The Effective Stress Law at a Brittle-Plastic Transition: Analogue Experiments with Halite Gouge Layers

*Hiroyuki Noda[1], Miki Takahashi[2]

1.Japan Agency for Marine-Earth Science and Technology, 2.National Institute of Advanced Industrial Science and Technology

We investigated the effect of pore pressure P_f near the brittle-plastic transition (BPT) for a halite (NaCl) shear zone. Our series of precut friction experiments with a gas-medium apparatus with temperature T≤200°C, confining gas pressure P_c≤150 MPa, and P_f≤140 MPa revealed that a tanh connection between the brittle and plastic regimes works well even at elevated P_f, with a coefficient for P_f in an effective stress law αbeing unity. Plastic deformation around the real contacts independent of the mean stress results in α=1 regardless of the ratio of the real contact area A_r/A. The functional dependency of the shear strength on the effective normal stress may deviate from a linear dependency with increasing A_r/A. The present findings support a smooth transition in a hypothetical steady-state strength profile around a BPT, providing new insights in geologically obtained paleo-stress data in exhumed mylonitic shear zones.

Keywords: Effective stress law, Brittle-plastic transition, Friction experiment

