Contemporary deformation of tectonic escape in SW Taiwan from GPS observations, 1995-2005

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Abstract

GPS velocity field in SW Taiwan inferred by 103 stations from 1995 to 2005 provides an excellent opportunity to recognize the contemporary crustal deformation in extrusion tectonics. Horizontal velocities relative to stable continental margin from east to west are rotated anticlockwise from 42.0 mm/yr to 13.0 mm/yr along azimuths from 246° to 265° across SW Taiwan. Vertical velocity field in SW Taiwan shows a subsidence rate of 5 to 20 mm/yr concentrated on the coastal area of Pingtung plain and an uplift rate of 10 to 20 mm/yr distributed at the mountain belt. Spatial velocity variation indicates motions of two escaping-parallel faults, the Chishan reverse fault (CHNF) with right-lateral motion and the Chaochou reverse fault, and one escaping-normal fault, the left-lateral Fengshan transfer fault zone (FTFZ). Dominant WNW-ESE shortening and NE-SW dextral shear strain subject to the NW area of SW Taiwan near the CHNF. A NE-SW extension and NW-SE contraction are represented near the FTFZ along the SW coastal area, where showing a NW-SE left-lateral shear strain. Our GPS data show that from east to west the FTFZ exhibits velocities rotating from nearly westward direction to WSW direction, parallel to the edge of the basement high. The FTFZ has probably developed since the late Pleistocene based on the comparison between the Pleistocene stress pattern and the present-day strain rate field. The Chishan fault is a boundary fault, dividing the SW Taiwan into a western deforming domain and an eastern quasi-rigid block. A nearly E-W contraction and N-S extension escaping stress regime is revealed by N-S-trending ductile flow within the upper mantle and by brittle conjugated-type fracture, formed by the CHNF and the FTFZ, within the crust.