

A semblance analysis on receiving ACROSS signal with a seismic array

Atsushi Saiga[1], Koshun Yamaoka[2], Takahiro Kunitomo[3], ryoya ikuta[4], Koji Miyakawa[5], Kenji Moriguchi[5]

[1] Nagoya Univ., [2] RC. Seis. & Volc., Nagoya University, [3] JNC, [4] Earth and Planetary Sci. Nagoya Univ., [5] Earth and Planetary Sci., Nagoya Univ

Experiments using seismic array for receiving ACROSS signal are carried out for a week in a cross-shaped vault at Mizunami, Gifu Prefecture. ACROSS system is a new observation method to monitor the temporal variation in seismic wave velocity. Some observation systems such as an extensometer, borehole strainmeters, borehole seismometers and water gauges are deployed near the site. The monitoring will enable us to interpret the cause of the temporal variation especially due to ground water. We deployed a seismic array along the extensometer to detect the temporal variation at the distance of 2.4 km from the ACROSS source. The array consists of 15 seismometers with the spacing of 8 meters. We continuously drove the two ACROSS sources with frequency modulation of 2.5 Hz at a modulation periods of 10 second, and obtained spectral data from 14 Hz to 24 Hz at an interval of 0.1 Hz. The 27 hours stack data with high S/N ratio was used for this analysis. In this study, we focused on identifying some particular phases in a static structure before monitoring the temporal variation.

Transfer function between the ACROSS source and each seismometer was calculated by a deconvolution with a theoretical force of the source and observed displacement. We evaluated some particular phases for a propagation direction and an apparent velocity by the Semblance method. We also used a normalized Semblance method to detect some coherent wave with relatively large amplitude and to eliminate some ghost peak with coherence.

We could identify an initial compressional and shear waves with appropriate lay-paths. The initial compressional and shear wave were arrived at 0.6 and 1.15 seconds, respectively. These waves also have apparent velocities of 4.0 [km/s] and 2.2 [km/s]. The results are consistent with the velocity structures obtained by geophysical logging data under the source and the array site. It was interpreted that the compressional and shear wave are head waves from the basement layer with granite. Surface wave with an apparent velocity of about 0.85[km/s] is possibly found at 2.2 seconds.

This result suggests that velocity structures of shallower part can be found for a simple experiment using ACROSS system. So, we can observe the temporal variation in wave properties including wave velocity and an arrival direction, hereafter.