Development of automatic detection software for N-type waveform events of infrasound

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1.Background
The lower frequency sonic wave less than 20 Hz is called as infrasound. The infrasound has a long distance propagation characteristics because of its weak attenuation feature in the atmosphere, therefore it is considered as the future technique for disaster prevention for volcanic eruptions and tsunamis, for example It has been studied on the infrasound in Yamamoto lab. in Kochi University of Technology since 2005, with developing direction-finding technique for incoming waves. Applying the direction-finding technique into the observation system, the source area of infrasound waves was fixed with multiple-site array observation of infrasound (Komatsu, 2012). However, the automatic detection of the N-type waveform events in the case of encountering explosive natural phenomena such as the eruptions of the volcano or thunders is essential to make the realtime observation of the infrasound for disaster prevention.
2. Purpose
The purpose of this study is to develop automatic detection software for N-type waveform infrasound events as well as to inspect the precision of the software for the real datasets of N-type waveform events.
3. Developed software
This software outputs the event detection time and number of counts by inputting five parameters including the trigger to detect the events with drawing spectrogram.The N-type waveform event shows broad spectrum in wide frequency range without any specific peak periods. Thus, the software divides long-time observational data into short-time blocks then performs FFT (Fast Fourier Transform) sequentially and calculates mean parameter of the spectrum strength in whole frequency range in the spectrum in order to detect a point (time) of enhancing as N-type waveform events.
4. Evaluation
Using observed infrasound data for firework events by Komatsu (2012), 11 events were confirmed by human viewing. We inspect the software with adding a kind of pseudonoise on these data gradually and tried to find out detection points of the N-type events with changing trigger parameter so that the number of the detection becomes 11. Thus, we evaluated the software with respect to the volume of noise included in the real infrasound data.
5. Consideration by the inspection result
It was recognized that the software could detect half of the N type wave form events even if the SNR was less than 1 from a result of the inspection. The software could detect a part of N-type events that had difficulty in confirmation by the human viewing.
6. Conclusion
We conclude that the purpose was confirmed successfully because the software can detect the N-type events from the noisy dataset
Reference:
Komatsu,Takayasu, Construction of multi-site arrayed-sensor system for infrasound observation and estimation of sound source coordinates, Special research report at graduated school of Kochi University of Technology, 2012.

Keywords: infrasound, N-type waveform event, automatic detection

