensified shear in the wide continental shelf is consistent with the dense outflow of WDW over the wide shelf region as opposed to the narrow shelf region.

1. Introduction

The Filchner-Ronne Ice Shelf (FRIS) is the second largest ice shelf after Ross Ice Shelf in Antarctica and is the dominant glacial feature in the Weddell area (Nicholls et al., 2009). FRIS floats over the southern Weddell sea continental shelf and plays a major role in converting a sizable fraction of shelf water into a form that is able to flow into the deep sea (Foldvik et al., 2004; Nicholls et al., 2009). In the southern Weddell Sea, where the large FRIS is located, the water both on the wide continental shelf (separating the ice-shelf cavity from the deep ocean) and inside the ice shelf cavity, is cold with temperatures being close to the freezing point (-1.9°C) (Nicholls et al., 2009; Orsi and Wiederwohl, 2009). The basalt melt rates observed in those regions are relatively low (~0.13m/yr) (Rignot et al., 2013). The Warm Deep Water (WDW) is originated from Circumpolar Deep Water (CDW) which enters the Weddell Sea (WS) in the east and is carried westward in the southern part of the Weddell Gyre (WG). WDW is the key water mass of the Antarctic Circumpolar Current (ACC) (Darelius et al., 2016; Ryan et al., 2016). Beside solar radiation, WDW is the only source of heat for the WG (Ryan et al., 2016). The WDW is found from 300m depth in the interior of the Weddell basin, below a cooled layer (Darelius et al., 2016). Its temperature is between 0 – 1.5 °C. The WDW is separated from the shelf water (cool and fresh) by a front over the continental break usually called Antarctic Slope Front (ASF). This front manifests through downward sloping isopycnals towards the continent along the narrow continental shelf break in eastern Weddell Sea with a V-shaped structure over the continental slope of the Southern Weddell Sea (Fahrbach et al., 1992). Along the ASF pycnocline, mixing creates slightly cooler and fresher water mass located just above the WDW and known as Modified Warm Deep Water (MWDW). The ASF is characterized by the southward depression of the WDW, isopycnals and thermocline toward the continental slope (Jacobs, 1991). This southward depression indicates a convergence of Ekman transport and downwelling along the coast, driven by easterly winds along the Antarctic continent (Paolo et al., 2015). Weaker summer winds cause both shoaling of the thermocline and a seasonal inflow of WDW along the eastern flank of the Filchner Depression (FD) (Darelius et al., 2016).

Figure 1 shows that in the eastern part of the WS, the continental shelf is very narrow, and the slope current meets the coastal current (dotted yellow arrow). During its westward propagation this current bifurcates into a coastal current

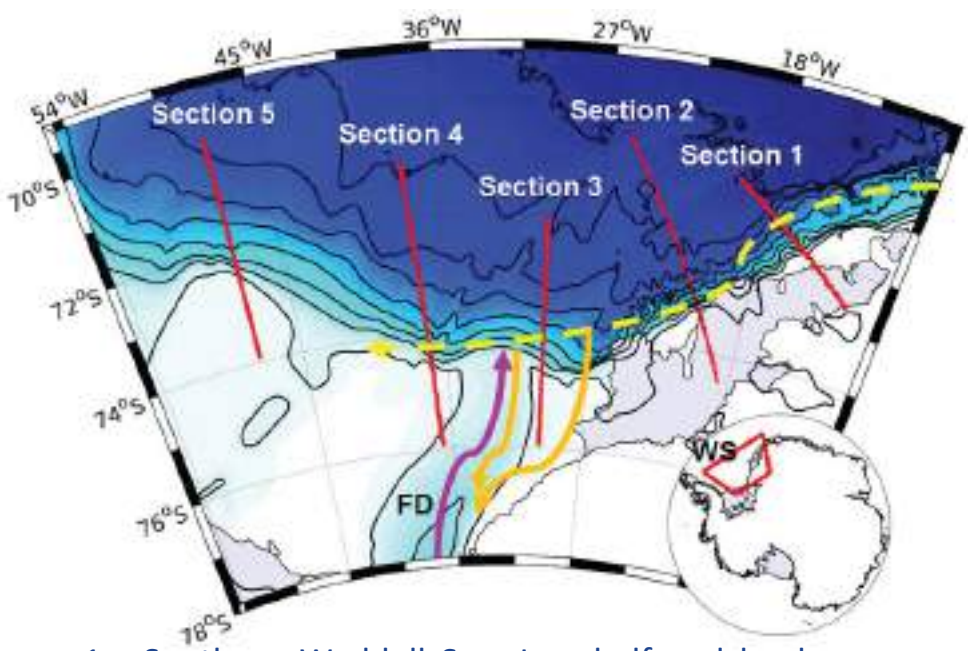

Figure 1 - Southern Weddell Sea. Ice shelf and land areas are shaded in light grey and white, respectively. Red arrows show the location of five sections (see the text for description). The dotted yellow line indicates the slope current. Dark yellow arrows represent coastal current and the inflow through the Filchner Depression (FD) and the violet arrow represents the outflow of Ice Shelf Water (ISW) through the FD. The inset located at the bottom right shows the Antarctic continent, with the Weddell Sea (WS) depicted within the red contour. Bathymetric contours are shown every 500m.

(dark yellow) and slope current (dotted yellow) at 27°W, where the continental shelf starts to widen. Below the bifurcation, the ISW flows out of the FD to the sill (violet arrow). In this study, we hypothesize that the intense eddy activity across the ASF plays a potential role in the seasonal inflow of warm water onto the continental shelf, which is stronger in summer compared to winter. To justify our hypothesis, we investigate three years (1989, 2009, and 2010) of daily output of Finite Element Sea-ice Ocean Model (FESOM), where we look at five sections (two in the narrow continental shelf and three in the wide continental shelf; red arrows in Fig. 1).

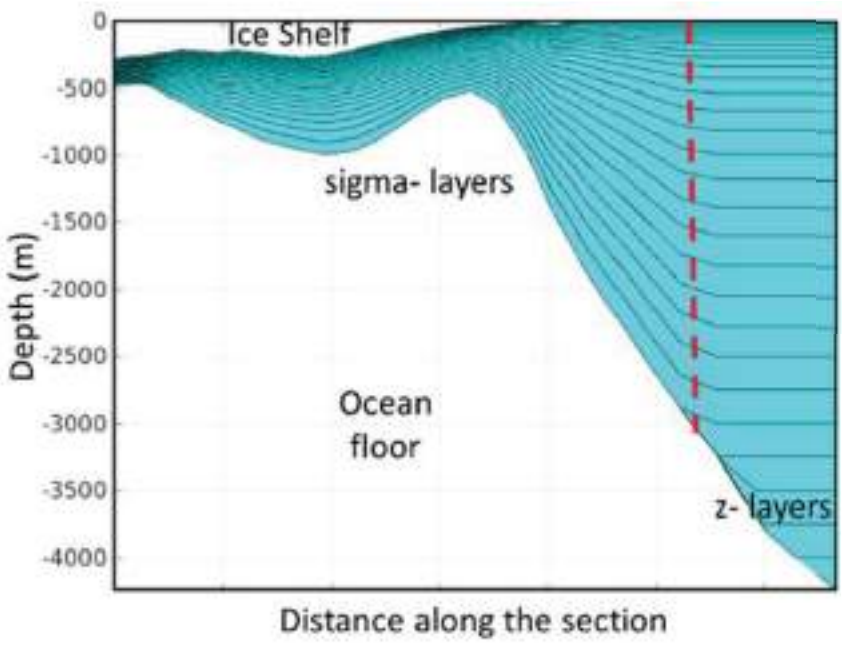

Figure 2 - Distribution of the vertical layer around the Antarctica. The sigma layers under the ice shelf follow the bathymetry and extend up to almost 3000m depth. Z coordinate represents fixed layers. The red dotted vertical line indicates the transition between sigma and fixed Z (constant) layers (VanCaspel, 2016).

2. Data and methods

2.1 Description of the model

The model used in this study is the Finite Element Sea-ice Ocean Model (FESOM), developed at Alfred Wegener Institute (AWI) (Timmermann et al., 2009), as an improvement of the Finite Element Ocean Model (FEOM; Danilov et al., 2004). It was built from the Finite Element model of the North Atlantic (FENA) described by Danilov et al (2005). FESOM solves the hydrostatic primitive equation based on an unstructured grid that consists in triangles at the surface of ocean and tetrahedrals in the interior of the ocean (Timmermann and Hellmer, 2013). The model uses hybrid grid in the vertical with 22 sigma layers (terrain following) going from the continental shelf to 2500m depth (those sigma layers are used only around Antarctica) and 36 fixed layers (z coordinate) in the rest of the domain (Fig. 2).

FESOM is a fully coupled combination of oceanic to finite element model that includes ice shelf cavities and a dynamic-thermodynamic component of sea ice and has been proven as an important tool to study the Southern Ocean (Timmermann and Hellmer, 2013; VanCaspel, 2016). The model describes the ice-shelf-ocean interaction, which impose a fixed sub ice shelf cavity geometry and thermodynamic coupling through the three system of equation proposed by Hellmer and Olbersn (1989) to compute the temperature and salinity. FESOM is configured for a global domain with focus on the southern and western Weddell Sea, where the horizontal model resolution (defined by surface node per unit of surface) is increased. FESOM general configuration consists of a hybrid grid of 3 to 30 km for the southern ocean, with increased resolution in ice shelves, especially under FRIS (Fig. 3). Outside of the Southern Ocean, the resolution decreases considerably, ranging between 250 and 300 km for the Atlantic and Pacific Oceans (Timmermann and Hellmer, 2013).

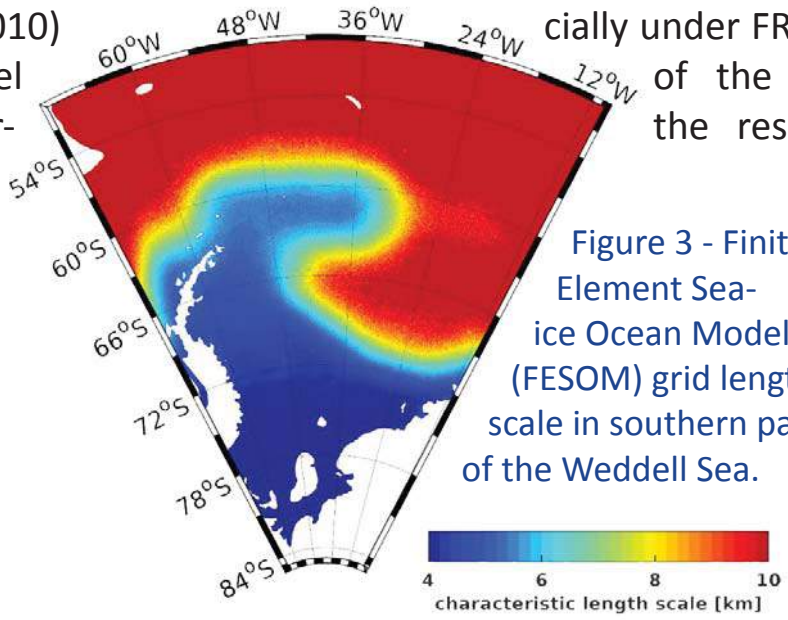

Figure 3 - Finite Element Sea-ice Ocean Model (FESOM) grid length scale in southern part of the Weddell Sea.

2.2 Methods

The daily data produced by FESOM are characteristically unstructured and for this project, were resampled into a structured grid. Daily data were tentatively used for eddy tracking algorithms (Nencioli et al., 2010), but the model was not capable of explicitly resolving eddies with this temporal resolution. We then decided to look at the background field by studying the buoyancy frequency, vertical shear and Richardson number in order to explain eddy activity and show which impact it had on the inflow of WDW on the continental shelf. Five sections (Fig. 1) are created from the climatological mean that we calculate using the structured daily data for the years 1989, 2009 and 2010. Potential temperature, salinity and vertical velocity were used as reference for the study.

The Richardson number, defined as the ratio between the buoyancy frequency and the vertical shear, helps to investigate density and baroclinic current in the ocean.

Richardson number (Ri) is indicated by $Ri=N^2/S^2$, where $N = sqrt(\frac{g}{\rho 0}\frac{d\rho}{dz})$ is the buoyancy frequency, which describes how water is stratified, and $S = sqrt(\left(\frac{du}{dz}\right)^2 + \left(\frac{dv}{dz}\right)^2)$ is the vertical shear, which helps to describe the baroclinicity of the current; g is the gravity, ρ is the density, ρ0 is the constant density (1027 $kg.m^{-3}$), z is the depth, and u and v are the vertical flow speed. When Ri is big, the vertical shear is small and the water is more stratified, and vice versa.

3. Results

3.1 Description of temperature, salinity and vertical velocity in the shelf break

Section plots of temperature, salinity, and horizontal velocity in the narrow (Section 1) and wide (Section 4; see Fig. 1) areas of the continental shelf are used to analyse the be-

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haviour of the WDW towards the continental slope during the westward propagation. Figure 4 shows Section 1 in winter (top) and summer (bottom). The surface water is very cold (~ 1.9 °C) and a clear structure of WDW is observed under the thermocline, which separates that water from the cold water located in the upper layer (Fig. 4a, top). The thermocline is located at 150m depth in the open ocean and increases to more than 500m near the continental shelf (Fig. 4a, top). The WDW layer extends over the continental slope to more than 600m depth (Fig. 4b, top). ASF is found at 200 m depth offshore and deepens to more than 600m towards the continental shelf (Fig. 4b, top).

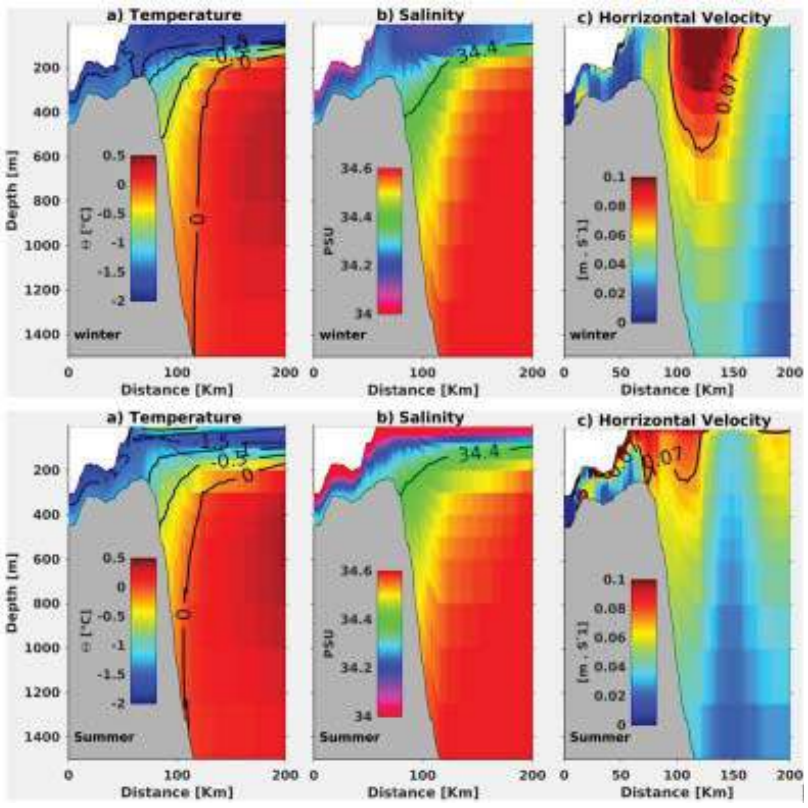

Figure 4 - Average temperature, salinity and horizontal velocity during (top) winter (June- August) and (bottom) summer (January- March) at Section 1 (see Fig. 1 for location). The 34.4psu and 0.5 °C isolines show the seasonal variability of the ASF.

During summer (Fig. 4, bottom), water in the surface layer is warm and fresh, originated by the melted ice (Fig. 4a, b, bottom). The isohaline is uplifted on the continental slope, from more than 400m during winter to 300m in summer. The horizontal velocity in winter shows the presence of the slope front, which separates WDW core from the coast (Fig. 4c, top). The slope front is located far away from the coast, where a strong, wide and deep current (circa of 80-180 km wide and 5-1000m deep) is also observed. This current is associated with the WDW and contributes to deepening the isohaline at the continental slope. Thus it prevents WDW from reaching the continental shelf. A second current, defined as coastal current, is completely separated from the current associated with the ASF, flowing southward in the ice shelf cavity (Fig. 4c, top). The coastal current enhances the ISW mixing (cold and fresh water, Fig. 4a, 4b, top) and MWDW reaches the continental shelf. During summer, the current associated with the ASF become weak and divides into two parts. One part is located in the offshore and the other part approaches the coastal current on their westward progression (Fig. 4c, bottom). This explains the fact that the coastal current is stronger in summer than in winter. The inflow of MWDW and ASW in the ice shelf cavity, as seen in the temperature and salinity, are clearly reflected by this westward propagation in summertime. The reduction of the slope current intensity in summertime explains the uplift of the 34 psu isohaline during this period.

Section 4 (Fig. 5) is isolated from the coast and ice shelf (see Fig. 1), which explains the absence of coastal currents. The 34.4 psu isohaline is lifted above the continental slope and reaches the continental shelf (Fig. 5b, top). Slightly offshore of the shelf edge, a doming of the thermocline is observed between the WDW and WW (Fig. 5a, top). This doming indicates upwelling events (Fahrbach et al., 1994), which explains the presence of WDW, on the continental shelf (Fig. 5b, top). Since the section crosses the shelf break, we have the presence of slope current associated with the ASF. However, this current is weaker and shallower than the current found in Section 1. This slope currents, in combination with the upwelling event, explains the presence of the V-shaped front (Fig. 5b), represented by the isohaline 34.4 psu. During summer, the slope current (Fig. 5c, bottom) becomes weaker and contributes to the uplift of the V-shaped (Fig. 5b, bottom) and to the intensification of WDW on the continental shelf. The maximum depth of the isohaline varies from 170m to 300m during winter and summer, respectively (Fig. 5b).

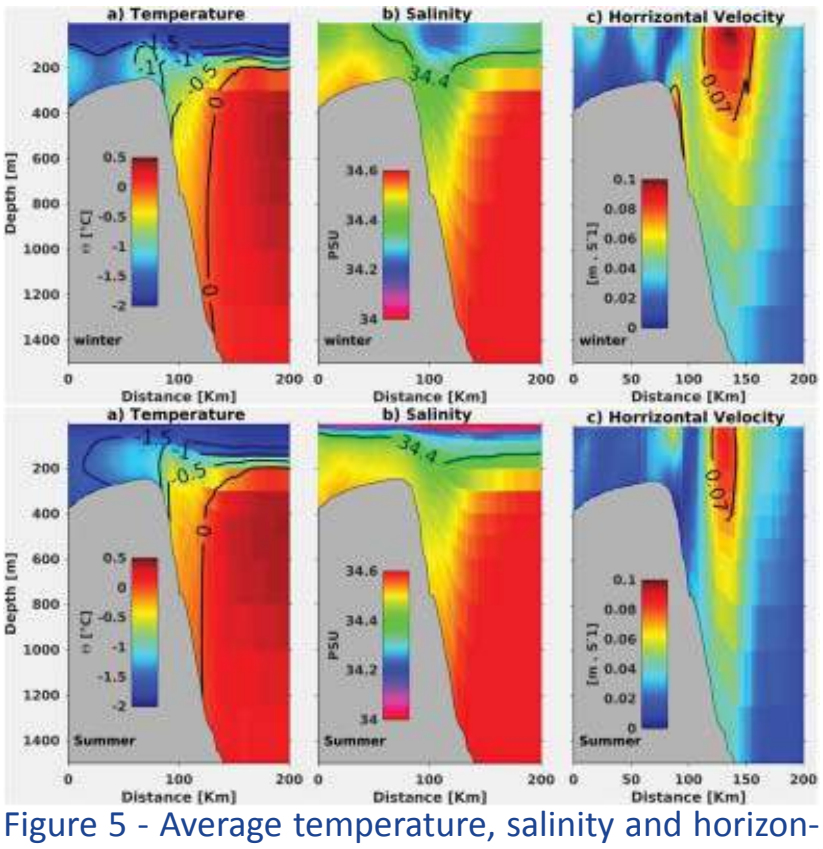

Figure 5 - Average temperature, salinity and horizontal velocity during (top) winter (June- August) and (bottom) summer (January- March) at Section 4 (see Fig. 1 for location). 34.4 psu and 0.5 °C Isolines show the seasonal variability of the ASF.

3.2 Buoyancy frequency, vertical shear and Richardson number

Buoyancy frequency, vertical shear, and Richardson number along Section 1 and 4 are analysed to understand eddy activities and their impact on the inflow of WDW over the continental shelf (Fig. 6). During winter, stability N^2 is uniform and small in the first 100m, increasing markedly under the ice shelf where the coastal current flows (Fig. 4c) and between 100-400 m depth from the continental slope to the offshore part (Fig. 6a, top). The vertical shear is large from the surface offshore until about 900m depth of the shelf break (Fig. 6b, top). Nevertheless, immediately at the

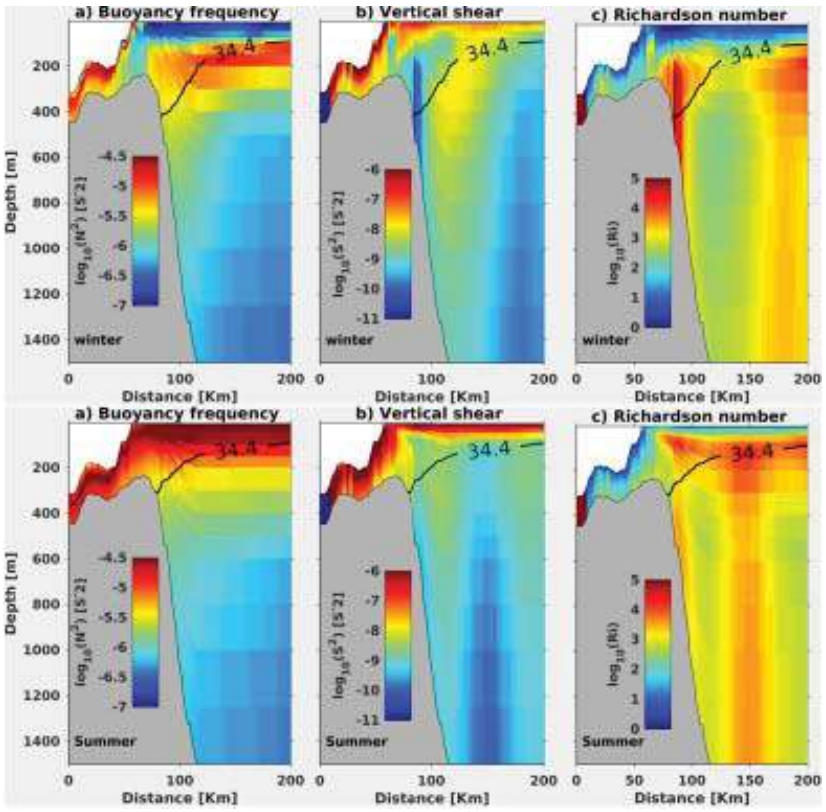

Figure 6 - Average buoyancy frequency, vertical shear and Richardson number during (top) winter (June- August) and (bottom) summer (January- March) at Section 1 (see Fig. 1 for location). The isohaline 34.4 psu shows the seasonal variability of the ASF.

shelf break, where the deepening of isohaline 34.4 psu is located, a low value of vertical shear is detected. The Richardson number (Fig. 6c, top) is the opposite of the vertical shear. The section plot of Richardson number shows a small number in the first 100m depth and under the ice shelf, a high number at the shelf break, a low value from surface to the depth of 900m immediately after the shelf break, and again high value at the offshore part. During summer, the stability became high from the surface until 400m depth in response to the meteorological conditions and warming of the surface water (Fig. 6a, bottom). Expectedly, at the shelf break, under the ice shelf and at the surface, the vertical shear becomes higher in comparison with winter (Fig. 6b, bottom). This implies the existence of some turbulence on the continental slope during this period and can explain the uplift of the 34.4 psu isohaline (Fig. 6b, bottom). The opposite is observed for the Richardson number. Nevertheless, due to the high stability, the Richardson number is high at the surface compared to winter.

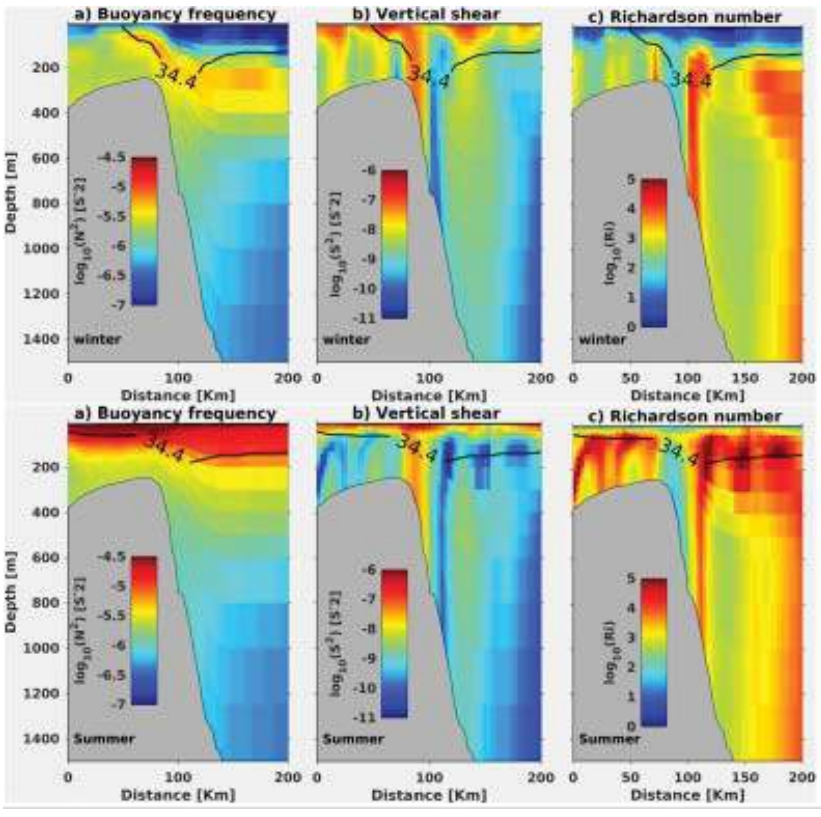

Figure 7 - Average buoyancy frequency, vertical shear and Richardson number during (top) winter (June- August) and (bottom) in summer (January- March) at Section 4 (see Fig. 1 for location). The isohaline 34.4psu shows the seasonal variability of the ASF.

Section 4 shows low stability in winter for the first 100m depth (Fig. 7a, top). From 100 to 400m depth, the stability starts to increase, but compared to Section 1, it is shallow. Comparing to Section 1, in Section 4, the vertical shear is small at the surface (Fig. 7b, top). The high value of vertical shear is observed directly at the shelf break. High value of vertical shear is observed on the continental shelf where the upward of isohaline 34.4 psu occurs, which can be assimilated to the strong isopycnal slope on the continental shelf. The Richardson number is the inverse of vertical shear (Fig. 7c, top). During summer, as the surface water warms up, the stability increases at the surface (Fig. 7a, bottom), but not as high as in Section 1. The vertical shear decreases at the surface and on the continent shelf compared to winter (Fig. 7b, bottom). The low value of the shear observed immediately after shelf break during winter became weaker in summer. This is reflected in the downward slope of isohaline 34.4 psu on the continental shelf during summer compared to winter. The same pattern or variation was noticed for other sections located in the wide continental shelf (Sections 3 and 5, not shown here).

4. Discussion

Based on FESOM monthly mean for the years 1989, 2009 and 2010, the seasonal inflow of WDW onto the continental shelf and the potential role of eddies on this inflow were analysed, focusing on FRIS. The processes that interact to control the access of WDW to the continental shelf were identified by comparing five different sections (two in the narrow continental shelf and three in the wide continental shelf; Fig. 1). The analyses based on the section plot of temperature and salinity showed that during the westward progression along the continental shelf, more WDW is getting into the continental shelf, with higher inflow during summer. This is consistent with a previous study based on moored instruments (Årthun et al., 2012). Close to the continental slope, the depth of the thermocline changes from about 500 m to 400 m between winter and summer on the narrow continental shelf. This result corroborates previous findings of changes in thermocline depth about 200 m between winter and summer in the Filchner sill (Semper and Darelius, 2017). Analysing the Richardson number and vertical shear, we found that the upward lift of ASF in summertime is due to eddy activities. This is in agreement with Daae et al (2017), who found that the increased southward transport of WDW during summertime is linked to a dynamic response rather than to changes in the thermocline depth. In the wide continental shelf, the dense WW is transported offshore, where the intensity of the slope current is high. This explains the creation of V-shaped structure across the continental slope. The change from surface intensified shear in Section 1 to bottom intensified shear in Section 4 is consistent with the dense outflow of WDW over the wide shelf region as opposed to the narrow

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shelf region. This result agrees with Stewart and Thompson (2016) who found that a pathway for CDW that accesses the continental shelf without doing work against the buoyancy force is created by the establishment of an isopycnal connection between the dense shelf water and the CDW.

5. Conclusion

Using three years (1989, 2009 and 2010) of monthly mean FESOM model, the seasonal inflow of Warm Deep Water (WDW) in the Filchner Ronne Ice Shelf (FRIS) was investigated. We found that during the westward progression along the continental shelf, a greater amount of WDW is getting onto the continental shelf and that this inflow was stronger during summer, in comparison to winter. The change from surface intensified shear in the narrow continental shelf to bottom intensified shear in the wide continental shelf is consistent with the dense outflow of WDW over the wide shelf region as opposed to the narrow shelf region.

Acknowledgements

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Spatiotemporal variability of phytoplankton bloom phenology in the Caspian Sea

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The Caspian Sea (CS) is the largest enclosed water body on Earth, and is of particular ecological, economic, and social value in the region (Zonn, 2005). The CS is surrounded by multiple climatic zones with a strong north to south gradient in physical and biogeochemical properties (Barale, 2008), which provide a vast diversity of different ecological niches for organisms living in this complex ecosystem (UNEP, 2006). In the last few decades, the CS has been witnessing severe environmental disturbances, such as climate change, increased pollution, changes in the riverine runoff, sea level fluctuations, and the intrusion of invasive species such as the jellyfish Mnemiopsis leidyi (Barale, 2008). These perturbations have cumulatively caused dramatic changes in phytoplankton phenology, i.e. the timing and magnitude of the phytoplankton bloom (Nezlin, 2005), which is of critical importance to the life cycle dynamics of zooplankton and larval fish, and the transport of energy and mass to higher trophic levels (Cushing, 1990; Platt et al., 2003; Foukal and Thomas, 2014). Metrics that quantify different aspects of phytoplankton phenology can thus serve as indicators of ecosystem health that can be monitored from space. To be able to identify potential trends (e.g. due to climate change signals) or critical thresholds (e.g. abrupt changes due to the introduction of alien species) in phytoplankton seasonality, the natural variability in phytoplankton phenology needs to be understood. In my recent POGO project, we studied the inter-annual variability of the phytoplankton bloom using an 18-year period (1998-2015) of interpolated weekly satellite chlorophyll-a (Chl-a) observations on a 0.1×0.1 degree grid. For each year, a 5% increase in Chl-a from its annual median concentration (46 weeks) was considered as a threshold for bloom formation (Siegel et al., 2002). We computed known bloom metrics describing bloom timing (initiation and termination), bloom duration, peak and integrated Chl-a concentration (Racault et al., 2012; Brodey et al., 2013). Average climatologies of anomalies of the phenological features over the study period were computed using temporal mean of absolute anomalies of each year (1998-2015). Magnitude of inter-annual variability in the phenological characteristics for each individual grid point in the CS was computed based on the standardized temporal anomalies in the phytoplankton phenology metrics in each year.

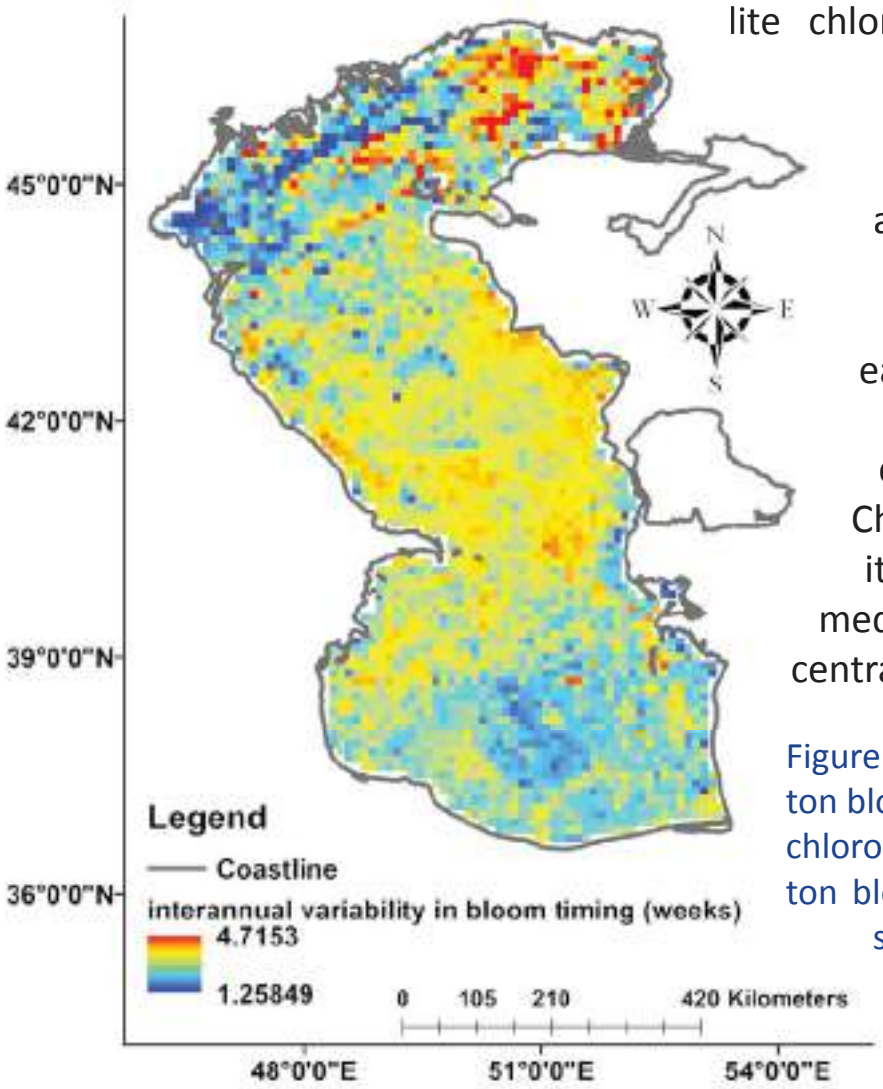

Figure 1 - Inter-annual variability in phytoplankton bloom timing (initiation, end, and maximum chlorophyll-a concentration during phytoplankton bloom period) in the CS. Colourbar represents mean climatology of standardized anomalies for the number of weeks through the study period (1998-2015).

Our results showed spatially coherent patterns of inter-annual variability of phytoplankton bloom phenology for the North, Middle and South CS (Fig. 1 and 2). Lower temporal variability in the timing and higher inter-annual variability in the magnitude of the phytoplankton bloom were observed in the North CS than in the Middle and South CS. Coastal and offshore parts in the Middle CS showed a higher degree of inter-annual variability in the temporal dynamics of the timing of phytoplankton bloom than the South CS (Fig. 1), but a lower inter-annual variability in the magnitude of the bloom (Fig. 2). Considerable differences were also observed between the western and eastern parts of the North CS in terms of their inter-annual variability of most phenological metrics. The western parts of the North CS showed a lower degree of inter-annual variability in timing (Fig. 1), but a higher degree of inter-annual variability in magnitude of phytoplankton bloom (Fig. 2) than the eastern and southern parts of this basin. Coastal and offshore parts in the Middle and South CS were surprisingly similar in the inter-annual variability of their phenological features. Basin scale differences can be explained by the strong differences in the hydrological and ecological conditions sustaining phytoplankton growth in the three Caspian Basins, such as average water depth, the influence of Volga River discharge, differences in the seasonal variability of sea water temperature, and in the formation of ice during winter in the North Caspian Basin, which all differ considerably in the level of their inter-annual variability (Nezlin, 2005). The large temporal variability in phytoplankton bloom phenology within the North CS can be attributed to a stronger influence of the Volga River and the shallower water depth in the western part of the North CS (Fendereski et al., 2014). Our finding suggests that potential future changes in phytoplankton phenology and potential impacts on

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higher trophic levels due to long-term climate change, pollution, and mismanagement will be more challenging to detect in the North CS (in particular in the western part) than in other CS basins due to the larger inter-annual variability.

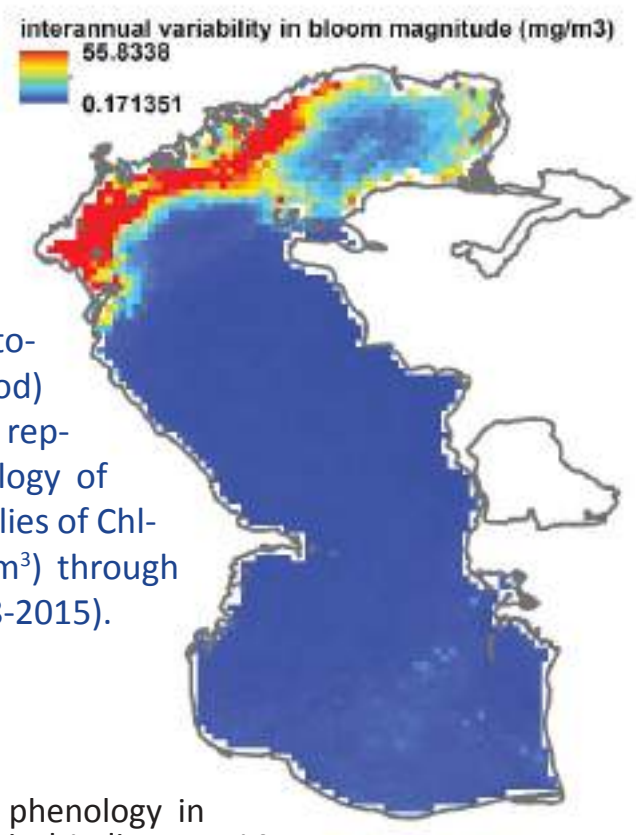

Figure 2 - Inter-annual variability in phytoplankton bloom magnitude (maximum bloom amplitude and integrated chlorophyll-a concentration during phytoplankton bloom period) in the CS. Colourbar represents mean climatology of the normalized anomalies of Chl-a concentration (mg/m^3) through the study period (1998-2015).

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NANO Alumni in action: Research communications

The baroclinic circulation of the coastal hypersaline waters of the Great Barrier Reef, Australia

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Brief background

Hypersaline water (salinity, S>35 ‰) is a common feature in the coastal waters of the Great Barrier Reef (GBR) during the dry winter season of northern Australia (August to October, Andutta et al., 2011; Wolanski, 1981). This very salty water in the coastal GBR waters, a result of the absence of precipitation and significant evaporation, produces a considerable inshore-offshore salinity difference (~ 1 ‰; Wolanski, 1981). This density difference is likely to play an important role in the inshore-offshore water exchange process in the GBR. Due to the aspect ratio of the GBR, i.e. its long-shelf distance (1000 km) is much larger than its cross-shelf distance (100 km) along with the prevailing southeast alongshore winds in the GBR, the flushing process of the hypersalinity via baroclinic circulation to the offshore GBR is challenging to study.

The simulation of the baroclinic circulation transporting the hypersalinity from inshore to offshore parts of the GBR, the prevailing winds and the tidal barotropic flow patterns over the GBR requires, ideally, a 3D model. This scientific suggestion also addresses the limitations of some previous studies corresponding to the GBR hypersaline water transports, i.e., the 1D cross-shelf exchange and diffusion models, which does not consider the southeast winds-induced alongshore transport of the hypersalinity (Hancock et al., 2006; Wang et al., 2007), and the 2D vertical integrated-models (Andutta et al., 2011), which does not account the baroclinic force. Thus, the 3D model description of the circulation for the GBR hypersaline water was carried out by the work of Salamena et al (2016), which is described in a concise manner in this article.

Methodologies

To simulate the 3D water transport features of the GBR, the 3D baroclinic model of the MOHID model (MOdelo HIDrodinâmico; a modular finite volumes water-modelling system)

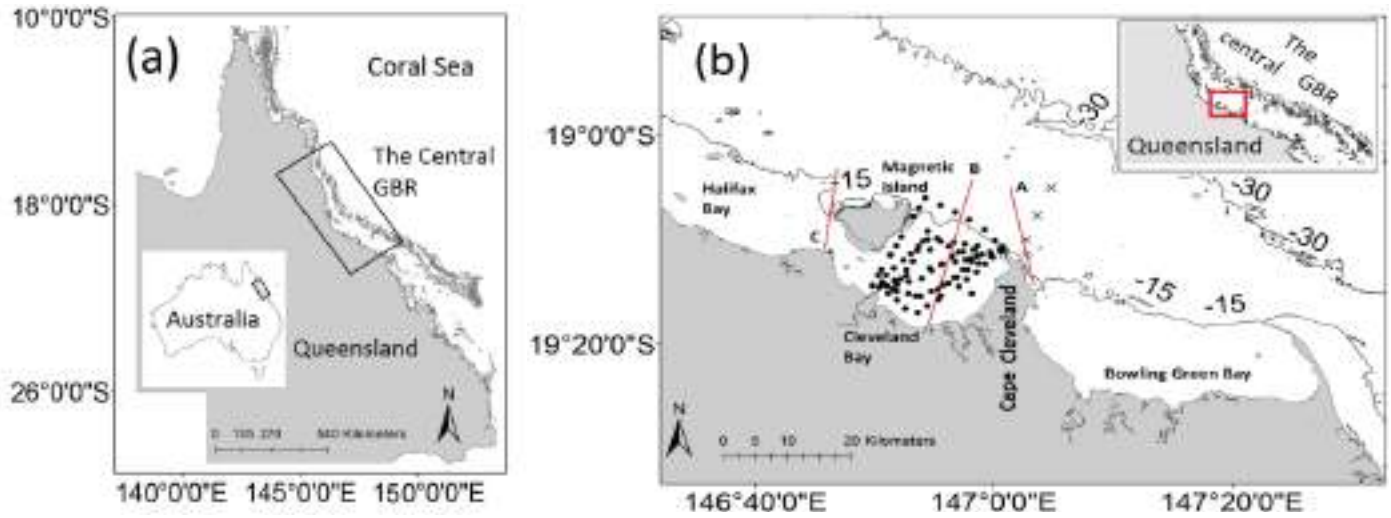

Figure 1 - (a) The central GBR and (b) one of coastal zones of the central GBR including Halifax Bay, Cleveland Bay and Bowling Green Bay; black dots represent oceanographic stations from routine measurements using Seabird SBE 19 (i.e. 19–21 September 2009, 18 September 2010, 10–11 September 2011, 7–9 September 2012 and 5–7 October 2013); crosses describe oceanographic stations of Wolanski and Jones (1981); transects A, B, and C represent cross-shelf transects of eastern Cape Cleveland, Cleveland Bay and western Magnetic Island, respectively, for which model results are calculated.

was employed. The central GBR (Fig. 1) was selected for this study due to the reasonable 3D computational cost and availability of observational data. The MOHID model applied the Lagrangian tracer, which was used to calculate the flushing time of the GBR coastal hypersaline water.

Some important results

As the modelled salinity and temperature were found to be comparable with the observed data (see Salamena et al., 2016), there are some important findings of the work, as follows:

1) The baroclinic circulation transporting the hypersaline water to the offshore GBR prevails at deeper bathymetry due to the insignificance of southeast winds-driven well-mixed condition; the vertical mixing is mostly profound at the shallow inshore GBR (see Fig. 2);

2) The presence of the deep inshore waters in several headlands of the coastal GBR waters enables significant baroclinic currents (up to 0.08 m/s);

3) The degree of the baroclinic circulation at the GBR deep inshore waters was also related to the SE winds-induced alongshore transports of hypersalinity;

4) Using the Lagrangian tracers, the flushing time of the GBR coastal hypersalinity was estimated by calculating the time of the tracers to be reduced to about 37% of its initial quantity within the coastal GBR waters and was found to be about 2-3 weeks;

5) The baroclinic circulation at the GBR deep inshore waters is weakened when the dry winter season changes to dry summer season (around December). At this period of time, SST increases.

Skills from the NF-POGO training

Several skills from the NF-POGO training programme were applied in this work. Due to the requirement of validating the modelled temperature of the GBR coastal hypersaline water, the satellite-derived sea surface temperature over the coastal waters of the central GBR was used. The data was obtained from the satellite MODIS Terra L3 (4 km; http://oceancolor.gsfc.nasa.gov/cms/). This dataset was processed with the NASA SeaDAS software (see Salamena et al., 2016). The drawing processes of the GBR shape map was highly related to the philosophy of SAGA software taught by Dr. Murray Brown and applied in the ArcGIS tools.

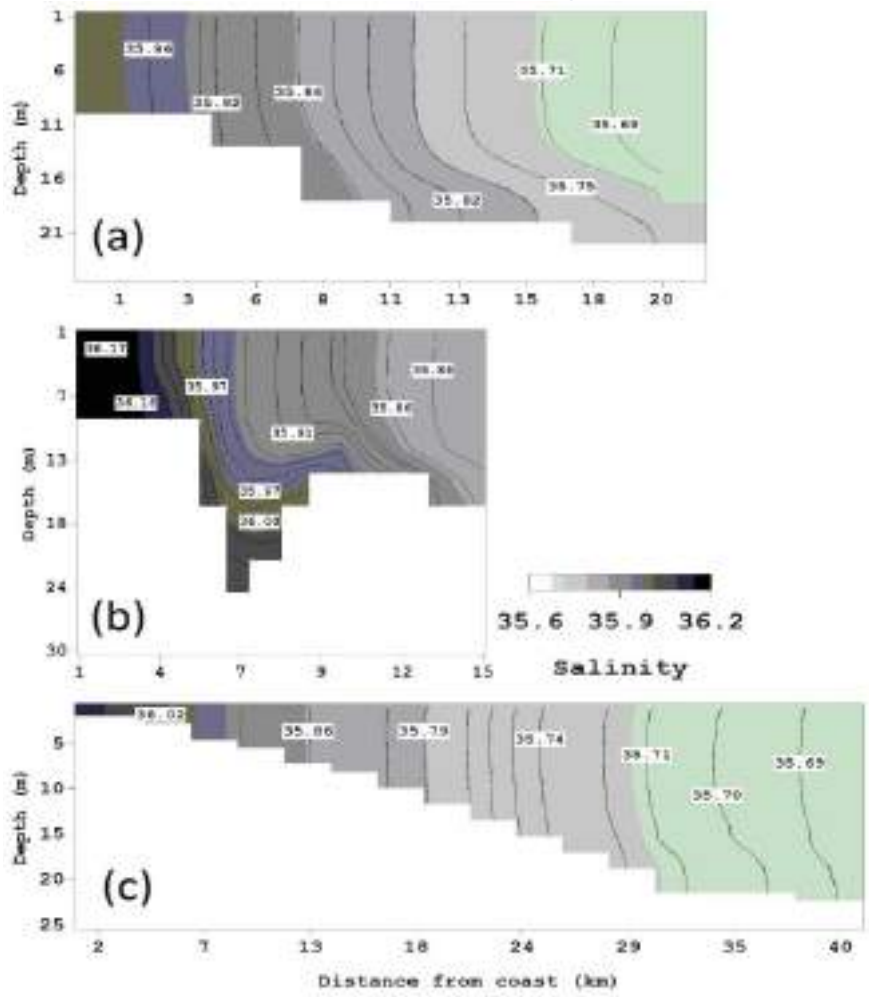

Figure 2 - The cross-section profiles of dry season average salinity at (a) Cape Cleveland (transect A), (b) at the near western side of the Magnetic Island (transect C) and (c) Cleveland Bay (transect B). The locations of these cross-sections are found in Fig. 1b.

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Some remarks of sea surface temperature variation in South China Sea based on MODIS data





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Introduction

Sea surface temperature (SST) is an essential variable in oceanography as it represents the air-sea heat exchanges. In terms of physical oceanography, SST can be combined with other factors to study surface currents and ocean vortices. In terms of marine ecosystems, SST with chlorophyll-a and nutrients can be important input parameters to identify upwelling, algal blooms, potential fishing regions, biophysical processes, and marine organism distributions (Hosoda et al., 2007; NEO). SST can be measured directly by sensors on ships and buoys, or can be inferred using remote sensing data. The direct measurement method allow temperatures from different layers of the water column, including the sea surface to be measured. Such SST data is discrete and inconsistent in terms of time, space and high in terms of cost. Moored or drifting buoys can provide continuous observations but cannot cover the whole area. Meanwhile, remote sensing images can provide SST values over time and space, but are influenced by weather factors. With these advantages and disadvantages, SST from remote sensing images is widely applied in many fields, including oceanography.

In the South China Sea, seawater temperatures are used in the study of ocean currents, fluid exchange and biogeochemical cycles. Most studies use the reanalysed seawater temperature data from some centres. However, these seawater temperatures are limited by the temporal and spatial distribution and low resolution for modelling marine hydrodynamic and biogeochemical cycles. Therefore, studying the characteristics of SST from MODIS images will contribute to supplementing the data in oceanographic studies in the South China Sea.

Materials and Methods

Materials

MODIS-Aqua level 1A images with the resolution of 1km were collected from http://oceancolor.gsfc.nasa.gov for the South China Sea area (3°N - 24°N, 100°E - 121°E) to study the variation of SST during 2003-2015.

Methods

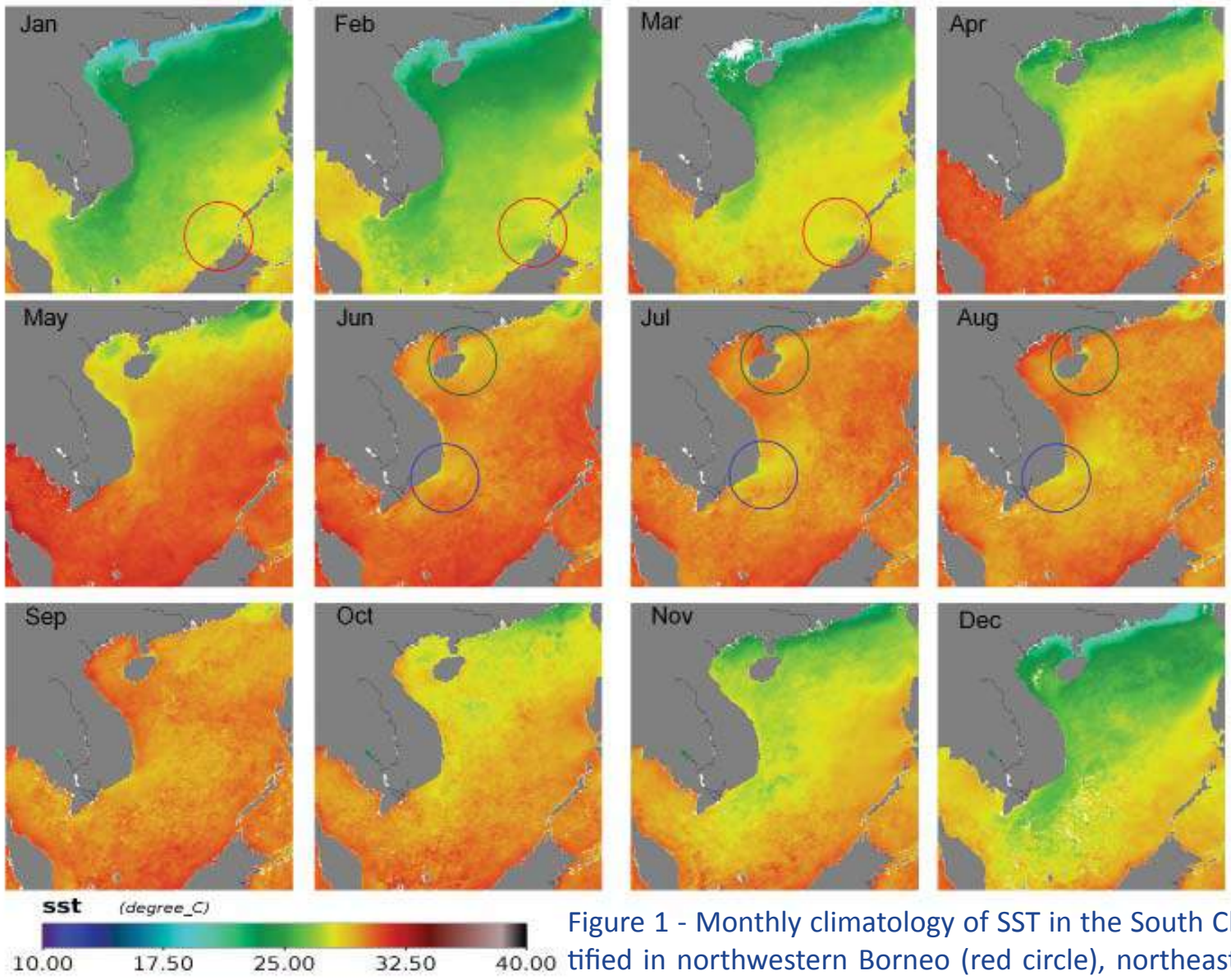
All MODIS images were semi-automatically processed on SeaDAS. The long-wave SST algorithm was applied using spectral bands 31 and 32 with wave lengths of 11 and 12 µm, respectively (Brown and Minnett, 1999). To analyse the variation of SST in the South China Sea in the period 2003 and 2015, the classical seasonal decomposition of moving average on R was used. The SST time series was decomposed into trend, seasonal, and random (anomaly) components.

Results and discussions

Based on the monthly average SST distribution in the South China Sea (Fig. 1), in some regions and specific periods, SST is lower than in the surrounding areas. The waters off northwestern Borneo from January to March (red circle), the northeast of Hainan Island (green circle) and southern centre of Vietnam (blue circle) from June to August. This result is consistent with the results of the other studies on the seasonal upwelling phenomena in the area (Xie et al., 2003; Jing et al., 2007; Chen et al., 2012; Yan et al., 2015).

For the whole South China Sea (Fig. 2, top), the average SST peaked (around 30 °C) in summer (from June to August), and dropped to about 25.5-26.4 °C in winter (from December to February). The temporal SST patterns of the entire South China Sea can be different in some upwelling areas. In the upwelling area of southern centre regions of Vietnam (Fig. 2, bottom), the average SST (area of 27km×27 km) was lower than in surrounding areas in summer; SST peaks were usually found in the early and late southwest monsoon season.

To better understand the SST variation in the South China Sea, the SST time series data was decomposed into three components: trend, seasonal variation, and anomalies (random) (Fig. 3). In terms of trend, there were some low peaks in 2005, 2008, 2009, 2011 and 2014, and high peaks in the summer of 2007, 2010 and 2013, and SST was increasing in



2015. In general, the monthly average SST fluctuated around a cycle of 3-4 years: 2005-2008, 2008- 2011 and the end of 2011-2014. About the seasonal amplitude, there is approximately a 4°C difference between winter and summer. The anomaly values were relatively small before 2008 and high after 2008. Such changes in SST might be related to the exit of the El Niño and La Niña events and multi-decadal ocean changes. In addition, variation in SST could have interacted with hydrodynamic systems, long-distance water mass transport, and biogeochemical budget in mesoscale. These SST features need to be further studied.

Figure 1 - Monthly climatology of SST in the South China Sea. Upwelling regions are identified in northwestern Borneo (red circle), northeastern Hainan Island (green circle) and southern centre of Vietnam (blue circle).

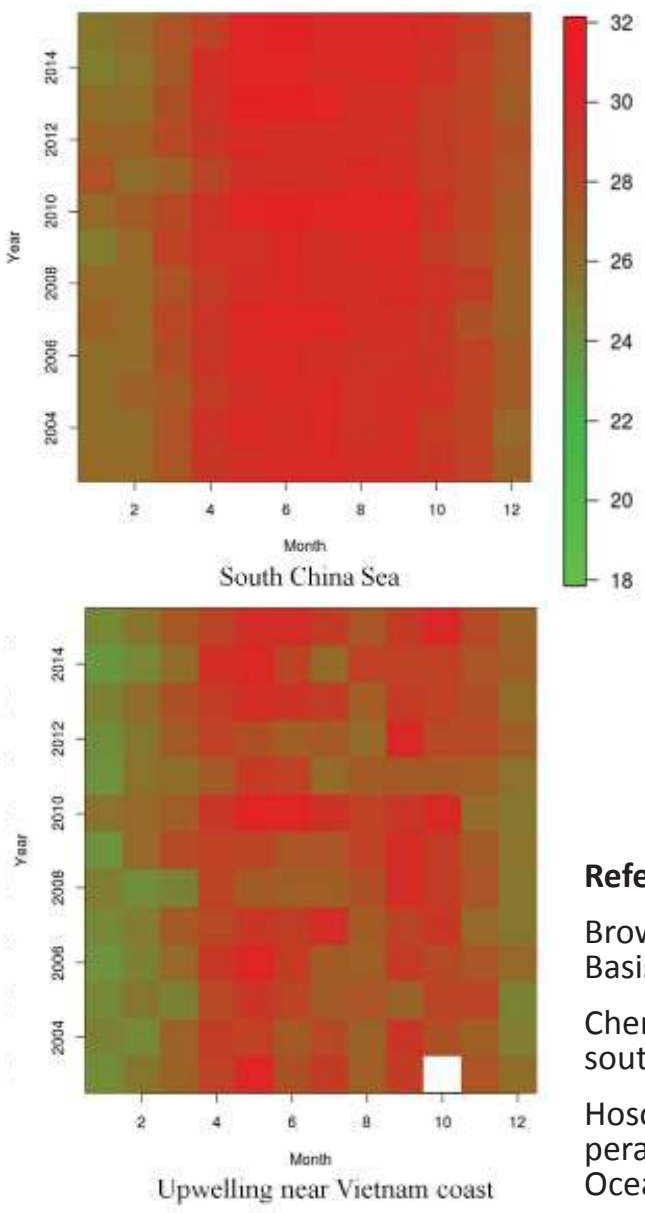


Figure 2 - Variation of SST average in the whole South China Sea (top) and at upwelling regions in the southern centre of Vietnam (bottom, blue circle region in Fig. 1).

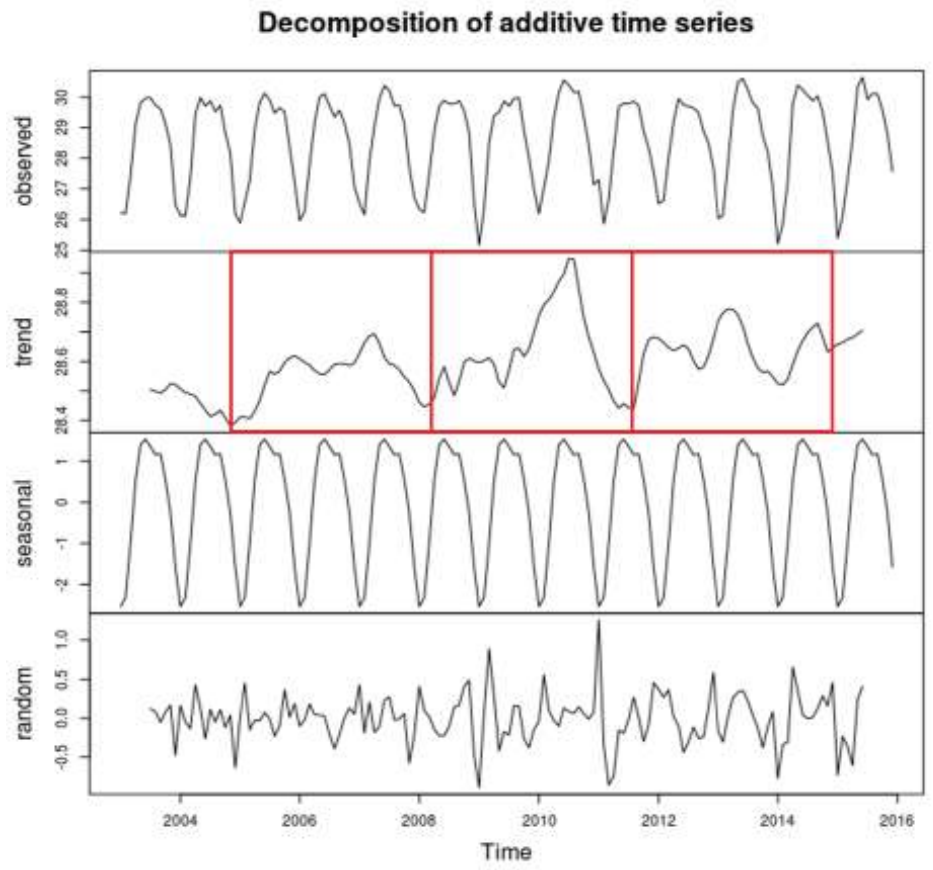


Figure 3 - Decomposition of SST time series data in the South China Sea during 2003-2015.

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Bioluminescence in Puttalam lagoon, Sri Lanka

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Some living organisms can produce and emit their own light which is known as bioluminescence. Fire flies are the most common example for bioluminescence on land. However, marine bioluminescence is more common than on land and in freshwater. It seems that marine bioluminescence evolved independently at least 40 times and at least 17 phyla have developed this ability. A remarkable diversity of marine animals and microbes are able to produce their own light, and in most parts of the ocean, bioluminescence is the primary source of light. Ocean bioluminescence has been extensively studied worldwide through the decades. In Asian countries, bioluminescence receives less attention. In Sri Lanka, there is no record of bioluminescence in marine organisms, though there are some observations recorded. So, the present research was formulated to investigate the extraordinary phenomenon of bioluminescence in the marine waters off Sri Lanka. Our goal is to identify bioluminescence zooplankton and their distribution around Sri Lanka. As part of this project, the bioluminescence within a lagoon was studied for six months with an additional six months proposed. Although lagoon bioluminescence is as important and prominent as ocean bioluminescence, a limited number of studies have conducted on lagoon bioluminescence.

Study area and Project activities

Sri Lanka has hundreds of coastal lagoons. One of the major of these lagoons, the Puttlam lagoon, is located on the west coast of Sri Lanka. The Puttlam lagoon bioluminescence was analysed during six months (December 2016 to May 2017) to observe seasonal variations. Six sampling sites (Fig. 1) were selected and monthly sampling of water and net (zooplankton) were performed after dawn. Temperature, salinity and pH were also measured. Apart from sampling bioluminescence intensity, profiles were recorded using a recoverable bathyphotometer.

Observations

In the lagoon bioluminescence was observed as blue coloured blinking lights. The lights were only observed when the water in the lagoon was in motion. These light producing organisms need a mechanical trigger to start their chemical reaction which produces biological light. They produce light when boats move or splash the water or when a plankton net is dragged along the surface. It looks like hundreds of thousands of tiny lights. We use an underwater camera to take pictures just below the surface layer. Luckily, there were photographs of some tiny organisms which glow with their own lights (Fig. 2). Zooplankton samples were preserved using 5% formalin and analysed in the laboratory. Two bioluminescent zooplankton species were identified: the *Oikopleura dioica* (Fig. 2) and the *Cypridina* sp. (Fig. 2). Other species present in the samples yet to be identified.

Bathyphotometer profiles (Fig. 3) showed the vertical distribution of bioluminescence organisms in the lagoon. Bioluminescence intensity peaks were observed along the entire water column. Since Puttalam lagoon is a shallow ecosystem (e.g., the maximum sampling depth was 6m), plankton are well distributed through the entire water column. Surface water samples were analysed to obtain nutrient parameters such as nitrate, nitrite, orthophosphate and silicate. These results will be used to identify the relationship between nutrient parameters and bioluminescent zooplankton abundances.

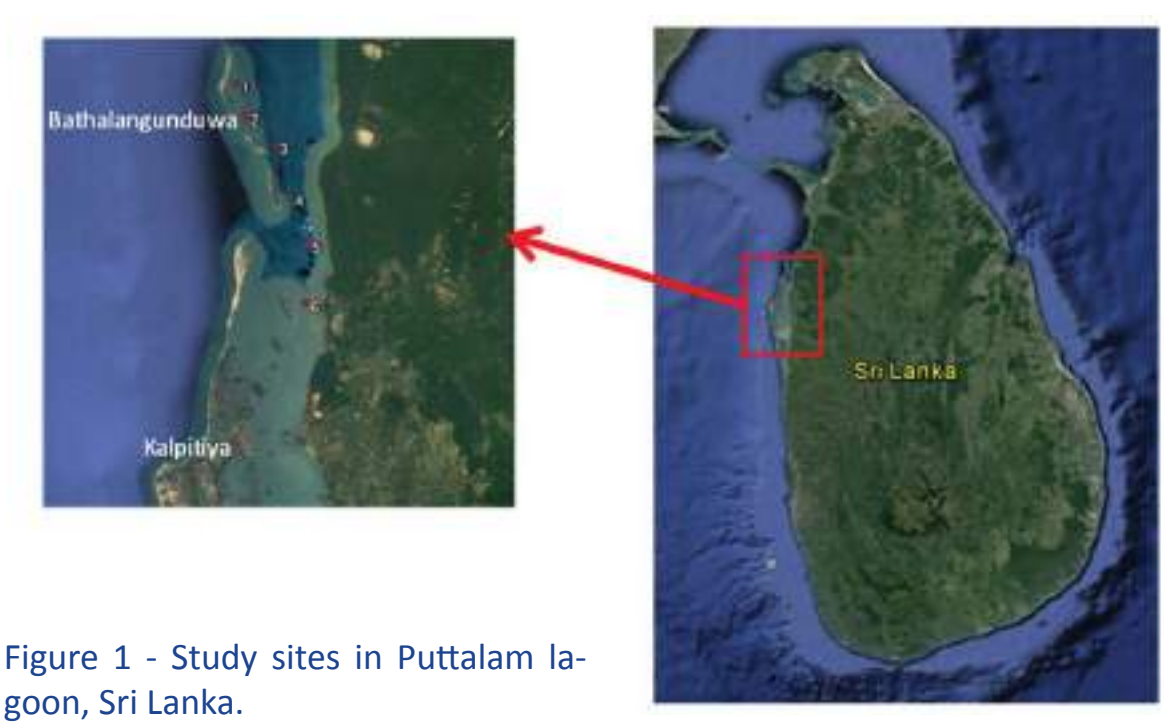

Figure 1 - Study sites in Puttalam lagoon, Sri Lanka.

The study of bioluminescence is vital: It can be used in various fields, such as medical research, where bioluminescence is used to identify the location of tumors or cancer cells; in agriculture for genetically modified bioluminescent plants to monitor the efficient use of water; and by scientists trying to find a way to answer the energy crisis using this 90% efficient light. Therefore, it is very important to identify the existence and distribution of bioluminescence as much as possible.

Figure 2 - Clockwise: *Oikopleura dioica*; *Cypridina* sp.; records of bioluminescence by the underwater camera

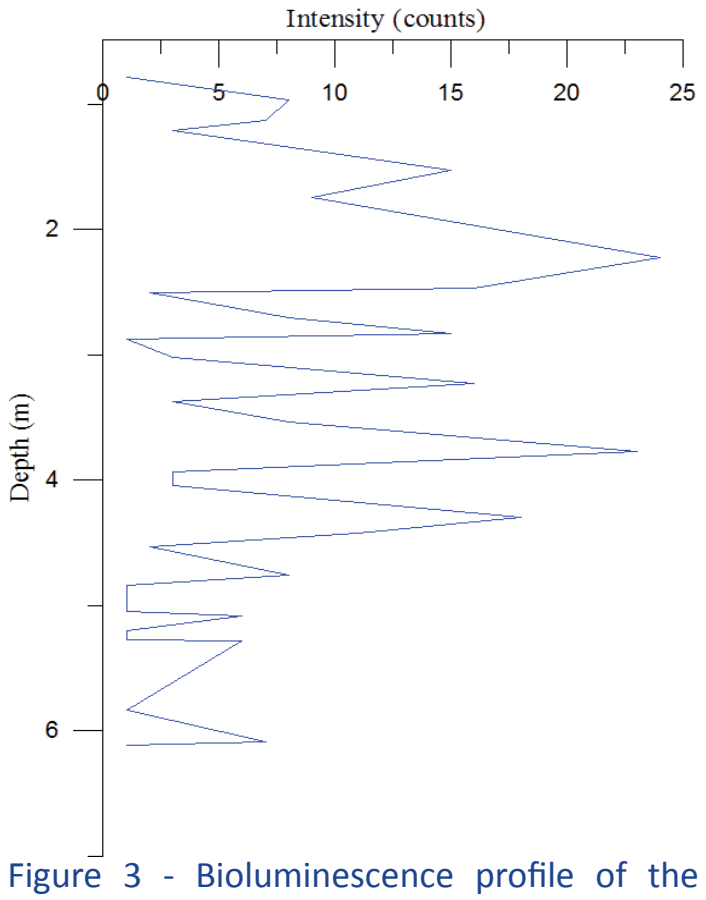

Figure 3 - Bioluminescence profile of the study site.

NANO Alumni in action: Research communications

Sea turtle on the east coast of India: risk and rescue

Sanjiba Kumar Baliarsingh
Indian National Centre for Ocean Information Services (INCOIS), India
Alumnus profile: https://nf-pogo-alumni.org/profile/sbaliar/

NANO: A knowledge boost up platform for oceanographers

I am a young scientist working at the Indian National Centre for Ocean Information Services (INCOIS) under the programme Satellite Coastal and Oceanographic Research (SATCORE). I have completed my post-graduate and doctoral degree in Marine Science. My research focused on phytoplankton ecology and ocean colour remote sensing. I have devoted a good time of my research career to studying the planktonic system of the north-western Bay of Bengal. Under an Indo-US collaboration, my present research is directed on the bio-optical study of episodic algal bloom events in the northern Arabian Sea.

Regarding my journey with NF-POGO and "NANO" until now, I will describe it by walking down memory lane! The first time I encountered NF-POGO was in 2012 from the regional training circular floating on INCOIS website. The training was on "The Application of ocean colour remote sensing in Primary Productivity and Ecosystem Modeling". During that period, I was pursuing my doctoral degree at the Department of Marine Sciences, Berhampur University, India. I found the themes of the training well aligned with my doctoral research. I applied and was selected to participate in the training programme. During the three week programme, I interacted with Prof. Trevor Platt and Dr. Shubha Sathyendranath, eminent scientists of ocean colour research. Their lectures on ocean optics and primary productivity were very useful for me. As part of the training programme, I learnt operative skills in ocean colour data processing software SeaDAS. The practical session with hands-on exercises on hyperspectral radiometer operation, bio-optical analyses and primary productivity measurements were very helpful in clearing up doubts and learning advanced techniques. Overall, the training was a booster for my doctorate research. During this programme, I was exposed to the "NANO Network" and registered myself in this family. The training bonded all the participants together as life time friends. Since then, we frequently share our views on research activities and solve research issues with mutual support.

In 2014, I completed my doctoral degree and joined INCOIS as a project scientist under SATCORE programme. In this programme, I am involved in biogeochemical studies of Indian coastal waters. Towards the end of 2014, the NF-POGO announced a regional training programme on "Phytoplankton bio-optical variability: application to the study of coastal systems" at University of Baja California, in Ensenada, Mexico, during 19 January to 6 February 2015. During that time, INCOIS was in process of acquiring an HPLC system for phytoplankton pigment analysis. The training was aimed at imparting hands-on practical knowledge on chromatographic analysis. Therefore, I applied for this programme. I was fortunate enough to get the application edited and endorsed by Prof. Trevor Platt who was then at INCOIS for a workshop. NF-POGO supported my travel and accommodation in Mexico. The lectures

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and practical demonstrations by experts fro parts of the globe were very beneficial. The chromatography session was especially useful. The off-classroom activities, such as the group lunch, dinner and weekend outing, facilitated all participant to exchange their views and share research experiences. The experience with co-participants and faculties in and out of the classroom was invaluable and unforgettable. The hospitality and friendly atmosphere created by NF-POGO never let me feel for a moment that I was at the other side of the globe. I carried the knowledge imparted by the faculties and the friendships to my home country. In a nutshell, it seems like yesterday that I met and spent moments with some members of the "NANO" family in Mexico. The training experience helped me a lot with chromatography work at INCOIS. In recent years, I have also been privileged to get support from the "NANO" family when writing research papers and have published two manuscripts in peer reviewed journals with "NANO" co-authors.

Sanjiba rescuing turtles

In general, direct and indirect support of NF and NANO helped me in shaping my research career and to understand the ocean with recalibrated eyes. Wholeheartedly, I thank NF-POGO for extending all the opportunities and providing a space in the "NANO" family.

Sea turtle on the east coast of India: risk and rescue

During my doctoral research period at Berhampur University, Odisha, I was involved in the rescue of hatchlings of vulnerable Olive Ridley sea turtles (*Lepidochelys olivacea*). It is important to mention here that the Olive Ridley rookery at the Ganjam coast, Odisha state, is one of the major "arribada" sites (mass arrival location for nesting) in the particular pocket of the Indian coast for breeding and nesting is a yearly phenomenon. In general, the turtles stay during November-May in the coastal waters of this site, while mass nesting happen between January and on the beach. After the incubation period, the hatchlings come out of their egg chambers and find their way to sea usually during the night. The artificial illumination from coastal establishments during seaward movement of hatchlings disorients these creatures and keeps them away from the sea. This disorientation results in the death of the hatchlings due to dehydration, entanglement in the creeping vegetation, and predation by feral dogs. During 2007-2013, along with other socio-environmental workers, I was involved in the rescue of the disoriented hatchlings and ensured their safe passage to the sea. Apart from this, I tried to build environmental awareness in civil society on the uniqueness of this episodic extraordinary biological phenomenon in the Ganjam coast, safety of this migratory guests, safe nesting and safe return of hatchlings to the sea.

Credits: L Krug

In loving memory of Helen Soares de Souza

(1985-2017)

It is with deep sadness that we communicate the passing of Helen Soares de Souza, recently graduated from the NF-POGO Centre of Excellence at the Alfred Wegener Institute (2016-2017). Helen, a marine biologist from Brazil, was an enthusiastic young researcher with a passion for travelling and for life. Our hearts go out to her husband and family. The NANO family leaves here a tribute to her memory.

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My sister Helen! A dictionary of words will never be enough to fill the empty space that you left since the tragedy. You are not speaking to us anymore, but you are present and looking at us maybe so close, but surely so far. I will not be able to speak to you anymore, or listening your voice which was always saying courage to me, but I'll keep from you the memories of a lovely friend, a sister, a person with great heart and kind soul. In our last long talk that we had in the summer school in Lauenburg (Germany), you did not stop to encourage me or to show me your love towards everyone. In that way, you taught me how to take care of people. Your heart was so beautiful. The science for you was something that you cherished a lot, and you showed us your interest about it. You were a model in the assistance and help. Dearest sister, your qualities and works are unquantifiable. You will forever remain in my heart. Go and rest in peace. May your soul rest in peace. When I see life, I will always think about you because you loved it and you knew always how to enjoy it. Rest in peace my sister, rest in peace my friend. Go and rest in peace, dear.
Your sister and friend,

Babette Christelle Tchonang

Helen was a person who was enjoying living life. It was like she was living every second of it. She was such a warm and friendly POGO-mate always ready to help her friends in any way she could. It was too early for her to say goodbye to this world. I hope her soul rests in peace!

Forough Fendereski

Ten month is a short period in a life but it was enough to mark mine when I encountered such a beautiful soul as Helen Soarez de Souza. I discovered a lovely, generous and cheerful woman, living her life thoroughly. I lost a colleague, a friend, a family member, a sister in heart. She went for a new journey but a part of her will remain in the hearts and memories of those who got to know her.

"The beauty of death it is the presence. The dead are invisible, but they are not absent" Victor Hugo

Sonia Gueroun

I will never forget you my dear friend. I will miss you. Obrigado for everything!

Onur Karakus

It was the beginning of the German winter when you evolved in my new circle of ten jewels. I was so much ecstasied when I got introduced to you. You were so amiable, social and graceful that I could not think of parting from my family for the first time. How could I forget the biking, cooking, playing UNO and Volleyball with you? In my POGO family, you were one of the best friends with whom I used to share my happiness and sorrows. Helen, it is you with whom I have tons of good memories. I was totally numb when I started to show the boldness by writing this. Who says you leave the world? You will be here, in my heart and the POGO family as well.

Md Masud-Ul-Alam

Images credits: O. Karakus, M. Masud-Ul-Alam, U. Nettleman, H. Soares, B. Tchonang, S. Vallyodan.

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Scientific events announcements

Marine ecosystem assessment for the Southern Ocean
Hobart, Australia
9 – 13 April 2018

The themes addressed during the conference will facilitate contributions from the Antarctic and Southern Ocean marine science community to the 6th Assessment Review (AR6) of the Intergovernmental Panel on Climate Change (IPCC), the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC), and recent initiatives to assess status and trends in global ocean ecosystems.

Deadline
15 Dec 2017

Contact: via website
https://ace-crc-fyw3.squarespace.com/

3rd Open Science Symposium on Western Pacific Ocean Circulation and Climate
Qingdao, China
8 - 10 May 2018

This symposium will provide a forum for oceanographers, meteorologists and climate scientists to exchange recent progresses in their study of the WPO circulation and climate and its generality/difference with other oceans, marine biogeochemistry and ecosystem, their variability, changes and impacts, to explore opportunities for international scientific collaboration, and to promote inter-disciplinary study in the WPO. It will be an excellent opportunity for early career scientists and students to showcase their research and gain international exposure.

Deadline
15 February 2018

Contact: npoce@qdio.ac.cn
http://oss18.csp.escience.cn/dct/page/1

50th International Liege Colloquium on Ocean Dynamics
Liege, Belgium
28 May – 1 June 2018

We welcome abstracts in the study of the ocean using long-term datasets, based on in situ data, remote sensing data, model simulations and reanalyses. Works that evidence the importance of maintaining in time the in situ and remote sensing datasets, and review studies that provide a perspective of the advancement of science during the last decades using these long-term datasets are also welcome.

Deadline
19 January 2018

Contact: Via website
http://labos.ulg.ac.be/gher/home/colloquium/colloquium-2018/

IV International Conference on El Niño Southern Oscillation: ENSO in a Warmer Climate
Guayaquil, Ecuador
16 - 18 October 2018

The main goal of the conference is to review the progress on the science of ENSO with a focus on examining the range of ENSO "flavours" (especially in regard to the longitudinal variations of warming), assess the existence of possible, and distinct precursors to the different flavours, and examine how the different oceanic and atmospheric processes that drive the different ENSO flavours and impact their predictability would vary in a warming world.

Deadline
30 April 2018

Contact: enso2018@clivar.org
http://www.ensoconference2018.org

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Have any opportunity you would like to announce here? Contact lilian.krug@nf-pogo-alumni.org

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