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Permeability evolution in the final fault plane –experimental observations of sandstone under general stress state-

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To investigate experimentally the characteristics of hydraulic conductivity along the final fault plane, a new coupled shear displacement - fluid flow testing technique under true triaxial compression was developed. The displacement and hydraulic conductivity measurements were made with increasing intermediate principal stress as well as with increasing maximum principal stress under constant minimum principal stress. Some major aspects of the new coupled shear displacement - fluid flow testing system are described. A continuous hydraulic conductivity from brittle regime to ductile regime can be measured. In the brittle fault regime, the hydraulic conductivity in the intermediate principal stress direction decreased with increasing the axial strain until the onset of dilatancy, then increase significantly with increment of axial strain. On the other hand, in both brittle-ductile transition regime and perfectly ductile regime, the hydraulic conductivity in the intermediate stress direction with large axial strain could not excess the initial value before the axial loading. The hydraulic conductivity in the perfectly faulted sample during shearing under the constant residual strength showed no significant change. This testing system allows us a continuous hydraulic conductivity measurement under high pore pressure and high axial differential stress

during the entire deformation process from elastic, plastic up to shearing along the eventual fracture.