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International Antarctic Experiment: hydroacoustic monitoring of tectonic activity and marine environmental changes within the Bransfield Strait and Western Scotia Sea, Antarctica

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Global seismic networks provide good azimuthal coverage throughout the world including the Arctic Basin, but in the southern hemisphere, global seismic catalog show very low levels of seismicity, in part reflecting the poor station coverage within this part of the world and dearth of array stations within the southern hemisphere. However, source of shallow submarine volcanism, many of which are unexplored, exist throughout, within the transtensional sections of the South Scotia Ridge and along the South Sandwich Back-Arc, Antarctica. Previous observations have highlighted the potential for hydroacoustic observation in the Polar Seas. During the last decade, the value of hydroacoustic monitoring of ocean floor seismicity has been demonstrated through work using the U.S. Navy's SOund SUrveillance System (SOSUS) and array of moored Autonomous Underwater Hydrophones (AUHs). As a result, the analysis of hydroacoustic data has revolutionized our understanding of mid-ocean ridge eruptive processes, has illuminated the complex structure of subduction zones and transform faults and has shown great promise as a tool in addressing a variety of tectonic problems.

In observance of the International Polar Year (2007-2008), KOPRI, collaborating with NOAA/OSU and Lamont-Doherty Earth Observatory (LDEO), has deployed AUH to record seismicity from along the Antarctic Peninsula and western Scotia Sea.This array will take advantage of the efficient propagation of sound in the oceans to detect and locate the acoustic (T-wave) signals of (>2.5-3.0 mb) earthquakes, as well as volcanic tremor, ice movement, and marine mammals from throughout the region. We will utilize the hydroacoustic waveform data to accomplish a number of tasks, including: a) Examine the overall temporal and spatial pattern of earthquake production along the Antarctic Peninsula and western Scotia Sea b) Evaluate the occurrence and distributionof submarine volcanic activity (using earthquake activity) in this region c)Record iceberg tremor to estimate the number and distribution of large icebergs in the Scotia Sea and the acoustic signature

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of ice breakup and movement within the Antarctic Peninsula region, d) Monitor volcanic arc and back-arc spreading centers for volcanic tremor and constrain those factors controlling its generation in the submarine environment, and e) Assess the type and distribution of baleen whale populations in the region where little previous information exits. As earthquakes can be used to track lithospheric processes, analyzing their distribution and association with magmatic, tectonic, hydrothermal and glacial/sea ice activity is paramount in accomplishing our goals. The polar regions also play key roles in our global environment and an important question is how are changes in ice mass linked with volcano-tectonic seafloor processes. Implementing polar observation systems would help document these linkages. This project also provides a new ocean sensor; a cold-water capable, deep-ocean hydrophone has been developed and tested that can be used in the polar oceans.