

Detection and time variations of infrasound sources using arrays deployed in Lützow-Holm Bay, Antarctica

M. Kanao, and T. Murayama

National Institute of Polar Research (NIPR), Japan Weather Association (JWA)



NiPR
National Institute of Polar Research

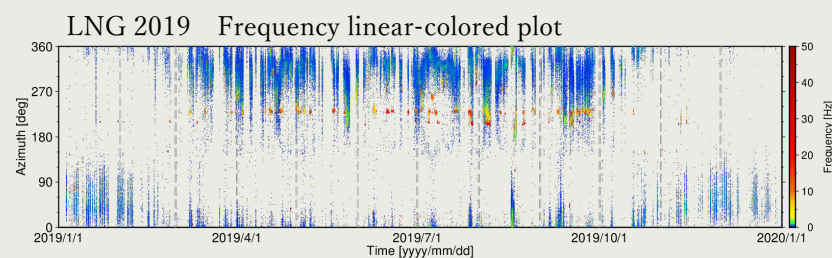
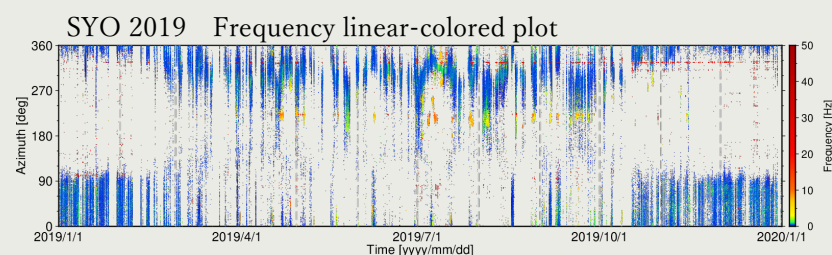
INTRODUCTION AND MAIN RESULTS

Time-space variations of infrasound source locations for three years, 2019-2021, were studied by using a combination of two local arrays in the Lützow-Holm Bay, Antarctica. The local arrays deployed at two coastal outcrops detected temporal variations in signal frequency content as well as propagating directions during these years. Many infrasound sources were detected with many located to the north and north-west directions from the arrays. These events were generated within the Southern Indian Ocean and the northern part of LHB with frequency-content of a few seconds; these “microbaroms” are believed to originate from oceanic swells. Based on a comparison of source locations with sea-ice and glacier distribution from MODIS satellite images, these high-frequency sporadic sources may be cryo-seismic signals associated with cryosphere dynamics near the arrays. The results suggest that infrasound can be used to monitor surface environments in the coastal area of Antarctica.



Introduction

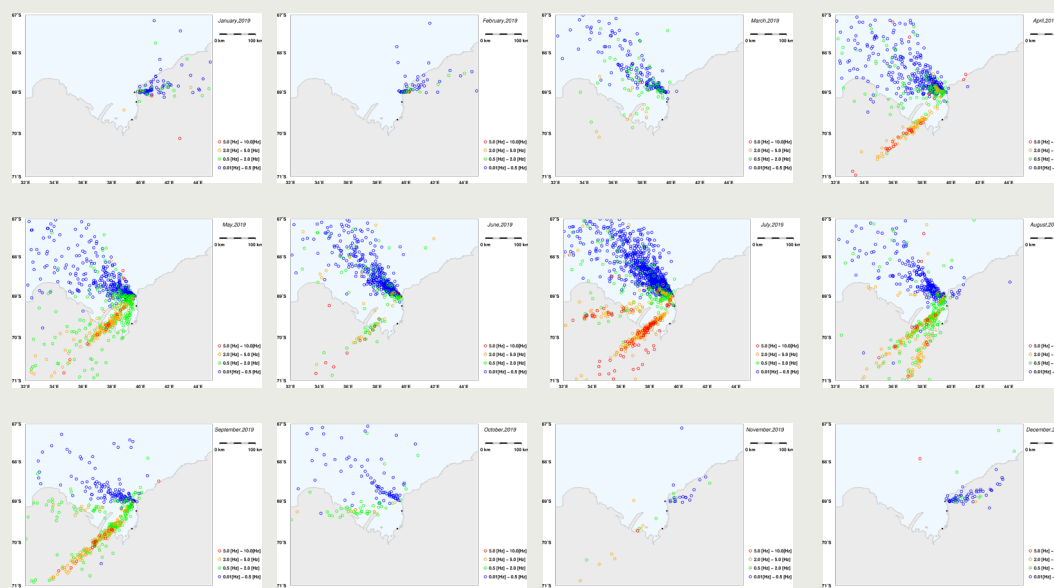
Time-space variations of infrasound source locations for three years, 2019-2021, were studied by using a combination of two local arrays in the Lützow-Holm Bay (LHB), Antarctica. The local arrays deployed at two coastal outcrops detected temporal variations in signal frequency content as well as propagating directions during these years. A large number of infrasound sources were detected with many located to the north and north-west directions from the arrays.



Azimuthal variations of the detected infrasound signals for whole year in 2019, for two arrays in SYO and LNG, in LHB of East Antarctica. Colors are varied on frequency ranges.

Results and Summary

- A large number of infrasound sources were detected and many of them located between northward and north-westward directions from the arrays.
- These source events (N-NW directions) are generated within the Southern Indian Ocean to the northern part of LHB with frequency content of few seconds; that is the microbaroms from oceanic swells.
- From austral summer to fall, sources orientation are determined to be north-eastward. These might be related to the katabatic winds from continental area.
- Several sporadic infrasound events during wintering seasons had predominant frequency content of few Hz, which are clearly higher than microbaroms.
- On the basis of a comparison with sea-ice and glacier distribution from MODIS satellite images, these high-frequency sources were considered to be cryo-seismic signals associated with cryosphere dynamics.
- Infrasound could be a useful tool for monitoring surface environment involving climate change in the coastal area of Antarctica.



Distribution of the source locations of the detected infrasound signals by PMCC analysis (from January 01 to December 31, 2019, represented by separated panel for one month), combined by both the SYO and LNG arrays. Colors representing in right hand side for each panel correspond to the central frequency [Hz] for each detected source event.