

Seismic harmonic tremors and interpretation of their origins in relation to cryosphere dynamics in April 2015 around the Lützow-Holm Bay, East Antarctica

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Characteristics of seismic tremors occurring during April 2015 were investigated by seismographs at Syowa Station, in the Lützow-Holm Bay (LHB), East Antarctica. In order to examine a relationship between surface environment in particular cryosphere variation, the MODIS satellite images were utilized for comparison with the detected tremor events. Since a large volume of sea-ice was discharged during the April 2015, along with a few numbers of large icebergs passed through the northern edge of the fast sea-ice of LHB, it was supposed to detect characteristic seismic tremors involving cryosphere dynamics at the local region. During the month, a total number of 49 tremor events including short duration ice shocks were identified (Kanao et al., 2017). Majority of the events had their duration times more than 15 minutes, which were divided into both tremors and ice shocks. Cryospheric sources recorded by seismic tremors were classified by their origins; “crevassing events” along the large cracks inside the fast sea-ice, “discharge events” of fast sea-ice from the bay, “collision events” between iceberg and the edge of fast sea-ice, “crashing movement” between fragmentation of fast sea-ice and packed sea-ice, etc.. Particularly, strong amplitude tremors with harmonic overtones (classified as “type C” by Tanaka et al., 2019) were assumed to be occurred independently from meteorological condition, along with episodic events in the cryosphere. The most plausible candidate of the source origins could be collision events between the bottom of drifting icebergs with the top of sea-bedding sediments/crystalline rocks at the places where the northern edges of continental shelf of LHB in which the depths of the ocean-floor could be less than 300 m from mean sea level (Moriwaki and Yoshida, 2002). Further investigation of ocean-floor topography at the edge of continental shelf will be expected by using multi-narrow beam system equipped by icebreaker vessel “Shirase”.

References

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