Please ensure that your abstract fits into one column on one page and complies with the *Instructions to Authors* available from the Abstract Submission web page.

Impacts of heterogeneities on fracture alteration: Investigations using a reduced dimension reactive transport model

HANG DENG[1], CARL STEEFEL[2], SERGI MOLINS[3], DONALD DEPAOLO[4]

[1]Lawrence Berkeley National Laboratory, Berkeley, CA, USA, 94720, hangdeng@lbl.gov
[2]Lawrence Berkeley National Laboratory, Berkeley, CA, USA, 94720, cisteefel@lbl.gov
[3]Lawrence Berkeley National Laboratory, Berkeley, CA, USA, 94720, smolins@lbl.gov
[4]Lawrence Berkeley National Laboratory, Berkeley, CA, USA, 94720, djdepaolo@lbl.gov

Fractures are the preferential flow pathways in porous media, and are highly relevant to many geological applications. The hydraulic properties of fractures are largely dependent on heterogeneous distributions of fracture apertures, and can be altered by the presence of reactive fluids and their interactions with the rock matrix. Geochemical reactions further complicate the characterization and prediction of fracture hydraulic properties because these reactions depend largely on factors such as mineral composition that are highly heterogeneous as well.

In this study, we use a reduced dimension model [1] to investigate the impacts of pore-scale geometric and mineralogical heterogeneities on evolution of fracture morphology and hydraulic properties. This reduced dimension model captures aperture variability in the fracture plane and the modification of fracture surfaces in presence of mineral heterogeneity, while allowing for high computational efficiency.

Simulations are conducted for a range of mineral compositions, each containing different proportions of carbonate minerals in the assemblage. Random fracture fields are generated based on a range of aperture variations and spatial correlations documented in previous experimental work. Comparisons of the simulations demonstrate the important role of mineral composition in controlling fracture hydraulic aperture. This is because mineral heterogeneity affects the alteration of the rock matrix bordering the fracture, which in turn affects subsequent reaction in the fracture and the extent and spatial pattern of fracture opening. As a result, flow channeling, which enlarges fracture hydraulic aperture disproportionally faster than the geometric fracture aperture, may be dampened or enhanced by the presence of mineral hetergeneity.

[1] Deng et al. (2016) *Env Sci & Tech* **49**, 10226-10234.