[JJ] Eveningポスター発表 | セッション記号 S (固体地球科学) | S-SS 地震学

[S-SS15]地震発生の物理・断層のレオロジー

コンビーナ:向吉 秀樹(島根大学大学院総合理工学研究科地球資源環境学領域)、谷川 亘(国立研究開発法人海洋研究開発機構高知コア研究所)、松澤 孝紀(国立研究開発法人　防災科学技術研究所、共同)、吉田 圭佑(東北大学理学研究科附属地震噴火予知研究観測センター)

2018年5月21日(月) 17:15 〜 18:30 ポスター会場 (幕張メッセ国際展示場 7ホール)

地震の発生および断層内での物理学的化学的素過程に関わる諸問題に対して，地震学・測地学・地質学・鉱物学等の固体地球科学諸分野における，理論・実験・観測・観察・シミュレーションなどの多様な観点から，学際的に議論を深めることを目標とする．地震前，地震時及び地震後の過程，断層岩と断層帯のレオロジー，断層運動などの震源とその周辺における現象，摩擦構成則とそれに基づく地震プロセスのモデル化，地震発生場の応力状態，断層掘削，震源過程など，関連する話題を広く募集する．

[SSS15-P06]超臨界地熱資源開発に向けた，加圧注水にともなう花崗岩き裂の力学・水理学特性の変化に関する基礎的検討

*石橋 琢也[1]、浅沼 宏[1]、石川 慧[2] (1.国立研究開発法人産業技術総合研究所 福島再生可能エネルギー研究所、2.東北大学大学院環境科学研究科)

キーワード：深部地熱資源、浸透率、岩石亀裂/断層、間隙水圧、表面粗さ

Hydraulic stimulation for the geothermal reservoirs is now a well-known operation for enhancing or maintaining the reservoir permeability [*Evans et al.*, 2005; *Häring et al.*, 2008]. In this operation, as a massive amount of pressurized fluid is injected into the targeted reservoir, preexistent fractures undergo slip/shearing and new fractures are also created. As a result of these events, mechanical, hydraulic, and seismic properties of the geothermal reservoir evolve. For the success of developing supercritical geothermal resources, it is essential to precisely understand how mechanical, hydraulic, and seismic characteristics of rock fracture evolve during pressurization (i.e., pore pressure increase), and how these characteristics are linked in each other.

Here, we report the laboratory experiments, where we concurrently monitor the strength, permeability and acoustic emission (AE) of rock fracture during shearing triggered by pressurized water injection. Cylindrical sample of Inada granite (diameter and length are 5 cm and 10 cm), which have a single tensile fracture with rough surfaces, is prepared and is set in the triaxial pressure vessel at Fukushima Renewable Energy Institute, AIST. In this system, we can control the confining pressure (0-40 MPa), axial pressure (0-250 MPa), pore pressure (0-25 MPa), and temperature (20-250℃) independently. In our experiment, we first simulate the critically stressed state of rock fracture, where the normal stress and the shear stress on the fracture are set to 54 MPa and 51 MPa respectively. Then, we gradually increase the pore pressure from 2 MPa to 8 MPa. As soon as the pore pressure reaches to 8 MPa, slow/aseismic slip is first triggered (3 AE events, 3 micron/sec), and then transit to fast slip (29 AE events, 51 micron/sec). Slip distance is 12 microns during aseismic/slow slip, whereas it is 155 microns during fast slip. Due to the self-propped mechanism by surface roughness, fracture permeability is enhanced by ~12 times of the initial permeability before slip/shearing. Interestingly, 57% of the permeability gain is acquired during the slow/aseismic slip, and this fact may suggest the slow/aseismic slip is interpreted as the mixed mode of fracture failure between opening and shearing. Such findings from laboratory experiments are well consistent with those obtained through the meso-scale (over a few hundred meters) experiment of fault re-activation, which is recently reported by *Guglielmi et al.* [2015]. Through the detailed comparison between laboratory and field experimental results, we try to explore the possible links between the hydraulic, mechanical, and seismic characteristics during the hydraulic (pore pressure driven) shearing.