



XXXIII Antarctic Treaty Consultative Meeting
3rd to 14th May, 2010

Punta del Este - Uruguay

Agenda Item: ATCM 13

Presented by: Korea (ROK)

Original: English

Scientific and Science-related Collaborations with Other Parties During 2009-2010





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Conscious of the importance of the collaborations and the spirit of the Antarctic Treaty and in accordance with Article 6 of the Protocol, the Republic of Korea cooperated with several parties during 2009-2010 in conducting polar scientific research and related activities.

1. Hydroacoustic monitoring in the Bransfield Strait

The Korea Polar Research Institute (KOPRI) and the United States National Oceanic and Atmospheric Administration's Pacific Marine Environmental Laboratory (US NOAA/PMEL) have maintained acoustic hydrophone arrays in the Bransfield Strait and Drake Passage since December 2005. During the 2009-2010 austral summer expedition, KOPRI and NOAA scientists successfully recovered five hydrophones in the Bransfield Strait aboard the *RRV James Clark Ross*. Five new hydrophones were redeployed at the same mooring location in the Bransfield Strait. These hydrophones passively record underwater sounds originating from earthquakes, icebergs and marine mammals. We expect these recordings to improve our understanding of tectonic events, volcanic activities, and ice break-up in the region. All the logistics were handled by the staff members of the British Antarctic Survey and all the recoveries and deployments were successfully completed with great support from the captain and the crew members of the *RRV James Clark Ross*.

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2. International collaboration on the study of Antarctic Oscillation and its impact on mid-latitude climate (2007-2009)

It is important to understand the causes of variability in the Antarctic Oscillation (AAO), particularly low-frequency variability. This depends heavily on the availability of AAO index reconstructions. To improve the quality of low-frequency changes in the reconstructions, we need to take advantage of multi-proxy data, including tree-ring and ice core data sets. The use of ice core and coral data would greatly improve low-frequency climate signal data and hopefully result in a much better AAO index for the past several centuries. This is essential to understanding whether the recent trend in AAO is caused by ozone, as suggested by recent simulations. To investigate the AAO variability and its connection to mid-latitudes, KOPRI is currently collaborating with Beijing Normal University of China. KOPRI provides matching funds of USD 20,000 for proxy coral data that is sampled in mid-latitudes, while Beijing Normal University analyzes the AAO index

using available meteorological data. This project was initiated by KOPRI to find teleconnections between Antarctica and East Asia over the long term by analyzing coral records in the northern mid-latitudes and integrating this data with modern meteorological data. Some of these results were published in 'Annales Geophysicae' (Journal). To understand the change in the AAO under the glacial climate conditions, KOPRI recently initiated another international collaboration with the Chinese Meteorological Administration (CMA). In this collaboration, KOPRI and CMA invest funds in each other and analyze the change in the AAO for the last glacial time. The purpose of this collaboration is to understand the role of the Antarctic winds on the glacial carbon budget.

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3. International collaborative marine and Quaternary geoscience research on abrupt environmental change in the Larsen Ice Shelf system

For the International Polar Year (IPY), two KOPRI scientists participated in an international, multi-disciplinary field program (USAP LARISSA program) driven by Professor Eugene W. Domack at Hamilton College, New York, to address the rapid changes occurring in the Antarctic Peninsula region as a consequence of the abrupt collapse of the Larsen Ice Shelf. The overarching goal of this project is to describe and to understand the basic physical and geological processes active in the Larsen embayment that **a)** contributed to the present phase of massive, rapid environmental change; **b)** are participating in that change as part of the coupled climate-ocean-ice system; and **c)** are fundamentally altered by these changes. The collaboration between KOPRI and its US partners will be extended for further accomplishment. This collaborative project will make use of the USAP *RV Palmer* in 2012 (as part of the IPY: LARISSA project) with Korean participation. In the following season, the Korea's icebreaker *Araon* will deploy to the NW Weddell Sea in the area of the Larsen Ice Shelf.

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4. The 16th International Symposium on Polar Sciences

The 16th International Symposium on Polar Sciences was held at KOPRI, Incheon, Korea from 10-12 June, 2009. It has been held in Korea and hosted by KOPRI every one or two years since 1988 (every year since 2000) with the aim of strengthening the network among polar scientists sharing the polar scientific research, and developing international collaborative research programs.

The theme of the 16th Symposium was "Polar Exploration with *Araon*", and consisted of more than 50 presentations spanning four themes: (1) climate change and the ocean system, (2) paleoclimate, (3) hydrothermal vent systems, and (4) tectonics and magmatism.

Many renowned and outstanding foreign scientists participated in the symposium and gave keynote speeches and presentations: Dr Eberhard Fahrback (AWI; “Decadal Fluctuations of the Water Mass Properties in Atlantic Sector of the Southern Ocean”), Dr Jian Lin (Woods Hole Oceanographic Institution; “Major Opportunities for International Multi-disciplinary Research and Exploration of the Global Mid-ocean Ridge System”), Dr Tom Trull (Univ. of Tasmania; “The Influence of Natural Iron Inputs on Southern Ocean Productivity and Carbon Sequestration”), Dr Julian A. Dowdeswell (Director of the SPRI, Univ. of Cambridge; “Glaciers, Ice sheets and the Marine Record: Evidence from Submarine Landforms”), Dr Eugene W. Domack (Hamilton College; “LARSen Ice Shelf System (LARISSA): A Multi-disciplinary Earth Systems Approach to Antarctic Environmental Change”), Dr Dana R. Yoerger (Woods Hole Oceanographic Institution; “Autonomous Discovery, Mapping, and Sampling of Deep Sea Hydrothermal Vents”), Dr Terry Whitley (Univ. of Alaska Fairbanks; “Biological Production in the Western Arctic and Possible Future Research Directions”), Dr Koji Shimada (Tokyo Univ.; “Mechanism of Catastrophic Climate Changes in the Arctic Ocean”), Dr Stephen F. Ackley (Univ. of Texas at San Antonio; “Antarctic Sea Ice Processes and Climate: What We Have Learned and What We Need to Know Further”), etc.

This symposium not only provided much information about how to take advantage of research vessels in the polar oceans so as to make the research activities feasible, but it also provided opportunities to share the research outcomes and fostered collaboration among the participants.

Also, the upcoming 17th Symposium, which is themed “Physioecological Responses to Climate Changes in Polar Regions”, will be held at KOPRI, Incheon from 26–28 May, 2010. The symposium will consist of five main sessions: (1) Current status and Changes in Polar Ecosystems, (2) Polar Ocean and Sea-ice Ecosystems, (3) Polar Terrestrial Ecosystems (4) Subarctic and Arctic Ecosystems, and (5) Stress Responses of Cold-adapted Organisms. Over 200 foreign and domestic researchers are expected to take part in this symposium of presentations and discussions. Through this symposium, the participants will not only get the information and know-how on how to connect polar ecological research and climate change, but they will also have the opportunity to share their ideas and collaborate with other researchers.

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5. Korea-UK Focal Point Project (First Year)

The Korea-UK Polar Focal Point Project (first year: April, 2009 to April, 2010) has been implemented as the follow-up action after polar science had been accepted as the Ministerial Agenda between Korea and the UK in 2008. During the 16th International Symposium on Polar Sciences (10-12 June, 2009) in Incheon, there was a discussion about holding the UK-Korea Polar Focal Point Workshop in Cambridge. As a result, nine Korean researchers participated in UK-Korea workshop, which was held in the BAS and the SPRI in October 2009, for a group meeting among researchers in the field (ecosystem, operations, geology and marine geophysics and research policy). And one KOPRI researcher visited the Rothera station to collect samples with the help of BAS in November 2009. Now, bilateral discussion for future collaboration in biology is progressing.

Also, KOPRI had entered into an MOU with BAS for “exchange of ship time” on 24 September 2009, which led to an invitation to seven KOPRI researchers and two NOAA researchers to board RRV JCR for 14 days of geoscience research (1 January 2010 to 14 January 2010).

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