

Korean Antarctic Research Programme
Geoscience activities 2001-2002
SCAR Working Group Geosciences

During the last two years (00/01-01/02) Korean Expedition have accomplished geoscience activities based on the researches in three categories: marine geology, geophysics and terrestrial geology. Especially, marine geology is closely related to paleoceanography and/or paleoclimate since LGM, and many global and regional scale paleoclimatological evidences have been found not only from the continental shelf core sediments and fjord sediments but also deep basin of Bransfield Strait.

Scientific Activities

Marine Geology in Antarctic Peninsula

Title - Recent climatic warming in Antarctic Peninsula recorded in marine sediments and ecosystems

Principal Investigator - Ho Il Yoon, Polar Sciences Lab. of KORDI
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To develop an understanding of the relative contribution of atmospheric and oceanographic forcing on the climate system of the Peninsula from historic and Paleoenvironmental proxies (marine sediment and lake sediment cores) and to begin to link these changes to global scale phenomena such as ENSO/SIO fluctuations, solar variability, anthropogenic greenhouse gases, and finally link these changes to Paleoenvironment in the northern hemisphere.

Title - Variability of surface temperature in the Antarctic Peninsula

Principal Investigator – Prof. Tae-Yong Kwon, Department of Atmospheric and Environmental Sciences, Kangnung National Univ.
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This study investigates the nature of interannual temperature variability in the Antarctic Peninsula through the comparison of temperature variations in the western and eastern sides of the Antarctic Peninsula.

Title - Microwave remote sensing of sea ice distribution

Principal Investigator – Prof. Jeong Woo Kim, Department of Earth Sciences and Research Institute of Geoinformatics & Geophysics, Sejong Univ.

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This project investigates the distributions of sea ice using various microwave remote sensing techniques in the part of Drake passage, Antarctica, between the area 45-75° W and 55-66° S by using Topex/Poseidon(T/P) radar altimeter, ERS-1 altimeter, ERS-2 scatterometer, Nimbus-7 Scanning Multichannel Microwave Radiometer (SMMR), and DMSP Special Sensor Microwave/Imager(SSM/I) data.

Title - Downward fluxes of settling particles in the Bransfield Strait, Antarctica

Principal Investigator – Dr. Dong Sun Kim, Polar Sciences Lab. of KORDI

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This is to examine particle fluxes by using time-series sediment traps at two sites of the Bransfield Strait from 1998 to 2000 for two years. Even though primary production is relatively low or moderate in the Antarctic Ocean, organic carbon flux is high compared to the temperate or equatorial areas due to the fast sinking of krill and salp fecal pellets. Therefore, the Antarctic Ocean may play an important role for anthropogenic CO₂ sink.

Title - A role of Antarctic-deep convection for the formation of monospecific diatom layer from Bransfield Strait in the northern Antarctic Peninsula

Principal Investigator - Ho Il Yoon, Polar Sciences Lab. of KORDI

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This project uses sedimentological, micropaleontological and porewater data of two piston cores from central basin, and one core from western basin in Bransfield Strait to infer the origin and its paleoclimatic implication for LDO interval encountered at the cores.

Title - Diatom assemblages from core sediments in the southern part of the Drake Passage, Antarctica

Principal Investigator - Dr. Young-Suk Bak, Department of Earth & Environmental Sciences, Chonbuk National Univ.

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This study deals with 64 species belonging to 23 genera identified in a sediment core from the Southern part of the Drake Passage, Antarctica.

Title - High-resolution echo facies analysis of glacial marine deposits in Bransfield Strait

Principal Investigator - Prof. Seok-Hoon Yoon, Department of Oceanography, Cheju National Univ.

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This study presents Quaternary sedimentation pattern in Bransfield Strait, based on analysis of high-resolution (chirp) echo characters.

Title - Chemistry and TEM microstructures of clay particles in the marine sediments around South Shetland Islands

Principal Investigator - Prof. Gi Young Jeong, Department of Earth and Environmental Sciences, Andong National Univ.

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Transmission electron microscopic (TEM) study was conducted on the clay mineral particles under $0.2\mu\text{m}$ separated from marine sediments around South Shetland Islands to examine their chemical compositions and microstructures.

Title - Holocene paleoclimate change recorded in lake sediment of King George Island, west Antarctica

Principal Investigator - Ho Il Yoon, Polar Sciences Lab. of KORDI
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A variety of sediment properties (sediment facies, magnetic susceptibility, grain size, total organic carbon etc) were analyzed from the drilled core which was obtained from the Langer See (King George Island) for the purpose of reconstructing the environmental variation during the Holocene.

Title - Holocene Paleoclimatic change with regard to the diatom flora recorded in the lake sediments of King George Island, Antarctica

Principal Investigator - Prof. Kyung Lee, School of Life Sciences, The Catholic Univ.

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The variation of sediment core including diatoms were analyzed from the drilled core which was obtained from the Langer Lake (or Yanou Lake) in King George Island for the purpose of reconstruction of the environmental variations during the Holocene.

Title - Anomalies of oxygen isotope stage 3 from a sediment core in the Antarctic polar front of Drake Passage

Principal Investigator - Dr. Sung-Ho Bae, Polar Sciences Lab. of KORDI

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The oxygen isotope stages from 1 to lower 5 can be recognised in the planktonic isotope record in sediment core DP00-02 just south of Antarctic Polar Front (AFP) within the Drake Passage, Antarctica. Based on oxygen isotope record of *N. pachyderma* sinistral, our data can be well correlated with the global isotope stratigraphy.

Marine Geophysics in Antarctic Peninsula

Title - Gravity and Bathymetric Study of the Antarctic-Phoenix Ridge and Hero Fracture Zone Intersection, Drake Passage

Principal Investigator - Dr. Young Keun Jin, Polar Sciences Lab. of KORDI
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This project aims to improve our understanding of the geological structures and the tectonic evolution process.

Title - Marine Magnetic Survey in the vicinity of Antarctic Peninsular

Principal Investigator - Dr. Sang Heon Nam, Polar Sciences Lab. of KORDI

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This Project examines the history of formation and evolution of Antarctic Peninsular.

Title - Geomagnetic and seismological observatory

Principal Investigator - Dr. Sang Heon Nam, Polar Sciences Lab. of KORDI

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Geomagnetic Observatory for magnetic secular variation at King Sejong Station in King George Island. Seismological Observatory installed the new broad-band seismometer in 2001.

Title - Seismic survey in Powell Basin and the peripheral area.

Principal Investigator - Dr. Yeadong Kim, Polar Sciences Lab. of KORDI

This project is to examine the geological structures and the evolution of the Powell Basin.

Terrestrial Geology around King George Island

Title - Volcaniclastic sedimentation of Barton and Weaver peninsulas, King George Island

Principal Investigator – Dr. Moon Young Choe, Polar Sciences Lab. of KORDI

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The Sejong Formation of Late Paleocene to Eocene is a lower volcaniclastic sequence unconformably overlain by upper volcanic sequence, and distributed along the southern and southeastern cliffs of Barton and Weaver peninsulas. This project aims to study sedimentary facies and depositional history of the formation during early Tertiary.

Title – Early Tertiary magmatic evolution of the southwestern King George Island

Principal Investigator – Dr. Jong Ik Lee, Polar Sciences Lab. of KORDI

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This project is to investigate the magmatic process and evolution of Early Tertiary mafic to intermediate volcanic rocks in the southwestern King George Island related to the subduction of ancient Antarctic plate. Many volcanic nunatak samples were obtained from icefield and are being analyzed at the lab for geochemical and isotopic studies.

Title - Seamount volcanism in the Phoenix Ridge (P3), Drake Passage

Principal Investigator – Dr. Jong Ik Lee, Polar Sciences Lab. of KORDI

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The axial seamount basalts in the P3 segment of the Phoenix Ridge were obtained from dredging and the geochemical analyses have been done in order to understand their origin. The seamount basalts have transitional geochemical nature between alkaline- and subalkaline-series basalts. The trace and rare earth elements compositions of the seamount basalts are very similar to those of ocean island basalts (OIB), and indicate that the seamount has been formed by a hotspot activity, not in association with a seafloor spreading.

Title – Geologic mapping of Barton and Weaver peninsulas, King George Island

Principal Investigator – Dr. Jong Ik Lee, Polar Sciences Lab. of KORDI

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The geologic and geomorphological maps (1:10,000) of Barton and Weaver peninsulas were published on January 2002 for summarizing geologic information related to sedimentation, igneous activity, hydrothermal alteration and structural evolution of the peninsulas.

Title – Mineralization and alteration of the southwestern King George Island

Principal Investigator – Dr. Soon Do Hur, Polar Sciences Lab. of KORDI

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This project is to investigate alteration process and mineralization property of altered volcanic and plutonic rocks in Barton and Weaver peninsulas. Four hydrothermal alteration types have been recognized; prophyllitic, phyllic, argillic and advanced argillic. The K-Ar ages of hydrothermally altered rocks are about 10 My younger than neighboring intrusive rocks.