A relationship between shear stress change and slip velocity on the fault (case study of the 2003 Tokachi-oki earthquake)

Shin'ichi Miyazaki[1]; Paul Segall[2]; Jun'ichi Fukuda[3]; Teruyuki Kato[4]

[1] ERI; [2] Dept of Geophys, Stanford Univ; [3] ERI, Univ. of Tokyo; [4] Earthq. Res. Inst., Univ. Tokyo

We investigate a relationship between the shear stress change and the slip velocity on the fault surface for the afterslip following the 2003 Tokachi-oki earthquake. We first infer the space time distribution of slip and slip velocity on the plate boundary with the Network Inversion Filter using GEONET and other additional GPS data provided by Geographical Survey Institute. The cumulative slip is distributed around the main rupture zone, suggesting a spatial heterogenity of the frictional properties on the fault. In order to examine the frictional properties, we calculated the shear stress change from the inferred slip distribution at each epoch using a dislocation obtained by Okada [1992], and plot the shear stress change with respect to the log(slip velocity). The result shows a quasi-linear path with a positive slope of d¥{tau}/d¥{ln}(v) ¥sim 0.6 MPa, suggesting the steady-state strengthening friction. If the medium is compliant, this path parallels to the steady-state line. By assuming the hydrostatic fluid pressure, the observation implies (a-b) of order 0.001.