

solas event report

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“Ocean Acidification - Training and Community Networking: Pathways to Success”

13 - 16 February, 2017
Dakar, Senegal

The Ocean Acidification - Senegal practical training and networking meeting (OA-Senegal) took place for the first time in West Africa at the University of Cheikh Anta Diop, Dakar, Senegal. The OA-Senegal events were organised by Future Earth Coasts with the support of the following organisations, represented by attendees: the oil & gas company Kosmos Energy, SOLAS, the Center for Marine and Renewable Energy, the Ocean Acidification International Coordination Center, and the Institut de Recherche pour le Développement; to name a few. The OA-Senegal events were attended by fifteen participants originating from Benin, Cameroon, Côte d'Ivoire, Nigeria, Senegal, and Togo. Overall, six lecturers coming from France, Sweden, Spain, South Africa, and



Figure 1: Networking session during the OA-Senegal events. © Cheikh Anta Diop University, Dakar, Senegal.



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Figure 2: Participants of the OA-Senegal events. © Cheikh Anta Diop University, Dakar, Senegal.

the United States, guided the participants through the events. Lectures and discussions covered a general introduction to oceanic conditions off the West African coast, the goal and urgency to study ocean acidification, as well as the chemistry involved in the acidification and its impacts on marine biodiversity. In addition, presentations were given regarding measurement techniques of ocean acidification, design of relevant acidification manipulation experiments, and re-

search in the field and in the laboratory.

Following the practical training, a networking meeting took place, where the training participants discussed ocean acidification in plenary sessions. In total, seventeen participants attended the sessions, coming from: Algeria, Benin, Cameroon, Côte d'Ivoire, Egypt, Ghana, Kenya, Madagascar, Morocco, Nigeria, Senegal, South Africa, Tanzania, Togo, and Tunisia. Presentations and discussions involved the development and improvement of the Ocean Acidification - Africa network (OA-Africa), the general knowledge exchange on operational outcomes and identification of current needs (resources and capacity) of the project. Potential scientific collaborations including research funding were discussed, as well as opportunities to extend the OA-Africa network in Africa. A steering committee involving researchers from Africa was identified, which will provide guidance and support to the network. The final part of the OA-Senegal events was a one-day field trip, which should give insights into building up ocean acidification experiments. These experiments were set up in aquaria and environmental parameters were manipulated. Finally, the trainees received their certificates of



Figure 3: Practical training on ocean acidification during the OA-Senegal events. © Lisa Robbins.

completion.

To conclude the OA-Senegal events, a dinner with all participants, local non-governmental organisations, and government officials from Senegal was organised. This event confirmed the importance of involving resident organisations and stakeholders, who can provide significant local expertise and experience. This dinner provided an invaluable opportunity to connect researchers, non-governmental organisations, and government officials and develop the OA-Africa network across the continent.

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Marie Boye is a researcher at the National Center for Scientific Research working at the Laboratory of Oceanography and Climate: Experiments and Numerical Approaches at the University of Pierre and Marie Curie, Paris,



France. Her research focus is on the interactions between climate change and the biogeochemical cycles in the ocean, including trace elements, isotopes and ocean acidification. Marie Boye assesses the biogeochemical drivers influencing the phytoplankton ecosystem and the carbon cycle at different scales of time and space, combining observations, calibration of emerging proxies of acidification and warming in phytoplankton, experimentations, and simulations. Her research provides key functions to develop biogeochemical models from the pre-industrial area, at present and for future projections on the carbon cycle. She was a trainer at the OA-Senegal events and works on the development of the OA-Africa network.

Events sponsors





Sam Dupont is a researcher and an associate professor in marine eco-physiology at the University of Gothenburg, Sweden. His main research topic is on the effect of global changes, including ocean acidification, on marine species and ecosystems. Sam works actively on the development of the OA-Africa network and was a trainer at the OA-Senegal events.

The Ocean Acidification - Africa network: Putting Africa on the ocean acidification map

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Ocean acidification is identified as a major threat to marine species and ecosystems and is one of the United Nations Sustainable Development Goals: Goal 14.3: Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels (United Nations, 2015). When it comes to understanding, projecting and anticipating the impacts of ocean acidification, some countries or even continents are left relatively unexplored, despite their biological and socio-economical vulnerability to future marine global changes. This problem was the rationale behind the development of a new network focusing on ocean acidification in Africa. The OA-Africa network has been built over four training courses (www.oa-africa.net/). A

first general training course was organised in Cape Town, South Africa (November 2-6, 2015) by the Ocean Acidification International Coordination Centre. It was quickly followed by more specific courses: (i) a practical course on biological experiments in Inhaca, Mozambique (March 7-11, 2016) organised by the Global Ocean Acidification Observing Network; (ii) a course focusing on chemical monitoring in Flic en Flac, Mauritius (July 25-30, 2016) organised by The Ocean Foundation through the ApHRICA project; and (iii) a practical training combined with a networking meeting in Dakar, Senegal (February 13-16, 2017) organised by Future Earth Coasts. All together, these courses gathered participants from more than 24 different African countries



Figure 4: Left: Participants of an OA-Africa network event in South Africa. Right: Participant Mohamed Elsafy at the OA-Africa network event in South Africa. © Sam Dupont.

(Algeria, Angola, Benin, Cameroon, Democratic Republic of the Congo, Republic of the Congo, Côte d'Ivoire, Djibouti, Egypt, Ghana, Kenya, Liberia, Madagascar, Mauritius, Morocco, Mozambique, Namibia, Nigeria, Senegal, Seychelles, South Africa, Tanzania, Togo, Tunisia). The OA-Africa network, led by Dr. Chibo Chikwililwa (Namibia) and Dr. Warren Joubert (South Africa), was launched officially on October 20, 2016 and the first face-to-face meeting was organised re-



Figure 5: Practical training on ocean acidification during an OA-Africa network event in South Africa. © Sam Dupont.

cently in parallel of the OA-Senegal events. Prominent researchers from several African coastal countries discussed the coordination and regional priorities for ocean acidification activities on the continent. Generally, the OA-Africa network aims to coordinate ocean acidification related research and its monitoring, provide information and guidance to stakeholders and policy makers, and promote and advance ocean research through outreach and capacity building initiatives. With a strong support from the international community, including the International Atomic Energy Agency project “Supporting a global ocean acidification network - toward increased involvement of developing states” the challenges and opportunities for ocean acidification research and governance across Africa are currently evaluated. The first three African institutions will be equipped with a new ocean acidification research beginner kit (funding ApHRICA project). These kits contain affordable technologies for ocean acidification experiments. Practical guidance is provided by the Scripps Institution of

Oceanography, San Diego, United States (Dr. Andrew Dickson, carbonate chemistry measurement) and the University of Gothenburg (Dr. Sam Dupont, biological experimentation). These efforts will combine both, the basic equipment and knowledge to start chemical and biological monitoring, as well as perform general biological experiments. The OA-Africa network already encouraged some of the participants and trainers to cooperate on a range of different projects. For example, two new PhD projects funded by the Swedish International Development Cooperation Agency will focus on the impact of ocean acidification in Mozambique. The OA-Africa network is already working toward addressing the indicator of the Sustainable Development Goal 14.3: Average marine acidity (pH) measured at agreed suite of representative sampling stations (United Nations, 2015). Additionally, the OA-Africa network will initiate and lead the Ocean Acidification Day. On the World Ocean Day (June 8, 2017), researchers from all over Africa and in partner countries will join and measure pH (www.oa-africa.net/events/world-oceans-day/). This initiative led by African scientists (Folasade Adeboyejo, Excel Research Academy, Nigeria and Dr. Andry Herizo Rasolomaharavo, University of Antananarivo, Madagascar) and facilitated by Dr. Sam Dupont (University of Gothenburg, Sweden) and Dr. Martin Le Tissier (University College Cork, Ireland) will be broadly communicated through a national and international press and social media campaign, as well as during the United Nations ‘The Ocean Conference’ held during June 5-9, 2017 in New York. The OA-Africa network is a success story demonstrating how capacity building combined with a real local passion for the ocean can transfer into self-organisation and actions toward addressing one of the Sustainable Development Goals of the United Nations.

References

United Nations (2015), Transforming Our World: The 2030 Agenda for Sustainable Development, United Nations Secretariat, New York, United States.



Felix Besack is a member of the OA-Africa network and a junior lecturer at the University of Douala, Douala, Republic of Cameroon, working in the laboratory of oceanography and limnology. He participated in the OA-Senegal events.

The OA-Senegal events were inspiring and an enrichment of knowledge. The events had a new and interdisciplinary approach, where every participant was able to find his or her research interest, which is a key factor to implement this new field of research in the participating countries. One of the most interesting parts of the events was to discover the different reasons why ocean acidification occurs and how to investigate it. Regarding factors that favour ocean acidification, the human demography and the industrialisation are good examples what happens in Central Africa and particularly in Cameroon. Some indicators of ocean acidification in Cameroon are salinity changes and rise in sea level, which are both causing serious damages to the marine and coastal environment along the coast of Cameroon. Numerous investigations are being carried out by many scientists. However, in Cameroon the understanding of ocean acidification is still limited due to little financial support, lack of political interest, and little or no network among scientists.

What I gained from the events

The events familiarised me with a wide range of topics, from the general lectures to practical sessions. These sessions involved how to evaluate the impact of pH changes on some biological relevant species (calciferous organisms) by using the simple pH specification method (requiring a pH meter, small aquariums and a Conductivity, Temperature, Depth sensor). Additionally, lectures dealt with how to measure and calculate the marine carbonate chemistry, experimental designs and large scale projections of biological impacts.

Future plans

The University of Douala, Republic of Cameroon, is looking forward to a strong cooperation with the newly-build OA-Africa network. We plan to conduct broad investigations along the coast of West Africa and the Republic of Cameroon, where we want to investigate the following:

- The spatial and temporal variation/distribution of carbon dioxide in marine ecosystems;
- The impact of pH changes on the species distribution;
- The conditions of ecologically important species regarding ocean acidification and climate change (Coccolithophores and Diatoms);
- The role of mangrove forests on carbon dioxide sequestration; and
- The potential reasons for the pH decrease along the African coast, which will be investigated by monitoring these areas and modelling.

Importance to my research

Currently, I am working on high resolution modelling of the hydrodynamics along the coast of Cameroon using 3D SYMPHONIE model developed at the Laboratoire d'études en géophysique et océanographie spatiales, Toulouse, France. This model has to be validated against *in situ* data by parameters such as temperature, salinity, pH, and carbon dioxide. The knowledge I acquired during the events has given me plenty of state-of-the-art information on marine pH concentrations, carbon dioxide and alkalinity, as well as how to sample, measure and calculate these variables in the field.



Ibrahima Diack is a PhD candidate in the laboratory of atmospheric and ocean physics at the Cheikh Anta Diop University, Dakar, Senegal. He was a participant of the OA-Senegal events.

The OA-Senegal events, organised in Dakar, were a wonderful opportunity.

What I gained from the events

One of the major benefits from the events was the interaction between trainers and participants. This course helped me to better understand the relationship between the ocean and the atmosphere, particularly with the carbon pathway and its association with other research fields, including physics, chemistry, and biology. My awareness and curiosity regarding ocean acidification have considerably increased. Ocean acidification broadly impacts the marine ecosystems and because a lot of people have the ocean as their source of life, also the local communities and policymakers should be aware of this issue and its impacts.

Hands-on experiences during the course were done via collecting data with a partial pressure of carbon dioxide sensor which gave some theoretical ideas of the values. To investigate ocean

acidification, a special software (CO₂Calc) was introduced, which allowed to compute parameters such as pH, total alkalinity, and the partial pressure of carbon dioxide.

Future plans

In the context of global warming, Africa is one the most exposed continents. Only a few studies on ocean acidification have been conducted in Africa and thus, it is extremely important to support African students that are interested in this research. The OA-Africa network is a step forward and it should be further strengthened by capacity building and data sharing between the institutions.

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Folasade Adeboyejo is a PhD candidate, focusing on marine ecology at the Excel Research Academy, Lagos, Nigeria. Folasade is a member of the OA-Africa network and participated in the OA-Senegal events.

It was a privilege to attend the OA-Senegal events. Overall, the events were very interesting and educative. I participated in an event that brought together researchers and stakeholders across several coastal African states, for the first time. The OA-Africa network is a great platform to develop collaborative science and individual research efforts, as well as connect different African states.

What I gained from the events

Prior to the OA-Senegal events, ocean acidification and its impacts were not really clear to me. The most important points that I gained from the events were the ability to communicate the concept of ocean acidification and changing ocean chemistry to the society, as well as the fact that we have to change our behaviour. If we do not change anything, ocean acidification will have terrific effects on the ecosystem with large effects on the society. The practical training, in-

cluding ocean acidification experiments, helped me to better understand the relationship between human activities, marine biological systems and ocean chemistry. The presentation of instruments and equipment to explore ocean acidification highlighted that we could start with this kind of research.

Future Plans

Attending the OA-Senegal events raised my interest in ocean acidification research using ecosystem based approaches. Thanks to the OA-Africa network, this research may provide more scientific opportunities for African scientists. Personally, I am taking the bull by the horns as I am promoting the upcoming World Ocean Day as a platform to make the African society aware of the goals and visions of the OA-Africa network. On the World Ocean Day we will join the global initiative and measure the pH of the coast along Africa.

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