

Deep borehole investigations and in-situ stress measurement in the Neodani fault zone in Midori district

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The occurrence of the intraplate earthquakes is dominated by processes of the recovery of fault strength and the accumulation of crustal stress. To understand physical and chemical mechanisms of these processes is one of the most fundamental problems of both earth science and disaster prevention technology. Drilling a borehole that penetrates a fault zone directly is the powerful alternative because it allows us to observe a fault itself, obtain real materials therein, and measure rock's physical properties in-situ.

The National Research Institute for Earth Science and Disaster Prevention conducted deep borehole investigations and in-situ stress measurement in the Neodani fault zone in Midori district, central Japan. The Neodani active fault is a part of the Nobi fault system extending approx. 80 km. This fault last ruptured in 1891 Nobi earthquake (M8), which had a maximum of 7-8m left-lateral and 6m dip-slip. It was the largest earthquake ever in inland Japan.

We report the outline of the borehole drilling, geological description of the core samples, and the results of physical and chemical property test using the cores and in-situ measurements of permeability and stress in the crust. Data of well logging and electromagnetic surveys that were performed concurrently, will be shown elsewhere.

Structures of boreholes: a vertical hole (approx. 1400 m in length), and an inclined hole (approx. 350 m in length and -55 deg. dip)

Items for investigations: well logging (spontaneous potential, electric resistivity, rock density, sonic log, caliper, gamma-ray, neutron, temperature, borehole televiewer, drill direction), in-situ test using boreholes (crustal permeability and stress), physical and chemical property test using core samples (uniaxial compression, tensile strength, triaxial compression, sonic log, rock density, water absorption, thermal conductivity, mineral composition, whole-rock chemistry, X-ray diffraction), and geological description of cores (lithology, radiolarian). A hydraulic fracturing was used as a method to measure the crustal stress at different depths along the vertical borehole.