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Scientific & Science-related Collaborations with Other Parties During 2011-2012

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Background Paper Submitted by Korea (ROK)

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 other parties during 2011-2012 in conducting polar scientific research and related activities. (Contact Point: Mr. Dongmin JIN, KOPRI, dmjin@kopri.re.kr)

1. Korean international Research Expedition on Amundsen Sea

The Korea Polar Research Institute (KOPRI) and BAS (UK), Gotenburg Univ. (Sweden), Rutgers Univ. (US) had a joint research expedition using the *Araon* in the Amundsen Sea, during 22 January 2012 ~ 11 March 2012 (30 days at the study site).

This joint research cruise is to investigate the warming trends and mechanisms in the Amundsen Sea, and to assess the chemical, biological, and biochemical consequences of the rapid warming by implementing an earth observation system from space down to the deep sea by investigating physical, chemical, and biological processes under the current trend of climate change; flux of the climate gases in and out of the polynya and their roles in ecological processes; biological processes and biogeochemical cycles associated with polynya; links between biogeochemical processes and food web structure; key functional biology groups, their roles, and interactions.

Through this expedition we conducted: 1) hydrographic survey; 2) moorings for ocean current and sediment trap; 3) survey of inorganic carbon system and dissolved trace gases; 4) estimation of POC export flux; 5) survey on plankton and microbial community; 6) study on Antarctic krill acoustics; 7) satellite remote sensing; 8) Multi-beam and sediment coring; 8) atmospheric research and snow chemistry 9) study on sea ice mechanics, etc.

UK (BAS 'iSTAR' program), Gotenburg university researchers deployed and recovered moorings at the targeted area, and a Rutgers Univ. researcher conducted phytoplankton sampling & analysis on board with KOPRI researchers.

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2. Joint Expedition for the Search of Antarctic Meteorites between KOPRI and Italian PNRA

KOPRI and PNRA (the Nazionale delle Ricerche in Antartide) carried out a joint expedition for the search of meteorites in Victoria Land, Antarctica, within the logistic framework of the XXVI PNRA Antarctic Campaign in January 2011.

The expedition was conducted at the Frontier Mountain blue ice field, operating from a remote camp installed in the area, and supported by the Italian Mario Zucchelli station at Terra Nova Bay. A number of helicopter-supported reconnaissance trips from the station were carried out to several blue ice fields in Victoria Land to evaluate their potential in yielding high concentrations of meteorites. These areas are potential targets for future joint meteorite search campaigns. During the expedition, both parties successfully recovered 113 meteorites ranging from >500 g to < 1 g. Both parties have classified together the specimens,

and registered about 40 meteorites to the Meteoritical Society. KOPRI and PNRA will continue for various scientific activities and logistics for further collaboration.

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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), KOPRI scientists participated in an international, multi-disciplinary field program (USAP LARISSA program) 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.

This collaborative project makes use of the USAP *RV Nathaniel B. Palmer* in 2012 with the Korean participation. During the cruise of *Nathaniel B. Palmer* in NW Weddell Sea in early 2012, four Korean scientists are involved in shipboard sampling. In particular, two Korean scientists of them attempt the new approaches in the biological field. In the following season, the Korean icebreaker *Araon* will cruise to the NW Weddell Sea in the area of the Larsen Ice Shelf to recover the deployed and moored instruments.

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4. Expedition to the Antarctic Ridge

In 2011, KOPRI conducted twice surveys on segments of AAR (the Australian-Antarctic Ridge), the largest unexplored expanse of the global mid-ocean ridge system, using the icebreaker *Araon*. Two times surveys were conducted in March and December 2011. Harvard University and Woods Hole Oceanographic Institution (from United States) participated in the first cruise in March. As a result of twice cruises, we had a multi-beam map and total 48 rock core samples from the two ridge segments at 160°E (KR1) and 152.5°E (KR2). Also, we found strong signals of hydrothermal venting using MAPR (Miniature Autonomous Plume Recorder) profiles from the ridge. It appears that hydrothermal vents are distributed in the central part of the KR1 segment. In the KR2 segment, hydrothermal vent signals were mainly found in the western part of the segment. This first discovery of hot vents may be of interest to CCAMLR. KOPRI keeps bilateral partnership with US research teams including data sharing & interpretation, and expedition cruise.

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5. International Collaboration on the Study of Magnetism in the King George Islands

Followed by agreement on collaboration between KOPRI and NIPR (National Institute of Polar Research: Japan) in the magnetic study in the area in 2010, NIPR have continued a magnetic study on King George Island and Bransfield Strait since 2010/2011. Study methods were aeromagnetic survey using an unmanned aerial vehicle and rock magnetism. The facilities in the King Sejong Station and logistics support were shared during the in situ activities.

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6. Planning Meeting for Korea-Italy-New Zealand-USA Joint Oceanographic Research Collaboration in the Western Ross Sea, Antarctica

The Terra Nova Bay region surrounding the Italian research station Mario Zuchelli and new Korean Jang Bogo Station is remarkably well situated for an ocean time-series study on the Ross Sea Shelf, with ready access to inshore coastal waters, and, more importantly, deeper waters of the western Ross Sea continental shelf during the austral summer and fall, including key regions of biological blooms and Antarctic Bottom Water formation. Recognizing this, we would like to develop a joint Korea-Italian-US ocean time-series research program in the western Ross Sea.

A number of key scientific questions were discussed in the Korea-Italy joint workshop held in KOPRI, 6-7 September 2011 and were discussed in the Korea-USA workshop which will be held in KOPRI, 6-9 May 2012, with an important theme being the linkage between physical, biological and biogeochemical processes in the coastal Terra Nova Bay region with the larger, regional-scale processes occurring on the Ross Sea continental shelf. In particular, there are considerable interests in extending the ongoing time series research program that is carried out in Terra Nova Bay to include several offshore sites in the western Ross Sea, with science questions being addressed by the collection of hydrographical, biogeochemical and biological data on an annual basis. In 2012 May meeting, we expect to explore the possibilities for a Korean-Italian-U.S. collaborative research program in the western Ross Sea. We are also trying to have a joint workshop with New Zealand colleagues in 2012 or 2013.

The joint oceanographic research collaboration between Korea-Italy-New Zealand-USA will be excellent in that we can seek to (1) build on and expand the complementary research strengths of the Korean-Italian-New Zealand-US institutions and investigators; (2) leverage the significant existing resources of the Korean-Italian-New Zealand-US Antarctic research programs; and (3) advance the education and career development of undergraduate, graduate and postdoctoral researchers from Korean-Italian-New Zealand-US institutions, by providing opportunities for research and training. These activities are expected to be intended to result in a sustained international collaboration between the Korean-Italian-New Zealand-US institutions involved. We believe this collaborative effort is particularly timely: it is galvanized by the increasing evidence of human-induced environmental changes in the Antarctic, by the urgent scientific imperative to understand the impacts of these environmental changes, and by the need to train the next generation of scientists who will continue this important research.

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