

## Permeability of fracture zone nearby the Nojima fault estimated using strain changes due to water injection experiments in 2006

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Water injection experiments were performed in November and December 2006 at the 1800m-deep borehole in the northwestern Awaji Island. The water injection experiments have been executed in 1997, 2000, 2003 and 2004 according to the similar procedure. In the experiments, permeability of the surrounding crust was estimated in order to investigate the healing process of the Nojima fault. We determined permeability of the fracture zone nearby the Nojima fault using the strain changes observed at the 800m-deep borehole located 70m south-southwest of the 1800m-deep borehole during the experiments. We report secular change of the permeability during the period of 1997 to 2006.

Water injection experiments based on a scientific drilling program were performed in February - March 1997, January - March 2000, March - May 2003, December 2004 and November - December 2006. Injected water was diffused in the surrounding crust at the depth of 540m in the 1800m-deep borehole. The injected water caused ascendance of pore pressure and strain changes in the surrounding crust. A multi-component borehole instrument installed at the 800m-deep borehole can observe strain changes in the directions of N45W-S45E (Str\_U), N75E-S75W (Str\_M) and N15E-S15W (Str\_D). Strain change Str\_U could not be observed during the experiment in 2004, because of some troubles in the observational system. Strain change Str\_U during the experiment in 2006 was contaminated by large noises. We used only two components Str\_M and Str\_D in order to determine permeability in 2004 and 2006.

Ascendance of pore pressure due to water injection caused elastic deformation of the crust around the 800m-deep borehole. We calculated time changes of pore pressure using a diffusion equation and predicted strain changes due to pore pressure. Strain changes due to water injection depend on permeability. Permeability in 1997, 2000, 2003 and 2004 were determined to be  $0.9 \pm 0.3$ ,  $0.8 \pm 0.3$ ,  $0.4 \pm 0.1$  and  $0.3 \pm 0.1 \times 10^{-6}$  m/s, respectively. The secular descent of permeability is consistent with a healing process of the Nojima fault. Change of permeability was negligible in the period from 2003 to 2004.

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