

# **Pressurized and depressurized hydrothermal fracturing of granitic rocks under sub-and supercritical conditions of water**

NORIYOSHI TSUCHIYA, TETSUYA MIZUNO AND  
NOBUO HIRANO

Tohoku University

Presenting Author: [noriyoshi.tsuchiya.e6@tohoku.ac.jp](mailto:noriyoshi.tsuchiya.e6@tohoku.ac.jp)

In order to understand rock and fault failure with fluid, we conducted hydro-fracking (pressurized fracturing) under supercritical conditions and hydrothermal experiments coupled with measurement of elastic wave ( $V_p$ ) around critical point of pure water. Hydrothermal experiments were for granite specimens to reveal rock failure by phase change of fluid (Depressurized fracturing: flashing, boiling) under subcritical and supercritical conditions.  $V_p$  measurement was also performed under hydrothermal condition on vapor saturation curve up to 350C. After flashing, rock specimens were cooled down rapidly (150-250C cool down within several seconds).  $V_p$  of intact specimens show between 4.0 and 5.0 km/s for granite. After flashing from 350C,  $V_p$  of granite was less than 3.0 km/s and  $V_p$  of gabbro showed around 4.5 km/s. Those results suggested that mechanical properties of rock can not show elastic behaviors. Brittle vulnerability, particularly granitic samples, can be recognized. Those facts indicate that brittle vulnerability of fault plane by vapor flashing triggered by earthquake should be occurred. Pulverizing behaviors of fault plane and fault itself coupled with fluid dynamics were one of evidence and trigger of earthquake.