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Introduction of Recent Geophysical Studies in the Nojima Fault Zone Probe Project

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The Nojima fault is one part of the earthquake source fault of the 1995 Hyogo-ken Nanbu (Kobe) earthquake (M_w 6.9). The Nojima Fault-zone Probe Project started immediately after the occurrence of the earthquake, drilling three boreholes with depths of 1800, 800, and 500 m, respectively, through or close to the Nojima fault to investigate the fault-zone structure using geophysical and geological approaches (Fig.1). Continuous downhole measurements with seismic, crustal movement, groundwater, and geoelectric instruments have been carried out, and also core samples have been analyzed to elucidate the material and fracturing properties of rocks in the fault-zone. Repeated water-injection experiments were carried out in 1997, 2000, 2003 and 2004 to measure the fault-zone permeability and its temporal change. The fault healing process is suggested from the decrease in permeability by about 70% during the period from 1997 to 2003 (Fig.2). Detailed fault-zone structure and the earthquake generating process in the fault-zone have been studied for injection-induced and stationary microearthquakes using borehole seismograms, from viewpoints of their source process, clustering properties, and fault-zone trapped wave.

Keywords: Nojima fault; borehole observation; water injection; fault healing.

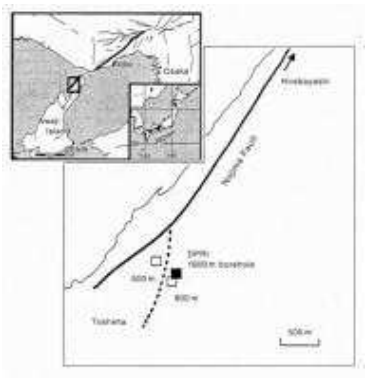

Figure 1. Map showing the borehole site at the southern end of the Nojima fault.

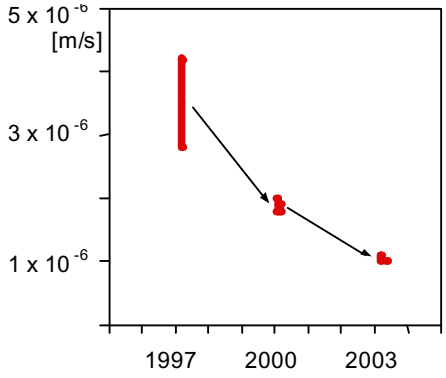

Figure 2. Temporal change of permeability estimated for the repeated water-injection experiments (Kitagawa et al., 2003).