Co-existing normal faulting and thrusting across plate suture during arc-continent collision in eastern Taiwan

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Based mainly on field structural investigations and combining available geophysical, geochemical and geochronological information, this study intends to illustrate the complex tectonic stress regimes across the plate suture between the eastern Central Range and the Luzon arc in eastern Taiwan. The eastern Central Range is composed of continental margin rocks that contain high-pressure minerals (omphacite, glaucophane, garnet) with Miocene-Pliocene ages suggesting rapid exhumation from mantle depths. The Luzon arc has been formed since about 15 Ma due to subduction of South China Sea under the Philippine Sea plate. Since then, the Central Range exhumed from about 40-50 km of depth at a rather rapid rate, presumably aided by geodynamic factors such as slab delimitation and/or detachment of either the downing slab (“paleo-Pacific ocean slab”?) or tearing of the overriding Philippine Sea plate. This rapid exhumation was characterized by intensely sheared zone in the lower boundary of the HP terrane (mé lange) with the continental crust. In addition we also observed widespread outcrop-scale normal faults with a general WSW-ENE extension, suggesting dominant vertical uplifting force and/or lateral extension during exhumation. It also implies that this normal faulting stress regime might be closely associated with a horizontal NNW-SSE compression ($\sigma 2$ principal stress axis), thus possibly driven by the incoming Philippine Sea lithosphere? On the other hand, as the Luzon arc approaching to the Eurasian continental margin and the exhuming Central Range, several-kilometer-thick turbidite first deposited upon the andesitic Luzon arc basement, as the fore-arc sediments, from about 15-5 Ma. A series of thrusts and different scales of folds in the Coastal Range (i.e., on-land Luzon arc in Taiwan), in particular within the turbidite sequence, manifested the deformation due to the collision of arc system with the Central Range. Numerous studies showed that recent deformation of the Coastal Range is mostly accommodated by a major boundary active fault between the Coastal Range and the Central Range (i.e., the Longitudinal Valley Fault). However, field investigations indicated that outcrop-scale thrusts (and strike-slip faults) are widespread in the Coastal Range. The juxtaposition of the two stress regimes across the collisional suture is intriguing, leaving open questions about the relation between the stress states. Were the two stress regimes operating simultaneously over spatial dimensions akin to the present configuration, or over larger distances and later brought into contact?

Keywords: arc-continent collision, exhumation, normal fault , thrust

