

**October 31th, 2016**

**Reunión Argentina- Estadounidense en Ciencias Oceánicas 2016**

**2016 Argentina – United States Ocean Science Meeting**

**Action Plan**

**Executive Summary**

In August 2016 in the city of Mar del Plata, scientific and technical staff, and officers from Argentina and the United States related to the ocean sciences came together to coordinate an action plan on the study and monitoring of the South Atlantic. At this meeting, key issues related to ocean dynamics, ecosystems, biodiversity, chemistry and marine biology have been discussed.

The long-standing tradition of collaboration between the two nations provides a suitable framework to achieve continuity of on-going projects and planning of scientific proposals. Common research areas, involving the study of atmospheric variables in the South Atlantic, climate change at regional and global levels and its impact on ecosystems, biodiversity, and fisheries.

Recommendations in this report provide for the continuity of existing research and the implementation of new studies. Interdisciplinary and multi-institutional aspects of the recommended actions propose the development of models, observations and studies that contribute towards the improvement of weather forecasts, the understanding of climate variations, and the development of fisheries and ecosystems. These are essential tools to ensure sustainability of biological resources and their management for the benefits of the society.

It was agreed that to achieve these goals within a framework of high-level scientific collaboration, it is necessary to implement new funding mechanisms

**Institutional Framework**

As from 2014, the Ministry of Science, Technology and Productive Innovation has been implementing the inter-ministerial initiative Pampa Azul in order to articulate the scientific-technological actions promoted by the Argentine State involving sea-related topics. The main objectives of this initiative include deepening scientific knowledge as a basis for conservation policies and management of natural resources; promote technological innovations applicable to the sustainable exploitation of natural resources and industries related to the sea and strengthen maritime

awareness in the Argentina society. In this context, it is considered essential to establish international cooperation programs to provide solutions for global problems.

Bilateral cooperation in marine science between Argentina and the United States of America was formalized in October 2014 under the Second Joint Commission on Science and Technology held in Washington. On that occasion, it was agreed to hold a Argentina- American meeting in ocean sciences with the aim of establishing a bilateral dialogue on current and future partnerships between researchers, governments and academic institutions of both countries to strengthen existing alliances.

In turn, and on the occasion of the visit of the President of the United States of America to Argentina in March 2016, both countries stressed the importance and the positive impact of science, technology and innovation to generate more sustainable and comprehensive development for all countries of the world.

These binational actions are in line with Target 14 of the recent declaration of the United Nations on sustainable development: "Conserve and sustainably use the oceans, seas and marine resources for sustainable development"

### **Argentine- American Meeting in Ocean Sciences 2016**

From August 23th through 26th the Argentina US Meeting – 2016 in ocean sciences was held in the city of Mar del Plata.

This meeting was organized, on the Argentine side, by the Ministry of Science, Technology, and Productive Innovation (MINCYT), the National Institute of Fisheries Research and Development (INIDEP), and for the American side, the Embassy of the United States and the National Administration of Oceans and Atmosphere (NOAA). The meeting consisted of three segments: a scientific meeting that included plenary presentations, panels and working groups; a meeting on data management; and finally, visits to institutions by several members of the delegation of the United States.

In the opening of the scientific meeting Dr. Lino Barañao, Minister of Science, Technology and Productive Innovation of Argentina; Honourable Ambassador of the United States in Argentina; Mr. Noah Mamet, Dr. Alejandro Ceccatto, President of the National Council of Scientific and Technical Research, Dr. Conrado Varotto, Director of the National Committee on Space Activities; and Dr. Otto Wöhler, Director of National Institute of Fisheries Development and Research participated. Approximately 200 people attended, including leading scientists and government representatives, all of them related to sea and the marine sciences.

The main topics of the scientific meeting included: 1) Ocean variability and its relation to meteorology and climate, 2) ocean variability and impacts on the ecosystems, biodiversity and fisheries in the South Atlantic Ocean, 3) Systems and platforms applied to marine observations, and 4) data Management and Administration . This document summarizes the main conclusions and recommendations of the meeting.

As regards the four above mentioned four topics, the participants emphasized the importance of continuous monitoring of the state of ocean ecosystems and the atmosphere. Having scientific quality data, which are critical to evaluate changes in the ocean, it is essential to reach the aims proposed in this document in the medium and long-term .

The system of ocean global observations supported by the international community, in which Argentina and the United States are active and interested parties, is largely supported by countries in the South Atlantic region. However, due to financial, logistics, and professional training constraints certain issues of this collaboration are still insufficient. The different manners in which collaboration and association could be carried out between scientists and institutions from both countries would contribute to reverse this situation.

In order to improve understanding of the processes affecting the oceanic and atmospheric changes it is necessary to implement an appropriate system for monitoring and forecasting physical, chemical and biological variables in the South Atlantic. Similar systems under development in other regions provide the critical information about meteorology, climate and ecosystems to managers, to decision makers and the public in general. These data are necessary to plan and implement solutions and adaptations to cope with challenges related to agriculture, rainfall fisheries, etc. This information is closely connected to regional and global economies, and will allow the promotion of the sustainable use of ocean resources.

Argentina's continental shelf is one of the most biologically productive regions of the world's ocean , and therefore, has great socio-economic potential. Fisheries contribute significantly to national economy and on its shores a considerable percentage of the Argentine population is based. South Atlantic Ocean connects Argentine platform with the rest of the world ocean through the circumpolar Antarctic current and meridional circulation cell. Simultaneously, it absorbs large amounts of atmospheric carbon dioxide (CO<sub>2</sub>), which is a critical component of the carbon balance and acidity levels (pH) of the world 's oceans. The mechanisms of ocean dynamics that are being studied and evaluated are crucial for understanding marine productivity and biogeochemical cycles in the southern hemisphere and its future evolution. Besides, recently published studies also indicate that changes in physical

parameters occurring in South Atlantic may be responsible for a significant percentage in some atmospheric and global climatic aspects, such as variations in precipitation, heat waves and other events of extreme weather events. Among other, global changes include, increasing temperature of the sea surface and the heat content of the oceans and an increased sea level, about 4 to 5 mm per year in the South Atlantic. In addition, studies indicate significant variations of the dynamic sea parameters, such as changing latitudinal separation of the Brazil Stream from the continental slope, whose average location has moved two degrees (~ 200 km) to the south over the past 20 years, according to satellite data obtained from the sea surface. This shift is very important because Brazil Stream carries subtropical water to sub polar region and influences a region where commercial fisheries, the absorption of CO<sub>2</sub> and heat transport are significant indicators of the impact of climate changes on the ecosystems. Besides, the Brazil Current is the south-western component of the subtropical shift, connecting large areas of the South Atlantic. These changes have been detected due to the existence of an ocean observations network and are being evaluated regionally in the South West Atlantic. Similarly, the regional changes in the South Atlantic are being evaluated to assess their global impact through Teleconnections and meridional circulation of the global ocean.

The long history of collaboration between scientists and institutions from both countries in the area of ocean research, mutual interest in certain lines of research, and the great human potential, serve as motivation to explore new partnerships with the aim of sharing knowledge, experiences, resources and staff training to consolidate existing initiatives and implement new systems of observation, monitoring and forecast. Some of these recent experiences include: (1) the National Aeronautics and Space Administration NASA of the United States and the National Committee on Space Activities CONAE were partners in the SAC-D / Aquarius joint satellite mission, launched in June 2011 to measure the surface salinity of the world ocean. (2) The National Oceans and Atmosphere Administration NOAA, the Naval Hydrographic Service (SHN), the University of Buenos Aires and CONICET keep a fruitful collaboration, with institutions from other countries, to measure and study the meridional flow of water and heat in the South Atlantic under joint projects that make up the SAMOC (South Atlantic Meridional Overturning Circulation). (3) The Inter-American Institute for Global Change Research (IAI) has partly funded through NSF researchers from the National Institute for Fisheries Research and Development (INIDEP) to measure biological and physical parameters and the ocean environment in the EPEA station (Permanent Station Study environmental), in the SAMOC projects (South Atlantic Meridional Overturning Circulation) (VOCES) (Variability of Ocean Ecosystems Around South America) (4) NOAA has provided high quality gauges, now operated by the NHS to monitor sea level. (5) NOAA is working with the Argentina

Naval Prefecture in monitoring surface salinity from the ship Bernardo Houssay (ex Atlantis United States).

These collaborations have been long-lasting and have had a significant impact on the development of scientific knowledge thus achieving concrete applications and forging collaboration ties between researchers. These partnerships have contributed to build the mutual trust between agencies and institutions involved which ensured the highest exploitation of scientific data. Joint Actions mentioned had a positive bilateral impact to position South Atlantic in a global research context.

During the meeting, specific areas of cooperation and possible synergistic partnerships were identified on the basis of existing mutual interest between the two countries and the impact they shall have on the study and monitoring of the status of the South Atlantic and in its relationship with the meteorology, climate, and regional and global ecosystems. The suggested recommendations imply a great challenge to scientific and technical personnel in charge of its implementation and completion. Success in the research shall relies on the support, involving financial and institutional resources, by both countries. However, the socioeconomic impacts and benefits that could be generated largely outweigh the investment in training, research and technological developments.

### **Short-term Recommendations**

Participants recognized the critical value of the continuous and uninterrupted observations of a multidisciplinary nature of long time series that allow identifying average and extreme conditions, monitoring the state of the ocean and marine ecosystems and fisheries; to detect, evaluate and project their future evolution. Evaluation of changes in ocean conditions which may be of natural or anthropogenic origin, are essential to also evaluate potential changes in meteorology, climate, and ecosystems at the regional, and at a global level. The detailed list of each of the short term recommendations of the working group and panels is submitted in separate appendixes.

Generally, it was recognized and recommended:

- 1) Continue and properly maintain the series of multidisciplinary time series, underway, and which are part of existing collaborations or common interest. Define protocols that prevent interruption of the acquisition, transmission and analysis of data from them. For example, the Argentine scientist highlighted the

value of measurements of tide gauges , that apart from contributing to sailing safety allow to evaluate the quality of data from satellites above sea level and ocean currents in the Continental Shelf Argentina and the South Atlantic. Such data are also useful for the validation of numerical simulations and for the assimilation of data. In addition, there was an agreement to recognize the value of the time series including physical and biological variables and parameters, as measured in SAMOC and EPEA, which had been described above.

- 2) Using data from the existing observations systems to create a system for determining and distributing indexes and indicators of physical, chemical status and biological South Atlantic, including the regions where they plan to establish marine protected areas. This implementation is critical to inform scientists, leaders and political decision-makers on variables and products such as, for example, sea level; temperature and heat content of the water; and its relationship to the abundance of phytoplankton; marine species, location and intensity of currents, etc. These parameters are directly related to the services provided by the ocean and, therefore, to the benefits that these services provide to society.
- 3) Intensely support the continued study of the impact of variations of the state of the South Atlantic on climate and the extreme meteorology events in South America and at a global level.
- 4) Explore with the National Science Foundation (NSF) and Woods Hole Oceanographic Institution (WHOI) of the United States the possibility that, CONICET, INIDEP, the University of Buenos Aires, and SHN and other scientific Argentine institutions may be actively involved in some aspects of the Ocean Observatory Initiative (OOI) project of NSF; and explore the possible collaboration of NOAA to support this effort.
- 5) Examine the possibility that Argentine scientists and technicians receive permanent support from their institutions to participate in international working groups in data management and conduct training courses to incorporate knowledge and experience in the area of evaluation and data management
- 6) Promote that Argentine institutions (from the United States) involved in ocean observations, shall carry out joint activities through from different platforms in coordination with NASA and CONAE (e.g. autonomous sensors, ships, etc.) to validate and evaluate the data for the next satellite mission SABIA-Mar Argentina.
- 7) Identify new systems of observations, sampling, and analysis, which are currently being developed in the United States for potential application in interdisciplinary studies of common interest in the South Atlantic. Specifically, the increased participation of Argentina in opportunity vessels y, cruise or

cargo ships transiting the South Atlantic Ocean. In these vessels, measure equipment may be installed ; share knowledge in the study of environmental DNA, install f autonomous measurements vehicles and high frequency radar to monitor currents in coastal areas. Many of these systems provide continuous, high quality and very low cost observations, as compared to traditional ocean observations.

- 8) Continue and improve joint cooperation in different aspects of maintaining the global system of ocean observations, such as increasing Argentina's participation in the Argo Program, in the Disposable Bathythermographs System (XBTs) and in the Drifters Buoys System (Global Drifter Program).
- 9) Share experiences to promote scientific and educational dissemination with respect to the value of the oceans and of carrying out oceanographic studies, including the active participation of the scientific community.

### **Medium and Long Term Recommendations**

Scientists recognized the importance of implementing institutional and governmental policies that recognize the value of sustained and uninterrupted multidisciplinary observations necessary for the continuous monitoring of the status of the ocean. The importance of a system of observations and distribution of quality data for climate studies according to international standards were considered as a critical aspect in these recommendations.

It was recognized and recommended:

- 1) to develop and implement physical and biogeochemical models in the Continental Argentina Shelf first and then in the South Atlantic, with the aim of eventually generate monitoring and forecasting.
- 2) continue with state-of-the-art complementary systems and multidisciplinary observation necessary for the implementation of new observations (eg, CO<sub>2</sub> and pH) with the implementation of studies and analyses, including numerical models
- 3) Implement new ocean observations to help conduct a comprehensive study of ocean variability, thus allowing a significant increase in our understanding of the physical processes involved in ocean dynamics, at large and medium scale, with a particular interest in processes related to the relationship between the shelf and continental slope. The use of advanced technologies is also recommended to carry out these observations (e.g. autonomous vehicles) and for the implementation of such studies.
- 4) Facilitate the importation/exportation of used, new, equipment and of those sent for repair or calibration to the United States, and biological or geological

samples for studies conducted within the framework of the agreements between both countries recommendations issued by this meeting.

- 5) Explore the possibility of inter - institutional agreements between the two countries to facilitate concrete and continuous cooperation in the field of ocean and fishery sciences.
- 6) Explore the possibility of institutional arrangements between the two countries to facilitate cooperation to develop studies in order to analyze the effect of climate change on ecosystems where the major fisheries activities in the Southwest Atlantic are developed , among which are worth mentioning hake, shrimp and squid.

### **Human Resources Training**

During the meeting the need for increased training of technicians and students was discussed and to update training processes for the benefit of future generations and recognized the in different research areas, making measurements, development of equipment and instruments etc.

Among them, the following recommendations are worth mentioning:

- 1- enable Argentine observers on board in oceanographic campaigns of US research vessels so that they also receive training during campaigns.
- 2- Explore the possibility of training technicians, experts, professionals, crews and undergraduate and graduate students in US institutions.
- 3- Take courses and training sessions and exchange, similar to the data management meeting held in Mar del Plata as part of the meeting described in this report. Specifically, it was discussed and recommended to use opportunities funded and / or supported by MINCYT, the Global Office of the US Navy (ONR Global), the Partnership Program for International Research and Education (ERIP) NSF, the University of Miami, NOAA, etc.
- 4- Organize courses and training and Exchange meetings, similar to the meeting of data management that was carried out in Mar del Plata as part of the meeting described in this report.

### **Specific benefits**

Argentina and the United States share an interest in marine conservation issues. The recommendations indicated in this Action Plan try to pave the way for the consistent implementation of collaborations between both countries focused on the support this objective. Recommendations include some actions that may be immediately achieved and long- term ones, because they require greater logistical training, and



financial effort, Specifically, the implementation of these recommendations will achieve:

- 1) Improve and develop new observations, methods, techniques and numerical models to monitor and predict ocean, weather and climate conditions, at regional and global levels.
- 2) conduct monitoring and achieve understanding of the impact of the changes in ocean temperature, acidification, sea level and other parameters in ecosystems, fisheries and biodiversity, using novel techniques and advanced equipment. This will allow to take appropriate action for the sustainable exploitation of fisheries, preserve marine resources and establish protected areas.
- 3) Consolidation of an international technical and scientific team through exchanges between agencies from both countries. This will enable future generations to increase the understanding of factors involved in the sustainability of environments and marine biodiversity.

### **Final recommendations**

It was proposed to create a committee to monitor progress regarding the recommendations of this Plan of Action. These members shall communicate with the contact points that participate in each recommended action to discuss the progress achieved and the state of advance of each action every six months.

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Appendix 1 agenda of the meeting

Appendix 2 Participant List