A high strain shear zone in the metamorphic core of Central Range, Taiwan: A possible Plio- Pleistocene transform fault

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Subduction of the South China Sea beneath the Philippine Sea plate in the mid-Miocene led to the oblique collision of the Chinese continental margin and the Luzon arc, and the birth of the Taiwan orogen. Traditionally, the collision in Taiwan has been interpreted to be a relatively continuous process with an invariant plate convergence vector for at least the last 5 Mya (Suppe, 1984; Teng, 1996), suggested an orogen with a relatively steady shape and size (Suppe, 1981). However, more recent plate reconstructions with 50˚ counterclockwise plate motion change (Wu et al., 2016) and detailed geochronology studies with simultaneous exhumation history (Lee et al., 2015), suggest alternative tectonic histories are possible.

Observations of meso- and microscopic structures along the eastern Central Range of Taiwan (a strip area of about 200-km-long, 30-km-wide) show two generations of superposed folds with type-1/type-3 interference patterns in the hinge and asymmetric folds in the limb of the metamorphic core complex, which was associated with corresponding two cleavage sets. The transition between the surrounding Slate Belt and the higher-grade metamorphic core of Tailuko Belt are marked by a well-developed, penetrative crenulation cleavage, S2, that dips moderately northwest. The stretching lineation plunges moderately south-southwest is oblique to both the gently plunging lineation in the Tailuko Belt and to the steeply plunging lineation in the Slate Belt (Pulver et al., 2002). A high-strain shear zone can be identified with the consistency of the asymmetric structures and paleotemperature in the detail-studied areas. Stereonets reveal highly concentrated shear planes and asymmetric structures in the high-strain zones suggested top-to-southwest sense of shear. The mineral grain size/boundary mobility and illite-crystallinity index suggested the metamorphic temperature has exceeded 400˚C, which is higher than the closure temperature of the biotite (~350˚C). Therefore, the biotite $^{40}Ar/^{39}Ar$ age in the gneiss mylonite yield well-defined plateau dates ranging from 4.1-3.0 Ma (Wang et al., 1998), suggested a syntectonic age for this high-strain zone. The results indicate systematic left-lateral kinematics from north to south in the eastern Central Range (from Hoping, Liwu, Mugua, Shoufeng, Wanrung, Hongye, Chinshui, Xinwulu, to Dalun rivers), that suggested a possible major transform fault in the Tananao metamorphic belt.

Keywords: Tananao metamorphic belt, high strain shear zone, left-lateral strike slip motion

