Hydroacoustic signals associated with possible submarine volcanic activity the deep-sea region near the southern end of the Ogasawara Islands observed on the seafloor along the Japan Trench

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For several months after August 2022, the hydroacoustic signals propagating the deep-sea sound channel (Sound Fixing and Ranging, SOFAR channel) from south have been intermittently observed by the ocean bottom seismometers (OBSs) of the submarine cabled observatory “S-net” along the Japan Trench, offshore east of Japan. The hydroacoustic signals associated with submarine volcanic eruptions at Fukutoku-Oka-No-Ba in August 2021 and Hunga Tonga-Hunga Ha'apai in January 2022 have been detected by the “S-net” (Iwase, 2022). Since the signal appearance pattern is similar to those, possibly they would reflect submarine volcanic activity. However, the amplitude of the signal observed at each station this time is much larger than those.
Meanwhile, as a report on marine volcanic activity during the period, colored water on the sea surface was confirmed by a Japan Coast Guard aircraft after August 2022 at Kaitoku Seamount. So, assuming that the signal source is at the position of Kaitoku Seamount, the propagation time to each observation point is calculated. In Fig.1, the time axis of the waveform for each station is shifted by the propagation time and arranging them in order of propagation distance. A number of vertically arranged signals show hydroacoustic signals, but they are tilted slightly to the left, indicating that the apparent velocity is faster than the sound speed. This suggests that the position of the signal source is east of Kaitoku Seamount. Also, the alignment is not straight, suggesting that Kaitoku Seamount is not the signal source. It iis the same when I assum Fukutoku-Oka-No-Ba as the signal source.
Therefore, I estimate the position of the signal source from the arrival time differences of the signal among each observation point, and the source position is estimated to be on the trench slope near the southern end of the Ogasawara Islands, about 2 miles southeast of Fukutoku-Oka-No-Ba. Fig.2 shows the observed waveform processed in the same way as Fig.1 under this condition. Compared to Fig. 1, it can be seen that the appearance positions of the signals are better aligned. The sound speed is assumed to be 1500 m/s here. If the sound speed is smaller than this, the location will be further southeast. The large amplitude of the observed signal suggests that the signal source is not in shallow water but at a depth that enables propagation to the SOFAR channel. In addition, since the observed waveform has features that appear to be multiple reflections on the sea surface and seafloor, it is probable that it occurred in the deep sea area of 1000 m or more. Further detailed analysis will be carried out.

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Reference
R. Iwase (2022), JpGU2022, SVC31-21.
Japan Coast Guard, Marine volcano database,
https://www1.kaiho.mlit.go.jp/GIJUTSUKOKUSAI/kaiikiDB/kaiyo20-2.htm.

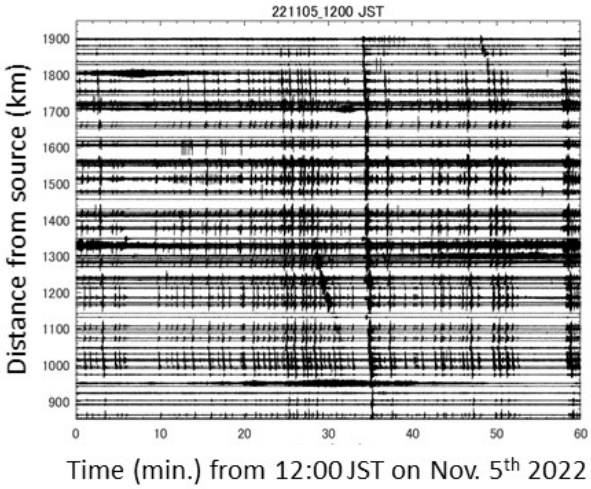

Fig.1

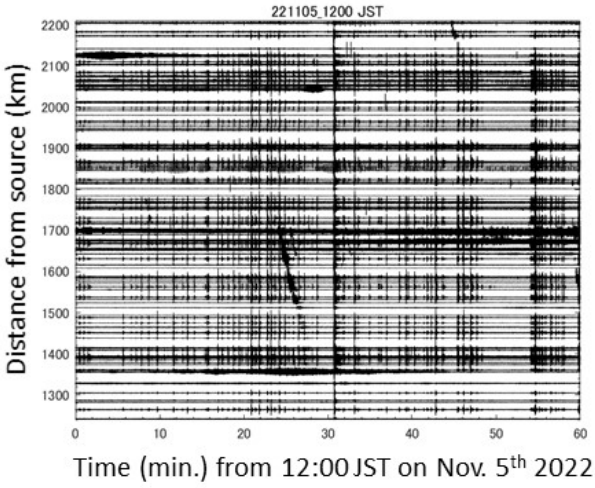

Fig.2

