

Estimation of seismic source location around East Ongul Island, East Antarctica, by using two seismic arrays

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In the polar region, various vibration phenomena are existed in association with physical interactions between the solid earth, atmosphere, ocean, and cryosphere systems. These phenomena can be observed as seismic and infrasonic waves, and the relationship between their occurrence and environmental variations was pointed out in the Lützow-Holm Bay region, East Antarctica (e.g., Murayama et al. 2017; Tanaka et al. 2019). To monitor environmental changes, it is important to reveal their characteristics and generation processes. Although several seismic and infrasound stations have been deployed in and around East Ongul Island, East Antarctica, it is not sufficient to detect small seismic events such as local icequakes and tremors because of the sparsity of the stations in the existing seismic network. One of the useful methods for estimating source locations is the array analysis, which uses data obtained by a dense seismic network. Hence, we carried out a special experiment using two seismic arrays in East Ongul Island during the summer of 2017-2018. These two arrays consisted of seven three-component seismometers and six vertical seismometers, respectively, with a spacing of about 100m. First, we picked 93 short-duration seismic events based on the short-term-average to long-term-average (STA/LTA) ratio from continuous waveforms with a high signal-to-noise ratio (SNR). Contamination caused by strong winds, as well as long-duration signals from the ice-breaker ship and helicopters, were carefully filtered out. Then, we estimated the direction of arrival of these signals by applying semblance analysis. As a result, we found that some of their epicenters existed around East Ongul Island. These events can be considered as icequakes because the sea-ice condition around the Lützow-Holm Bay had been changing dramatically during the observation period. We further investigate the relationship between these signals and the sea-ice distribution in this area.

Keywords: seismic array observation, antarctic