

# Improvement and evaluation of microphone array type infrasound sensor

\*Masashi Fujimoto<sup>1</sup>, Masa-yuki Yamamoto<sup>1</sup>, Hiroaki Saito<sup>1</sup>, Kou Saito<sup>1</sup>

1. Kochi University of Technology

## 1. Introduction

Infrasound is a low-frequency sound wave that is lower than the human audible frequency (20 Hz). It occurs from large-scale natural phenomena such as volcanic eruption, tsunami, and lightning, and it is hard to be attenuated by the viscosity of air, so it has long-distance propagation characteristics. Therefore, it is attracting attention as a remote sensing technology of natural phenomena. It is important for infrasound observation that there are many observation points. However, it is difficult to install a large number of expensive sensors. Therefore, the low-cost infrasound sensor has been developed in our laboratory. For example, sensors using piezoelectric elements and using semiconductor lasers and PSD elements had been developed. In 2016, we conducted basic research on low-cost infrasound sensors using condenser microphones. In this time, we improve the previous condenser microphone type sensor and observe using it, and evaluate it by comparing it with result observed by infrasound sensor jointly developed with SAYA Co., Ltd. based on the knowledge of this laboratory.

## 2. Improvements

The previous sensor was using Arduino for A/D conversion and PC communication, sampling frequency was 40 Hz, and the resolution was 10 bits. However, this time we changed the microcomputer to mbed of ARM Ltd. and set sampling frequency 200 Hz. Then the resolution increased to 12 bits and greatly improved. Besides, we have automated data sampling and provided a low-cost dedicated data logger. We made the sensor possible to observe when it is installed in the observation site.

## 3. Observation

We have observed several days experimentally as to whether the improved sensor can automatically collect continuous data. In this regard, we will conduct a parallel observation with a corporate infrasound sensor made by SAYA currently observing, borrowing a room of the Geisei Astronomy Learning Center located in Geisei, Aki-gun, Kochi Pref. Besides, we will also introduce the data which has been observed since 2017. Furthermore, we will consider differences by changing the arrangement pattern of the microphone array.

## 4. Conclusion

Succeeded in improving the performance of the previous sensor, the measurable frequency band expanded to 100 Hz, which is the deep bass range of the human audible. At present, our laboratory continues to observe infrasound in around Kochi widely. In this presentation, we report that the brand-new improved sensor was installed one of the observation points mentioned above, and the long-term observation was carried out, and it was evaluated as an infrasound sensor.

Keywords: Infrasound, microphone array