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GPS and DInSAR to estimate the ground motions and co-seismic displacements on Feb. 6, 2016 Meinung earthquake, Taiwan

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To realize the movement behaviors and precise displacements caused by ML 6.6 Meinung earthquake (occurred at about 35 km ESE of the Tainan city with a focal depth of 16.7 km on Feb. 6, 2016), we applied GPS and DInSAR techniques for this study. Daily solution and kinematic positioning by GPS algorithms can determine the co-seismic displacements and ground motions, and the surface deformation information by DinSAR technique can fulfills the reginal differential movement.

All of GPS positioning are estimated by GIPSY-OASIS that is a free scientific GPS software designed by JPL, USA. After removing the sidereal bias, the GPS daily solution (30 seconds sampling rate) presents the largest horizontal co-seismic displacement reaching 64 mm with 308° in station GS32 which located at the lakeside of Hsin-Hwa district of Tainan city, 22 km away the epicenter center, and the largest vertical displacement provides 63 mm uplift in station LNCH which situated at the top of hill of Long-Chi district of Tainan, 15 km away the epicenter center. However, kinematic positioning (1 Hz sampling rate) provides the surface ground motions and co-seismic displacements during the quake. For the determination of co-seismic displacements, there is no obvious difference between the daily solution and kinematic positioning algorithms, due to no prominent post-seismic displacement have been found. Following the study of magnitude scaling properties of peak ground displacement (Melgar et al., 2015), we analyze 1 Hz kinematic positioning result from 40 continuously operating reference station (CORS), and the Mw can be determined to 5.9. A slight lower than that reported (Mw 6.2) by Taiwan Earthquake Research Center, more earthquake events need to be investigated to utilize the seismogeodetic data.

According to the result from DinSAR technique, the main deformation area occurs within 4 faults zone which are Hsin-Hwa fault, Zuo-Jhen fault, Long-Cheun fault and Mei-Ling fault in an area 144 km^2, the deformation zone presents in a round shape with almost 100 mm movement in the south of the station LNCH. The outside of these faults show the subside behavior that is similar with the result acquired from the daily solution of GPS.