

Differences in the Initiation Area and the Large Asperity of the 1999 Chi-Chi Taiwan Earthquake

James Mori[1]; Hisao Ito[2]; Kuo-fong Ma[3]

[1] RCEP, DPRI, Kyoto Univ.; [2] GSJ, AIST; [3] Institute of Geophysics, National Central University

<http://www.rcep.dpri.kyoto-u.ac.jp/~mori/>

We study the relation between the initiation and the area of the large slip (asperity) during the 1999 Chi-Chi, Taiwan earthquake (Mw 7.6). The area of the initiation has relatively small amounts of slip and the recorded strong-motion records show high levels of high-frequency radiation. In contrast, the area of the largest slip (over 10 meters) occurs about 15 seconds later and is characterized by a smooth slip that has a very fast slip velocity and generates much less high frequency radiation.

We use near-field strong-motion seismograms to model the slip behavior for the two different regions and show that the differences can be explained by differences in the level of dynamic friction. The area of large slip may have a much lower level of dynamic friction during the rupture process. Such low levels of dynamic friction may be characteristic of large asperities, and are consistent with the observations of the fast, smooth slip observed on the northern portion of the Chelungpu fault.

Verification of these inferences about the frictional properties of the fault may come from observations collected by the Taiwan Chelungpu Fault Drilling Project (TCDP). In this project a 1 km borehole is currently being drilled into the area of large slip on the Chelungpu fault to obtain physical samples of the fault and measure its geophysical properties..