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# The 1999 Mw 7.6 Chi-Chi earthquake: Co-seismic study based on InSAR and GPS data

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## Abstract

One of the largest inland earthquakes in Taiwan happened on 21 September 1999, the Mw 7.6 Chi-Chi event. It 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. An improved study of this earthquake will allow better understanding of regional fault properties. Six ERS images from the descending track 232 and covering the period from 21 January 1999 to 25 May 2000 were processed to investigate the co-seismic deformation. The Interferometric Synthetic Aperture Radar (InSAR) technique was used and via the ESA open-source software SNAP. With InSAR, only the footwall can be analysed because the hanging-wall, which likely experiences the main deformation, is densely vegetated resulting in very low coherence in the interferograms. Co-seismic interferograms show about 10-11 fringes which is equivalent to a displacement variation of approximately 30 cm. We used PSOKINV (Particle Swarm Optimization and Okada Inversion package), a geodetic inversion package, to determine the fault geometry and the slip distribution. First, the non-linear problem is to use the Particle Swarm Optimization (PSO) for geodetic modelling with the assumption of a uniform slip on a rectangular fault. Second, a joint inversion of InSAR and geodetic data (GNSS and levelling) is realised. The GNSS enables us to get information about the hanging-wall of the fault and to improve the modelling. The slip distribution is determined as a linear problem, optimally-smoothed parameters are obtained.

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