南極昭和基地で観測された微気圧変動シグナルの長期トレンド

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Long Term Trend of Infrasound Signals Observed at Syowa Station, East Antarctica

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Infrasound is sub-audible sound whose frequency range is about 3 mHz to 20 Hz. Because this frequency is common between atmospheric, oceanic and solid earth vibrations, those waves are interacting with each other and interaction itself generates infrasound. At polar region, cryosphere also play an important role for generation and propagation of infrasound. Last decade, for the purpose of monitoring nuclear tests, a global infrasound network is constructed by CTBTO. The CTBT-IMS infrasound network has 47 working stations (as of September 2014) and each station consists at least 4 infrasound sensors (arrayed observation), they can detect a some-kiloton TNT level atmospheric explosion in range of some 1000 kilometers. The network is almost enough for monitoring nuclear tests, but much sparse for detecting and analyzing in detail of natural infrasound phenomena. Especially at Antarctica, CTBT-IMS has only two stations and is most insufficient observation area.

The Japanese Antarctic infrasound observation started at April 2008 as one sensor pilot observation. A Chaparral-type infrasound sensor was installed at Syowa Station (SYO) in Lützow-Holm Bay (LHB) of East Antarctica, as a part of the International Polar Year (IPY2007-2008). And then, following success of pilot observation, in austral summer in 2013, we extended one-sensor observation at SYO to 3-sensor arrayed observations, and installed a few field stations along the coast of the LHB.

In this study, we will show the long-term trend of infrasound signals observed at SYO during whole observation period. Characteristic infrasound waves observed at SYO demonstrate physical interaction involving environmental changes in the Antarctic region. Continuous recording of infrasound, from April 2008 to present, clearly indicate existence of the background atmospheric vibration generated by ocean-atmosphere interaction (microbaroms) with peaks of 0.1 to 0.25 Hz observed during entire period. Because larger amount of sea-ice extending around the LHB near SYO suppress ocean wave, the microbaroms become weak during austral winter. Newly established SYO array clearly detected the propagating directions and frequency contents of the microbaroms from Southern Ocean.In addition, we found harmonic signals around lowermost human audible band, however, currently unclear how and what generating hamonic signals. Those signals are recorded under windy condition. Since our system has no mechanical resonance at those frequency ranges, we speculate that the characteristic harmonic signals are probably related to local surficial phenomena such as ice sheet vibration generated by katabatic winds.

Infrasound measurement at Antarctica could be a new proxy for monitoring a regional environmental change in high southern latitude. In such point of view, we will continue and improve the observations at and around SYO, Antarctica.