Improvement of Deep Non-volcanic Low Frequency Tremor Detection Sensitivity by Using Vertical Seismic Array for Real Time Monitor

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Since a discovery of deep non-volcanic low frequency tremors (LFT) in southwest Japan by Obara (2002), many methods for a detection of the LFT have been proposed, and several real time monitoring systems of the LFT have been developed (in NIED by Obara, ATMOS in Hiroshima university, TAMS in GSC by Kao et al. etc.). These monitoring systems were useful to roughly grasp the LFT activity. In order to understand details of slow slip events, however, sensitivity and accuracy of the LFT detection of these systems should be improved.

Geological Survey of Japan, AIST has recently started integrated geophysical observations of water level, strain, tilt, water temperature and seismic wave at boreholes in southwest Japan. Each observation site has three boreholes of different depth levels (about 30m, 200m and 600m) and installed high-sensitivity seismometers at the bottom of each borehole. The semblance analysis using this vertical seismic array revealed that seismic signals of the LFT are clearly detected even if they have a very low signal-to-noise ratio (Imanishi et al., 2008). It means that the semblance value derived by the AIST vertical seismic array network is also a useful parameter for the LFT monitoring system.

In this study, we propose a LFT detection method by incorporating the semblance analysis of the AIST vertical seismic array. By using the semblance value, the signals of LFT are easily distinguished from noise. It makes a good improvement of the LFT detection sensitivity in the case of small LFT activities observed in a few stations.