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Characteristic multi-sphere interaction in the coastal and marine environment inferred from infrasound observation at Terra Nova Bay, Antarctica

Dr Masaki Kanao
Poster No. P5.2-016

National Institute of Polar Research, Japan

POSTER

Characteristic multi-sphere interaction inferred from infrasound observation at Terra Nova Bay, Antarctica

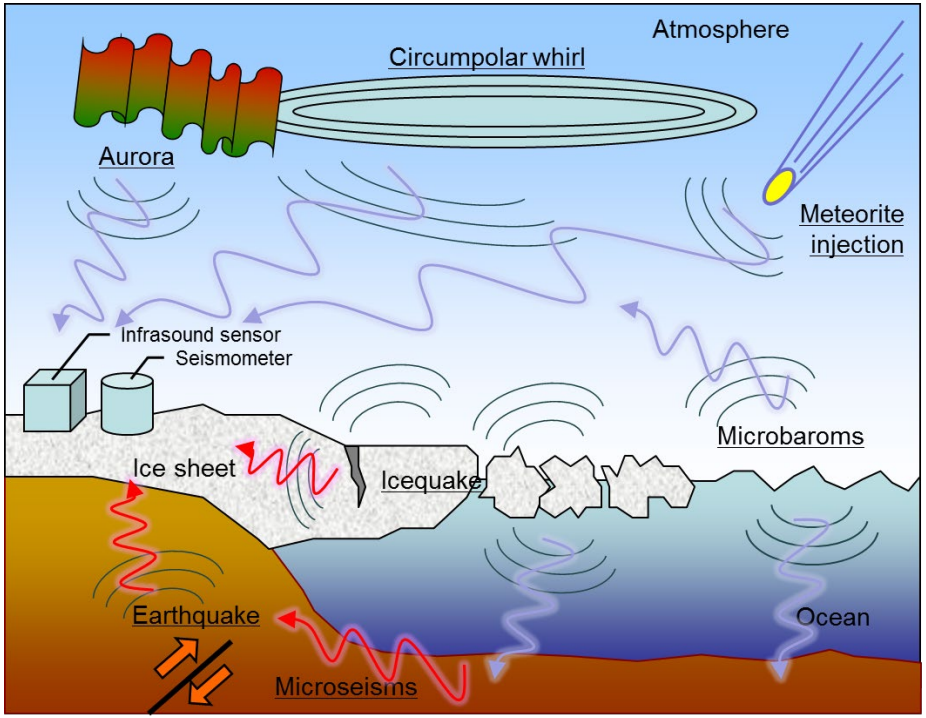
Dr Masaki Kanao, Researcher, National Institute of Polar Research, Japan

ABSTRACT

In December 2015, an infrasound array by three sensors by a detectable frequency range of 0.1-200 Hz, combined with a broadband barometer was deployed at Jang Bogo Station, Terra Nova Bay, Antarctica.

Two years data observed by the broadband barometer include characteristic signals caused by surface environment nearby the station, mixed with local signals such as katabatic winds. Clear signals caused by oceanic swells (i.e., the microbaroms) have been continuously recorded with predominant frequency around 0.2 s.

Variations in their frequency context and amplitude energy in the Power Spectral Density have been considered as affected by dynamics of the sea-ices surrounding the Terra Nova Bay.



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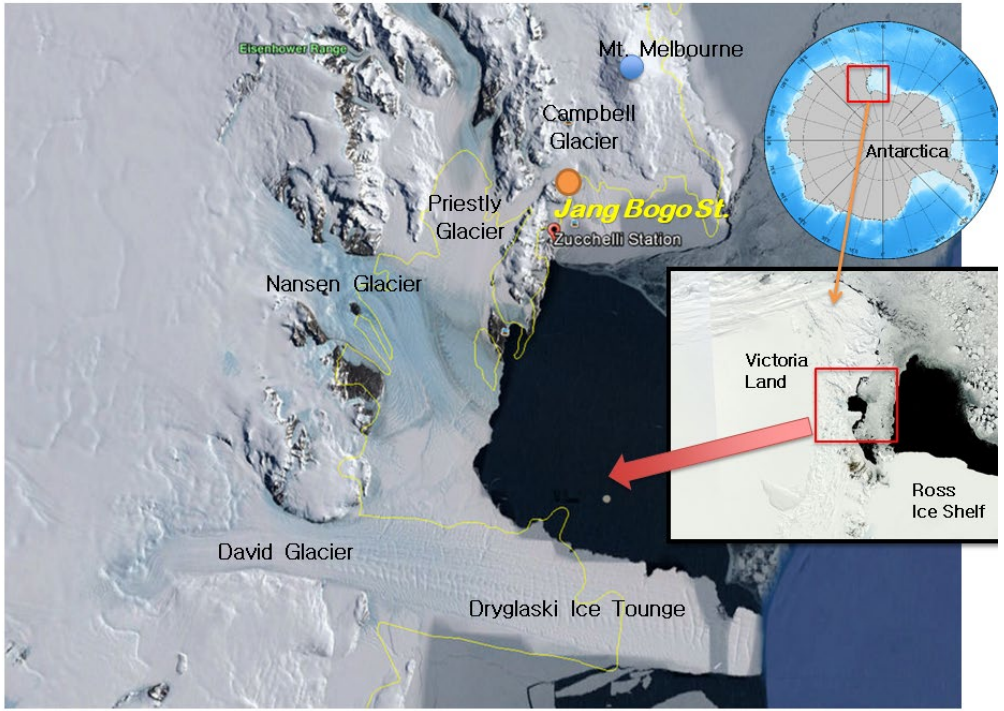
INTRODUCTION

Characteristic signals of infraosund data recorded at Jang Bogo Staiton, Terra Nova Bay, Antarctica is treated by demonstrating two years of data from 2015, as a joint project between Japan and South Korea.

Background signals with a peak of few seconds in its intrinsic period were investigated, involving far-field loading effects from Southern Ocean. Time variations in infrasound amplitudes and frequency content will be especially investigated by the power spectral densities (PSD).

Infrasound monitoring in Terra Nova Bay contribute as a new proxy for environmental variations caused by such as global warming, cryosphere dynamics, together with volcanic eruptions in the Northern Victoria Land.



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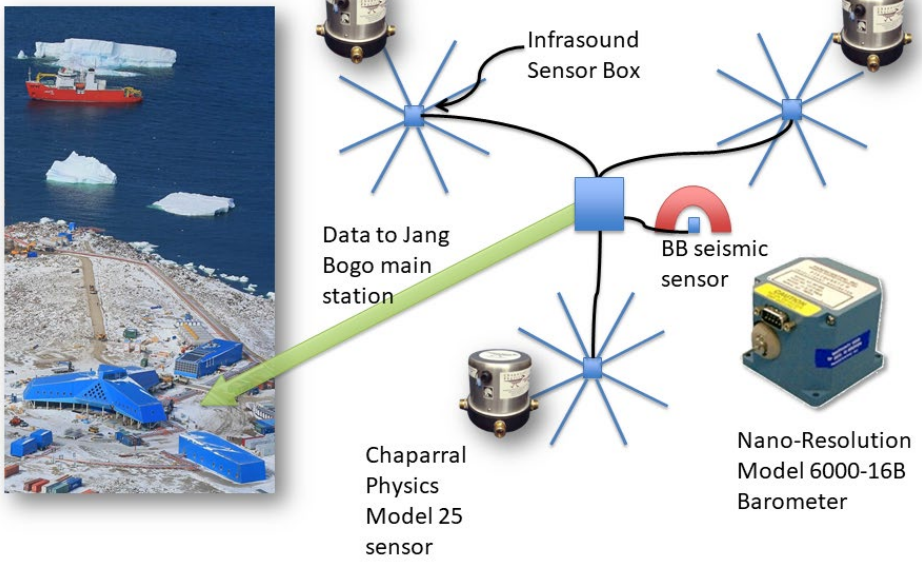
METHODS

At Jang Bogo, infrasound tripatite array was started by three sensors (Chaparral Physics Model 25), where 500 m NW from main buildings of the staiton. The sensors were attached on the exposed rocks and installed inside adiabatic boxes, equipped with eight air-pipes.

In addition to the array by using Chaparral sensors, a broadband barometer (Digiquartz Nano-Resolution Model 6000-16B) was set in geophysical observatory hut, to merge the data retreieved from Chaparral sensors. A triangle shape air-pipes were attached to the Barometer for the same purpose of reducing wind noises.

The data have been logging in acquisition system, followed by sending partial data to KOPRI using LAN and Intersat telecommunication system from Jang Bogo station.

Infrasound array stations in 2015



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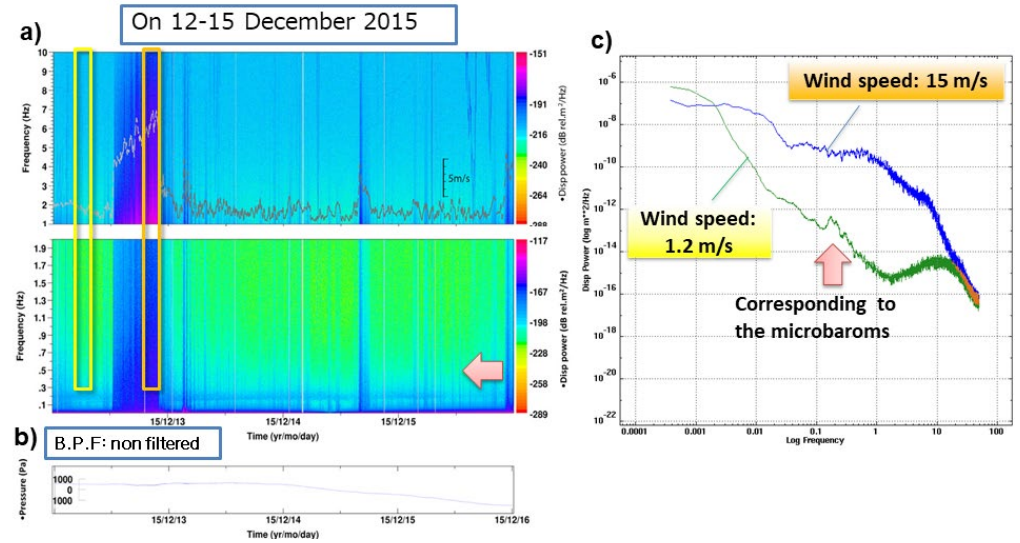
RESULTS

PSDs and time-domain infrasound signals for four days on 12-15 December 2015 by Nano-Resolution Model 6000-16B Barometer for the frequency band of 1-10 Hz (a), 0.01-2 Hz (b).

Predominant continuous signals with 0.2 Hz are identified, which correspond to the microbaroms from Southern Ocean. Local wind noises (caused by "katabatic winds") are recognized. In particular, the latter half on 12 December was the time window with the strongest and the longest duration.

Time variations in frequency context are not identical within these days, therefore, it is necessary to monitor long-period over few months or few years in order to detect the long-term variability including seasonal dependence.

PSD of infrasound signals @ Jang Bogo St., geophysical obs.hut



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RESULTS

Figure 5-1 shows an example of characteristics of the observed infrasound signals on 9 May 2017. a) The PSD of the observed atmospheric pressure data for frequency band of 0.01-5 Hz (03:15-03:25 UTC) (5-1a), time series of atmospheric pressure data (0.01-5 Hz band-pass filter was applied) (5-1b) and spectrum of the observed atmospheric pressure data for 30 min. length (5-1c) are shown, respectively.

Figure 5-2; 11 May 2017. PSD of pressure for frequency band of 0.01-5 Hz (10:15-10:30 UTC) (5-2a), time series (0.2-5 Hz band-pass filtered) (5-2b), spectrum data for 30 min. (5-2c).

Figure 5-3; 13 May 2017. PSD of pressure for frequency band of 0.01-5 Hz (18:05-19:45 UTC) (5-3a), time series (0.01-5 Hz band-pass filter was applied) (5-3b), spectrum data for 30 min. (5-3c).

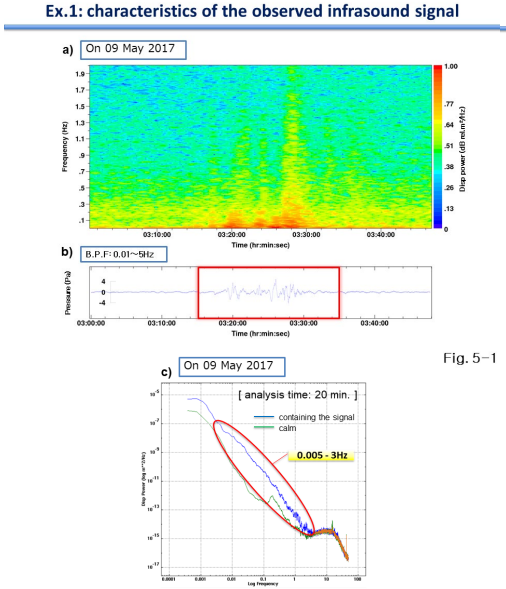

Fig. 5-1

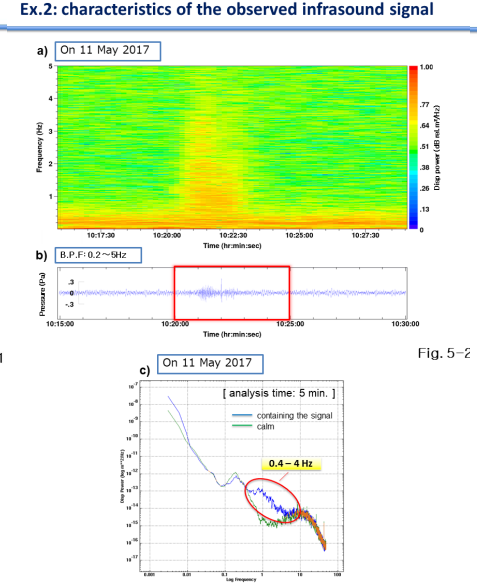

Fig. 5-2

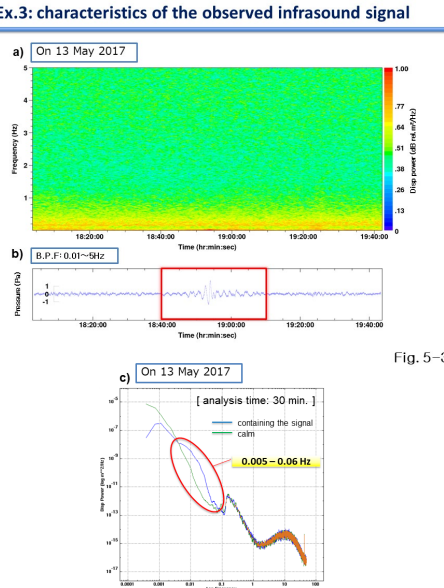

Fig. 5-3

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CONCLUSIONS

Characteristic signals of infrasound were recorded at Terra Nova Bay, Northern Victoria Land by a broadband barometer deployed at Jang Bogo Station. Two years data retrieved by barometer include chracteristic signals from surrounding environment of the Staiton, by mixing a contamination of local noises involving katabatic winds from continental ice-sheet to the Terra Nova Bay.

Continuous signals of oceanic origin ("microbaroms") had been clear in austral summer with predominant frequency content around 0.2 s. Variabilities of their frequency and amplitude strength in the Power Spectral Density might be influenced by an seasonal evolution of the sea-ices surrounding the Bay.

By utilizing the infrasound array combined by other three barometric sensors deploying insdie the Staion, multi-sphere interaction among surface environments around the coastal area and Southern Pacific Ocean could be investigated in future.

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Chaparral Physics Model 25 (inside the box)

Nano-Resolution Model 6000-16B

Jang Bogo Station, December, 2015