



The observation of crustal deformation derived from Taiwan Continuous GPS Array (2007-2013)

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Data collected by 281 sites of Taiwan Continuous GPS Array from 2007 to 2013 are processed with GAMIT/GLOBK software. The acquired GPS position time series are described by model parameters such as linear rate, annual and semi-annual periodic motions, coseismic offsets, postseismic rate change, and exponential decay after earthquakes. Stacking of power spectral densities from 281 continuous GPS data in Taiwan, we found the slopes of spectra (spectral index) are -0.72, -0.77, and -0.57 for the E, N, U components, respectively. It indicates the errors of continuous GPS data can be described as a combination of white noise and flicker noise. The common-mode errors are removed by stacking data from 50 continuous GPS sites with data period more than 5 years. By removing common-mode errors, the precision of GPS data is further improved to 2.3 mm, 1.9 mm, and 6.9 mm in the E, N, U components, respectively.

After strictly data quality control, time series analysis and noise analysis, we derive a new ITRF2008 velocity field and velocity field relative to Penghu using GPS data from 2007 to 2013 in the Taiwan area. The general pattern of the newly derived 2007-2013 velocity field is quite similar with that from previous studies, but the station density is much larger and spatial coverage is better, too. About 80 mm/yr plate convergence rate is observed, approximately half of plate convergence rate is accommodated on the fold and thrust belt of western Taiwan and another half is taken up in the Longitudinal Valley and the Coastal Range in eastern Taiwan. The velocities in western Taiwan generally show a fan-shaped pattern, consistent with the direction of maximum compression tectonic stress. In northern Taiwan, the velocity vectors reveal clockwise rotation, indicating the on-going extensional deformation related to the back-arc extension of the Okinawa Trough. In southern Taiwan, the horizontal velocity increases from about 40 mm/yr at Chiayi-Tainan to 55 mm/yr in the Kaohsiung-Pingtung area with a counterclockwise rotation in the directions.

The 2007-2013 Taiwan velocity field and GPS position time series can be used in active tectonics and earthquake prediction studies. It also provides important information for seismic hazard analysis.