

Hydroacoustic observations of cryogenic signals in the Bransfield Strait, Antarctica

남극 브랜스필드 해협에서의 극저온 신호 수중음향관측

Lee, Won Sang, Yun, Sukyoung, Lee, Choon-Ki, Dziak, Robert P., Matsumoto, Haruyoshi,
Haxel, Joseph H., Jin, Emilia Kyung, Yoon, Seung-Tae

The soundscape in the Southern Ocean is a combination of marine mammal vocalizations, natural forces, such as wind and submarine tectonic activity, as well as cryogenic signals. The air-ice-ocean interaction is the primary process that creates cryogenic signals, which are largely from 1) internal cracking/calving of icebergs, 2) tremor from icebergs grounding on the seafloor, and 3) sea-ice breakup caused by thermal stresses as well as physical deformation from winds/currents/waves. The unique frequency content of cryogenic signals makes it straightforward to separate them from other sound sources. For 2005-2010, we deployed an array of hydrophone moorings in the Bransfield Strait, Antarctic Peninsula, to investigate the temporal variation in cryogenic signals and identify their contributions to the soundscape in the area. We identified source locations for 9,221 cryogenic events out of a total computer-detected events (19,689) that were recorded simultaneously by 4 stations. For the analysis presented here, we focused on cryogenic events that occurred in the Bransfield area with residual errors of <5 sec. In total, 8,768 events (~ 2.9 km error on average) were selected over the recording period. Preliminary results indicate that the most (4,139) and highest energy (229.5 dB) cryogenic events occurred during the austral summer (January-February-March), which is likely attributed to thermally induced collapse/fracture of icebergs and/or sea-ice. Interestingly, there is a higher occurrence of cryogenic event (2,465) during the austral winter (July-August-September) than for the austral spring and fall, which may be due to more sea-ice formation by stronger winds during the winter. The contribution of winter events to the overall soundscape is, however, relatively small (219.7

dB). The goal of our study is to elucidate processes controlling the seasonal variation of cryogenic events and highlight their influences on the soundscape as well as any potential impact on behavioral changes in marine mammals in the region.

Key words: Bransfield Strait, Antarctica, Hydroacoustic observations, cryogenic signal