

Crustal stress around Shikoku and Kii region derived from the construction of integrated groundwater observation network

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GSJ/AIST has been constructing the integrated groundwater observation network around Shikoku and Kii region for forecasting the Tonankai and Nankai earthquakes since 2006FY, and fourteen stations have already been completed. Three observation wells with different depths, usually 30, 200 and 600m, were drilled at each station. Various information about shallow crustal stress was derived by experiments using these boreholes and the drilled cores.

Hydraulic fracturing stress measurements were conducted in the 600m borehole of five stations, where granitic rock was drilled. Flow rate and water pressure were monitored just above the measurement interval to measure the reopening pressure precisely. The measurements were succeeded over a wide range of depths at the station in Toyota, Aichi prefecture, and a reverse fault type stress field with E-W to NE-SW maximum horizontal stress direction was obtained.

Borehole breakout (BB) and/or drilling induced hydraulic fracturing (DIHF) were found at eleven stations on the borehole wall images produced using borehole televiewer/camera. The direction of maximum horizontal stress derived from BB and DIHF as well as the hydraulic fracturing stress measurements ranges between E-W and NE-SW for almost all the stations. This stress direction is perpendicular or largely oblique to the relative convergence direction of Philippine Sea plate to Amour plate. Our results are roughly consistent with the previous stress measurements as well as the focal mechanisms of shallow crustal earthquakes in this region. We are examining the orientation distribution of fractures and its relation to the stress orientations reported here.

Keywords: Shikoku and Kii region, Shallow crustal stress