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野島断層への注水実験による影響域のイメジング：2003 年淡路島注水実験の再解析
Imaging of the fluid injection zone at the Nojima-fault: Reanalysis of 2003 Awaji Island water injection experiment

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Monitoring the physical states of seismogenic zone is one of the most demanded subjects in seismology. The attempt to monitor the underground fluid behavior by seismic ACROSS (Accurately Controlled Routinely Operated Signal System) has been continued by the research group of Nagoya University and other institutions. The air injection experiment in 100m depth in Awaji Island in 2011 showed clear image of injection zone by the time-reversal method (Kasahara et al., 2012). In order to compare the 2011 results and the previous water injection experiment in 2003, we reanalyzed the data obtained by the seismic ACROSS at Awaji Island in 2003 (Misu et al., 2003), to detect the influence of the water-injection experiments at the Nojima Fault.

The continuous observation was made for about five months in February to June, 2003, using two seismic ACROSS vibrators and two seismic arrays at about 300 m away from the source to NW and SWW, respectively. In the water injection from March 13 and March 23, 225 tons water in total with 4.5MPa was injected at 540 m depth of the 1,800 m borehole at 150 m distance of NNW of the source. Two ACROSS vibrators shared the frequency band and generated vibration in 10-22 Hz in total. Each seismic array comprised 10 seismometers shaping a cross with 10 m spacing.

By the previous analysis by Misu et al. (2003), no significant signal accompanied with the water injection was found in the temporal variation of travel times of S- and surface waves, which showed the obvious response to the rainfall. By the water flow simulation, we found the similarity of flow speed caused by rain falls and the observed S-wave travel-time changes (Kasahara et al., 2011.

In this study, we performed the time-reversal imaging using the differential waveforms between before and after the water injection, in order to examine the ability of detecting the area of influence by the water injection. As a result, the NS-oscillation of the time-reversal using the two arrays focuses around the borehole of the water injection. The array distribution seems not to be appropriate to this imaging and might be the reason for the other components not focusing around the injection point.

For the fluid migration into the subduction, we obtained the clear image of fluid layer by simulation (Tsuruga et al., 2010) and the current imaging method sing seismic ACROSS can be useful for the real-time monitoring physical state change along the future focal zones on subduction zone.

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