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07 Dec. 2020

Editorial Office

JGR

Dear Editor,

We are submitting the attached manuscript entitled “***Imaging elastodynamic and hydraulic properties of in-situ fractured rock: An experimental investigation exploring effects of dynamic stressing and shearing”*** by *Clay Wood, P. Shokouhi, P. Manogharan, J. Rivière, D. Elsworth, C. Marone* for consideration as an article in JGR: Solid Earth. This work addresses fundamental questions about fracture permeability and elastic properties.

We describe laboratory experiments to elucidate the relationship between nonlinear elasticity and permeability evolution in fractured media subjected to local stress perturbations. This study is part of an effort to image fluid pathways and fracture properties using active-source acoustic monitoring during fluid injection and shear of rough fractures. Unique experiments were conducted in which samples of Westerly granite were fractured in-situ under true tri-axial stresses while monitoring fluid flow through the resulting fractures. We study the impact of effective stress oscillations, via applied normal stress and pore pressure, on fracture properties using an array of active source piezoelectric transducers. We interpret the resulting evolution of elastic wave properties in the context of elastic nonlinearity and relate the estimated nonlinearity parameters to the relative change in permeability of the fractured media. Fracture roughness is then altered in-situ by shearing, with the generation of breccia and wear products. We document the evolution of permeability and fracture contact stiffness as a function of dynamic stressing and shear offset and discuss our findings in relation to fractures in Earth's crust.

This manuscript contains original work that has not been submitted for publication to another journal or conference proceeding. All authors have approved the submission of this manuscript.

We have included a list of potential reviewers below. If you have any questions please do not hesitate to contact us.

Sincerely,

Clay Wood (for all authors)

Potential referees (in alphabetical order):

* Thibault Candela, Applied Geosciences, TNO, Netherlands, thibault.candela@tno.nl
* Bill Carey, Los Alamos National Laboratory, bcarey@lanl.gov
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