



Basement involvement in the south-central Taiwan thrust belt

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The Taiwan mountain belt is generally thought to develop above a shallow, through-going basal detachment confined to within the sedimentary cover of the Eurasian continental margin. Recently acquired surface geology, when combined with seismic tomography, earthquake hypocenter, and gravity data suggest, however, that basement is also involved in the deformation in south-central Taiwan. Since basement does not crop out in south central Taiwan, we adopt a P-wave velocity of 5.2 km/s as a proxy for the basement-cover interface and use it as a reference horizon. This interpretation is then tested as a density contrast by 3D modeling of the Bouguer anomaly data. The good fit between the two suggests that this surface provides a reasonable proxy as an interpretation for the top of the basement in what follows. The data suggests that, in the west, beneath the Coastal Plain and the Western Foothills, the mountain belt is evolving above a southward deepening level of detachment that is illuminated by sub-horizontal clusters of earthquake hypocenters located near the basement-cover interface. In much of the study area, this detachment appears to be below the depth of the basal thrust determined from geological constraints provided by the thrust system mapped at the surface. Furthermore, when viewed in a northwest-southeast orientation, the hypocenters cluster that defines the detachment appears to mimic the rugose extensional fault architecture imaged in the off shore to the west of Taiwan. This suggests that pre-existing faults on the margin, although oriented at a high angle to the convergence direction, are playing an active role in the development of thrust belt while still not being completely inverted. Eastward, the detachment at the basement-cover interface joins with an east-dipping hypocenter cluster that is interpreted to form a ramp that extends to greater than 20 km depth, into the middle crust. Above this ramp, basement rocks (P-wave > 5.2 km/s) are uplifted to near the surface, forming a basement culmination beneath the Hsuehshan and Central ranges. The uplift of these basement rocks, together with the juxtaposition of higher metamorphic grade rocks across the Shuilikeng, Lishan and Chaochou faults suggests that these faults form a linked fault system that extends downward into the middle crust at the location of the ramp.