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Analysis of Active Crustal Deformation in Chiayi Area, Southwestern Taiwan by Continues GPS network and numerical modeling

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Locating in the boundary between the Eurasia Plate and the Philippine Sea Plate, the island of Taiwan lies in a complex tectonic area. The fold-and-thrust belt in the southwestern Taiwan provides distinctive morphotectonic features reflecting the initial mountain building stage in Taiwan orogeny. Several devastating earthquakes have occurred in this region since 1900, the famous one is M7.1 Meishan earthquake in 1906. In addition, a seismic concentration zone is observed in Coastal plain in Chiayi counties, which no active faults have been reported in this region. The active deformation in SW Taiwan has been suggested to be related to active growing folding initiated by the blind thrust fault system. How surface deformation related to the subsurface active structures is a crucial topic for seismic hazard assessment in study area. The newly initiated blind fault system increases potential earthquake hazard in the southwestern alluvial plain where is densely populated. Thus we try to characterize the existence of blind fault-folding system beneath the coastal plain area by geodetic method. We derive a velocity field based on data at 55 continuous GPS (CGPS) stations from 2006 to 2010, and data at 97 campaign mode GPS over a time period between 2002 to 2010. The CGPS data used in this study were processed with the GAMIT/GLOBK software version 10.4. The crustal motion in this area shows the horizontal displacement about 30 mm/yr with the directions of 297° in the easternmost part of the Western Foothills, and crossing the main active structures, Chiushiunkeng-Chukou Fault and blind fault systems, the velocities significantly decrease to 3 mm/yr with the directions of 288° in the westernmost part in the coastal plan, with respect to Paisha station, S01R. The compressional strain rate dominates and the larger compressional strain rate is observed at the Foothill region, the east side of Chiushiunkeng- Chukou Fault. In some coordinate time-series of our CGPS sites, the strong periodic signals whether in horizontal component or vertical component is observed. These signals might include the effect of variation of ground water level or tectonic motion. In this study, we try to use the available geological structural profiles from CPC to characterize complex motions in Chiayi region and to assess the fault activity based on 2-D dislocation model. Further, we try to use Poly3D to inverse the fault motion during interseismic period.