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A comprehensive approach of near surface deformation study: an example from Fengyuan city planning benchmarks.

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The northern segment of the Chelungpu fault resulted from the Mw 7.6 Chi-Chi earthquake show an unusual high coseismic displacement in comparison with its central and southern segments. This segment provides an excellent opportunity to characterize the faulting-related folding structures in the near-field of the northern part of the Chelungpu fault near Fengyuan city. The city is the capital of Taichung County, located in the east edge of Taichung basin, and had been cut by the surface rupture. Because it is a big city, they had their own city planning map which first surveyed and made in 1992. In 2002, they did another survey in the eastern part of city on account of the damaged of the road and houses. We use 924 city-planning benchmarks' displacement to calculate the offsets in Fengyuan City. Furthermore we reproduce coseismic deformation patterns with a very dense coverage of the geodetic data in study area. The maximum horizontal displacement of whole hanging wall in northern part can reach to 9.87 m and the maximum vertical offset is 8.14 m. The northward component of hanging wall displacement's range is 8.07 m to 3.17 m. It's generally decrease from north to south. The westward component of hanging wall displacement's range is 5.67 m to 2.61 m and the distribution of offset value is effected by the locally fault geometry. The average direction of hanging wall movement is $329.9 \pm 3.8^{\circ}$, and is approximately consist with the GPS measurement. The vertical displacement of hanging wall is -0.94 m to 8.14 m. We also inverse the attitude of the subsurface fault plan based on observed geodetic data, and the observation consists with the surface deformation model which we suggest and the borehole data from Fengyuan 450m well.