Title：Impact of rough fractures on computational rock physics

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Abstract: Many issues of energy and environment are interlocked in the geosphere of the Earth, and are critical to the developments, advances and safety of the human community on Earth. One most important issue is the fracture systems of different sizes, geometries, densities, physical-chemical behaviors and properties of the fractured rock masses, especially the coupled thermal, hydrological, mechanical and chemical processes that have been one of the driving issue of rock mechanics and rock engineering to meet the demands for the more save and efficient energy and safe environment. This presentation gives a brief but in-depth of the research results from a part of numerical modeling of computational rock physics issues involving mechanical, hydrological and coupled hydro-mechanical processes in fractured rock masses and single fractures, with focuses on outstanding issues of numerical modeling achievements and remaining challenges, and impacts of single rough fracture on computational rock physics, both numerical modeling and lab tests.

The content of the presentation include:

1). Achievements of numerical modeling for deriving conceptual understanding of hydrological, mechanical and coupled hydro-mechanical fractured rock masses, including REVs of elastic and hydrological properties, limit of Biot's poroelasticity theory for modeling coupled hydro-mechanical processes and solute transport in fractured rock masses;

2). Outstanding issues of the above modeling approaches;

3). Achievements and outstanding issues of numerical modeling hydrological, and coupled hydro-mechanical processes and solute transport in single rock fractures, in 2D and 3D spaces.

4). Acknowledgement.