

Inferring constitutive parameters with slip displacement during quasi-stationary contact

Kohei Nagata[1]; Shingo Yoshida[2]; Masao Nakatani[3]

[1] Earth and Planetary Sci., Tokyo Univ.; [2] ERI, Univ. of Tokyo; [3] ERI

We proposed a method to infer rate- and state-dependent friction constitutive law parameters a , b using slip velocity or slip displacement during quasi-stationary contact and applied it to data obtained from frictional experiments with Aji granite. In this method, we assume that the change of frictional strength during quasi-stationary contact depends only on time-dependent healing. Time change of slip velocity and slip displacement during quasi-stationary contact with fixed shear stress can be expressed by constitutive law with this change of frictional strength. We inferred the value of b/a by fitting this expression to the slip displacement data obtained from the experiments under less than 10 MPa of normal stress with double direct shear apparatus. With this value of b/a and the value of $a - b$ determined from the difference between shear stresses during steady-state sliding in velocity step tests, we inferred that the values of a and b are 0.05-0.09. These values are larger than those previously inferred from velocity step tests, 0.01-0.02. The advantage of presently used method is that the parameters can be inferred without evolution law, which assumes the transitional change of frictional strength. It has been suggested that every evolution law proposed previously may not express transitional change of frictional strength correctly [e.g. Nakatani, 2001]. The values of constitutive parameters may not be inferred correctly with these evolution laws.