

PRESS RELEASE

The South Atlantic Ocean: another unexpected greenhouse gases sink?

The Ocean Mapping Expedition unveils new sets of « world first » scientific data between Cape Town and Dakar regarding the exact role of the oceans in the carbone cycle, as well as record concentrations of plastic pollution in Southeast Asia

The Swiss expedition engaged in a four-year journey (2015-2019) around the world in the wake of Magellan aboard the *Fleur de Passion* sailboat to measure the human impact on the oceans and raise awareness of sustainable development issues stops in Dakar from March 28 to April 8, 2019 after four weeks of sailing from Cape Town.

The Winds of Change program monitoring greenhouse gases on the surface of the oceans in partnership with the University of Geneva reveals surprisingly low concentrations of methane and carbon dioxide over the South Atlantic after similar observations in the Indian Ocean, although oceans are commonly supposed to be emitters of these gases.

The *Micromegas* program on meso and microplastic pollution, in partnership with Oceaneye NGO, shows that more than 90% of the surface water samples collected by the expedition to date contain plastic particles in higher proportions than in considered « highly polluted » Mediterranean, with a record average pollution of 551 g/km² in Southeast Asia.

From Dakar, *The Ocean Mapping Expedition* will set sail towards Cape Verde, the Azores, Galicia and Portugal before returning to Seville on Friday, September 6, 2019 putting an end to a trip that has also included to date 58 adolescents as part of the *Youth At Sea* socio-educational program, and 17 comics artists.

Geneva/Dakar, 2 Avril 2019 - Four years after its departure from Seville on April 13, 2015, and less than six months before its return to the Andalusian city on September 6, 2019 at the end of her world tour in the wake of Magellan, *The Ocean Mapping Expedition* continues its tireless inventory of the human impact on the oceans thanks to the now widely proven potential of *Fleur de Passion* as the logistics platform and flag-bearer of the expedition.

The 33-meter ketch and largest sailboat under the Swiss flag arrived in Dakar on March 28, 2019 after a four-week run from Cape Town across the Southern Atlantic ocean, the longest navigation without touching the ground since the departure of the expedition. And as at each of the stopovers, she will be the privileged place to bring the word of the oceans to the schoolchildren who will visit the boat, and to share the results of the various scientific programs on noise and meso, microplastic pollution as well as on greenhouse gases over the surface of the oceans.

« *The Ocean Mapping Expedition and sailing ship Fleur de Passion embodies a new approach to oceanographic challenges today. They bring to the scientific community an unsuspected potential*

for reference field data collection, » says Samuel Gardaz, vice-president for public affairs at the Pacifique Foundation, a Geneva-based non-profit organization that leads the expedition.

« *By our ability to cross oceans as well as to sail closer to coastlines, and thanks to the various scientific programs implemented on board with our partners, we are able to contribute in a very significant way to a better understanding of these still largely unknown environments, in this case in the way they are impacted by human activity* », continues Samuel Gardaz.

The Winds of Change program on greenhouse gases: a world first

« *So is the pioneering Winds of Change program consisting in continuously monitoring greenhouse gases - methane (CH₄) and carbon dioxide (CO₂) - over the surface of the oceans developed and conducted in partnership with the University of Geneva,* » he adds.

From Mactan in the Philippines, where the program was launched in December 2017, to Dakar via Singapore, Jakarta, Maputo, Durban and Cape Town across the Indian and South Atlantic oceans, some 12,000 nautical miles (about 22,000 km) have been analyzed continuously by the expedition, « *a world first revealing unprecedented data* », underlines Gardaz.

The South Atlantic Ocean: surprisingly low methane and carbone concentrations

« *The data collected by The Ocean Mapping Expedition between Cape Town and Dakar from 28 February to 28 March 2019 reveal surprisingly low concentrations of methane and carbon dioxide over the surface of the South Atlantic Ocean* », says Prof Daniel McGinnis, head of the Aquatic Physics group at the Faculty of Sciences, University of Geneva, and responsible of *The Winds of Change* program along with his colleague Dr Daphne Donis.

« *These low CH₄ and CO₂ concentrations could be indicative of the fact that Fleur de Passion sailed off shore well away from any land sources, adds McGinnis. Though the region is thought to be an atmospheric CO₂ source, our low near-surface concentrations indicate the South Atlantic Ocean could be an unexpected greenhouse gases sink during this season.* »

« *Average carbon dioxide concentrations over the transect from Cape Town to Dakar were under 400 ppm, with the minimum recorded of 392.6 ppm (Global average atmospheric concentrations are ~410 ppm). Similarly, average methane concentrations over this transect were below 1.78 ppm with minimum recorded value of 1.7. The global average atmospheric concentration is 1.85 ppm* », explains Pro McGinnis. « *Our preliminary analysis of these data don't even show the usual diurnal CO₂ concentration fluctuation associated with algal growth* », he says.

According to the researcher from the University of Geneva, « *the unprecedented data collected by The Ocean Mapping Expedition underline how further observations are urgently needed to better determine the processes guiding the uptake (or emissions) of these important greenhouse gases transports by South Atlantic, and potentially all the oceans around the globe.* »

Similar observations over the Indian Ocean in 2018

In June 2018 after completing the crossing of the Indian Ocean from Jakarta to Maputo, *The Ocean Mapping Expedition* unveiled this ocean could be an unexpected sink for methane.

« *For the first time ever, we were able to assess and quantify the near-surface atmospheric methane and carbon dioxide concentrations while performing the longest longitudinal transect of an ocean, namely the Indian Ocean* », recalls Prof. Daniel McGinnis.

« *This unprecedented data-set showed us that the Indian Ocean continued to be an important CO₂ sink* », he adds.

« More surprisingly, however, was that the Indian Ocean could be an unexpected sink of atmospheric methane. In general, it is thought that almost all oceans and inland freshwaters are sources of methane to the atmosphere. Over the Indian Ocean, the methane above the sea surface is consistently about 5-6% lower than atmospheric concentrations. Though more investigation is needed, it appears at first glance that the Indian Ocean may uptake atmospheric methane », says the scientist.

To perform *The Winds of Change* program, 33m-long *Fleur de Passion* - a former WWII minesweeper from the German Navy converted into a ketch and now the biggest sailboat under Swiss flag - is equipped with a ultraportable greenhouse gas analyzer with a sampling port positioned 16 meters above the sea surface on the aft mast and automatically collects methane and carbon dioxide readings every 1 minute.

An urgent need to revise our concepts on the global carbon cycle

The ambition of *The Winds of Change* monitoring program for greenhouse gases on the surface of the oceans is to provide the scientific community with unprecedented and reference field data and therefore to contribute to a better understanding of the role of the oceans in the current changing global climate. In view of the worrisome evolution of the climate and the resulting ocean acidification, it is becoming increasingly urgent to have baseline data available to revise our concepts on the global carbon cycle.

« *These new exciting results of the program present a huge step forward in the project and the overall issue of climate change, and prove our approach as a very effective method to track atmospheric gases over the sea* », also adds Prof McGinnis.

« *It provides the opportunity to access essential information at a very large geographical scale to complement that available by satellite so far at a time when the global scientific community is specifically alarmed by the lack of data on this issue* », he also says.

As explained by the scientist of US origin, « *climate change scientists need to have a comprehensive and accurate view of the concentrations of greenhouse gases on the surface of the oceans to be able to better understand their role not only as reservoirs of such gases, but also as emitters.* »

« *The oceans and fresh water as a whole emit more greenhouse gases, especially methane, than previously estimated, according to recent studies* », Prof McGinnis insists. *It is therefore urgent to re-evaluate the role of the oceans and lakes in the global carbon cycle for a better understanding of global warming issues.*».

Micromégas program : 91% of samples contaminated with plastic

Another field of research of the expedition: the meso and microplastic pollution, through the Micromegas program of cartography of this planetary plague, in partnership with the association Oceaneye in Geneva.

From Seville to Dakar, 194 surface water samples were taken by the crew. And of the 187 samples analyzed by the NGO's biologists, it turns out that 91% contain plastic polymers in the analyzed dimensions, from 1.0 to 5.0 mm for micro-plastics and over 5.0 mm for meso plastics.

« *All areas The Ocean Mapping Expedition crossed are affected by plastic pollution,* » says Pascal Hagmann, executive director of Oceaneye and head of the *Micromegas* program.

« *The average pollution of all the samples collected by Fleur de Passion is 26 g/km² in micro-plastics and 195 g / km² in meso-plastics, ie a total average concentration of 221 g/km² », he adds.*

Plastic pollution records in Southeast Asia

« *Southeast Asia beats all records with an average pollution of 551 g/km² », continues Pascal Hagmann, who however notes that the very high concentration of plastic particles observed in this region of the world is linked to a few samples particularly polluted.*

« *The most polluted sample was collected off the archipelago of Palau (Micronesia) with a pollution of 50'546 g/km², he says, even if it should be noted that the latter figure, although impressive, is by no means indicative of average pollution in this region », crossed by the expedition end of 2017-beginning of 2018.*

« *The Great Barrier Reef is also highly polluted with an average concentration of 855 g/km². This figure is nevertheless to be taken with precaution because the number of samples collected by the expedition in this region from April to June 2017 is limited and one of them proved particularly polluted », tempers Pascal Hagmann.*

« *The South Pacific Gyre, although thousands of kilometers away from any human activity, is also particularly polluted with an average concentration of plastic measured at 185 g/km² », he continues.*

Pascal Hagmann explains: « *This omnipresence of plastic pollutants is explained by the transport and dispersion of floating waste due to movements of surface water. It has now been shown that 3 mechanisms contribute to this transport: 1) marine currents (continuous and steady currents); 2) Ekman transport (currents due to shearing of the water surface by the wind); 3) Stokes drift (displacement due to waves).* »

Chilean Patagonia and Polynesia, on the other hand, are very poorly affected areas. Indeed, these regions are far from sources of pollution (densely populated areas) and are not under the influence of waste accumulation areas.

« *By way of comparison, the concentration in the South Pacific Gyre or the Great Barrier Reef is close to the level of pollution observed in the western Mediterranean Sea, a region considered by the scientific community to be highly polluted », Hagmann concludes.*

The comprehensive map of samples analyzed by Oceaneye is available on www.oceaneye.ch/cartographie/

Sharing the experience: 58 young people at sea

In parallel with the scientific programs, *The Ocean Mapping Expedition* includes a part devoted to the sharing of experience. This translates into the involvement on board of *Fleur de Passion* of teenagers in the frame of the Jeunes en mer (*Youth At Sea*) socio-educational program, in partnership with the Geneva association Pacifique (www.pacifique.ch).

Since April 2015, 58 teenagers and young adults - 47 Swiss, 7 Argentinean and 4 South African - have thus embarked by 2-3 or in groups of 5-7, for two months on average, to learn the maneuver and to the life of the edge as a foam.

« *These young people are the privileged witnesses of the environmental issues at the heart of the expedition and are involved, along with the crew, in the collection of surface water samples as part*



of the *Micromegas* program on micro plastic pollution, among other activities carried out on board », says Samuel Gardaz.

« They have the opportunity to meet our scientific partners and exchange in a multidisciplinary spirit that is essential to promote a sense of common good and of better living together on Planet Earth », he continues.

Outreach and culture: 17 illustrators « in residence »

As part of its cultural and environmental awareness program, *The Ocean Mapping Expedition* has so far welcomed 17 illustrators "in residence" aboard the ship since the departure of Seville: Zep, Matthieu Berthod, Tom Tirabosco, Pierre Wazem, Peggy Adam, Isabelle Pralong, Ambroise Héritier, Pierre Baumgart, Alex Baladi, Mirjana Farkas, Maurane Mazars, Cécile Koepfli, Aloys Lolo, Amélie Strobino, Frederick Peeters, Katharina Kreil et Anton Kannemeyer. They will be followed by Anne Bory, Renata Martino and a 20th and last artist until the return to Seville.

About the Fondation Pacifique

The Fondation Pacifique is a non-profit Swiss-based non-profit organization recognized of public utility based in Geneva. It was created in 2007 by a handful of men and women from the civil society driven by a passion for adventure and a strong spirit of enterprise at the service of the oceans and the common good. It designs, organizes and conducts at sea aboard sailing ships thematic expeditions combining scientific research, cultural, socio-educational and environmental awareness programs. Its goal is to contribute to a better knowledge of the human impact on the oceans and to raise awareness about sustainable development issues. To this end, its expeditions promote a multidisciplinary and experience sharing approach to global challenges, and are accompanied, in particular at the main stopovers, by outreach and communication actions to the attention of the media, policy makers and the general public.

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