



## **New evidence that the 1999 Mw=7.6 Chi-Chi earthquake is a characteristic earthquake: Deciphering long-term (30 ka) fault slip vectors on the northern Chelungpu fault from fold scarps on alluvial terraces**

Maryline Le Beon (1,2), John Suppe (1), Manoj Jaiswal (1,3), Yue-Gau Chen (1), and Michaela Ustaszewski (1)

(1) Department of Geosciences, National Taiwan University, Taipei, Taiwan (mlebeon@gmail.com), (2) Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan, (3) Department of Earth Sciences, Indian Institute of Science Education and Research, Kolkata, India

In convergent tectonic setting, fold scarps on alluvial terraces provide a quantitative long-term record of the amount of slip through an underlying fault bend since abandonment of the terraces. Cumulative slip can be computed in 3 independent ways, based on the terrace height in the hanging-wall relative to base level, the fold-scarp relief, and the width of the fold-scarp limb. We use these techniques to invert for fault-slip magnitude and azimuth from fold scarps on dated alluvial terraces in the hanging wall of the northern Chelungpu thrust, located at the piedmont of the Taiwan fold-and-thrust belt. Three main levels of alluvial terraces show progressive folding by kink-band migration in relation to the underlying fault geometry, forming a main N-S fold scarp up to ~193 m high and secondary E-W scarps. Based on scarp relief, the 3D deformation of the highest terrace T1, OSL-dated at ~30 ka, leads to  $523 \pm 81$  m cumulative slip oriented  $N338^\circ \pm 6^\circ$ , which is parallel to the 1999 Mw=7.6 Chi-Chi coseismic displacements in this area ( $N333^\circ$  to  $N341^\circ$ ), but strongly different from the azimuth of interseismic deformation ( $N285^\circ$ ). In a similar direction, scarp reliefs on terraces T2 and T3, OSL-dated at ~22 ka and ~17 ka respectively, yield slip values of  $432 \pm 78$  m and  $271 \pm 62$  m, respectively. The slip and age results indicate a constant fault slip rate of  $17.7 \pm 2.2$  mm/a along  $N338^\circ \pm 6^\circ$ . Late Quaternary shortening rates observed at 4 sites along the fault vary in similar proportion to Chi-Chi coseismic displacements. Together with the colinearity of long-term and coseismic slip vectors at our study site, this suggests that Chi-Chi earthquake is a characteristic earthquake for the Chelungpu thrust with an average recurrence of ~440 years for the last ~30 ka.