



The 1999 Mw 7.6 Chi-Chi earthquake revisited: Co-seismic deformation from earth observations

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On 21 September 1999, the Mw 7.6 Chi-Chi earthquake, one of the largest inland earthquakes in Taiwan happened and struck the Taipei Basin, in the Central western part of the island, killing more than 2400 people and damaging 100 000 structures. The rupture was complex with several dislocations along the 100-km long Chelungpu thrust fault. Revisiting this earthquake with a range of earth observations will allow better understanding of regional fault properties.

ERS images from the descending track 232 and covering the period from 21 January 1999 to 28 October 1999 were interferometrically processed using the ESA open-source software SNAP to investigate the co-seismic deformation. With InSAR, only the footwall can be analysed because the hanging-wall, which likely experienced the main deformation in this event, is densely vegetated resulting in low coherence in the interferograms. Co-seismic interferograms show about 10-11 fringes in the footwall which is equivalent to a surface displacement of up to approximately 30 cm. In order to obtain observations of the hanging-wall, Cosi-Corr software was used to correlate pre and post SPOT optical images. In addition to these two datasets, GNSS and leveling data were also used. PSOKINV (Particle Swarm Optimization and Okada Inversion package), a geodetic inversion package, was used to determine the fault geometry and the slip distribution. Firstly, the relative weights of the four datasets were determined using the generalized Akaike's Bayesian Information Criterion (gABIC). Secondly, the Particle Swarm Optimization (PSO) was utilised in the geodetic modelling to determine an optimal uniform model with 4 fault segments. Thirdly, a joint inversion of InSAR and geodetic data (SPOT, GNSS and leveling) was realised to estimate the slip distribution. These datasets enabled us to get information about the hanging-wall of the fault and to improve the modelling.