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Lateral extrusion in southwestern Taiwan as revealed by GPS measurements and 3-D numerical modeling

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The campaigns of dense GPS measurements from 1995 to 2500 have been conducted to investigate the fault activity and crustal deformation patterns in SW Taiwan located in a transition zone between collision mountain belt and accretionary prisms of the subduction zone. These GPS surveys have provided the complete velocity field in SW Taiwan relative to the permanent station located on the stable continental shelf. The GPS displacement velocities display the trends of variation in the investigated area. The station velocities decrease westwards from 42.2 mm/yr to 55.5 mm/yr along the azimuths from 247.1^o to 272.5^o. In the central and western part of the study area, GPS stations move nearly toward the west, whereas in the Pingtung-Kaohsiung coastal area, the displacement vectors demonstrate a clear counter-clockwise deviation toward the SW. The distinctive counterclockwise rotation of the velocity vectors across the study area can probably be best explained as a result of the lateral extrusion. These results demonstrate that the transtensional deformation and the along-strike variation of southward increase of extensional deformation in the whole area of southwest Taiwan is due to the low lateral confining conditions related to the Manila subduction zone as a free boundary or/and the presence of the prominent Peikang High as a rigid indentor. The right-lateral and left-lateral structures facilitate the southwestward extrusion. Furthermore, we exploits 3-D distinct element model to characterize the crustal deformation in study area. We construct the model with a basal décollement and four major faults in southern Taiwan which bounded the extruding wedges. The models test the

mechanic properties of major faults, the rheology contrast of different blocks and the depth of decollement to find the mechanical explanation of lateral extrusion.