



The Roles of Pre-existing Normal Faults in Recent Tectonics of Western Taiwan

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The Wilson Cycle describes the evolution of plate tectonics from continental rifting to arc-continent or continent-continent collision. It is very common that many structural settings formed in the rift stage shed some influences on or are reactivated by the settings developed in the contractional stage. Some extensional settings also develop in the foreland areas in the early stage of orogeny. These syn-orogenic features could be viewed as a part of contractional tectonics. The main purpose of this study is to propose the role of pre-existing normal faults in recent tectonics of western Taiwan.

The pre-orogenic terrain in western Taiwan is mainly characterized by extensional tectonics, which have developed since the Paleogene and formed normal faults extending from the offshore area and striking at high-angle to the fold-and-thrust belt. While the proximal part of the extensional tectonic belt started to be involved into the newly developed orogenic belt, the rest of the settings were still active in development but stepped backward to the craton. There are several structural styles for those pre-existing normal faults that have been involved into the fold-and-thrust belt. Most of normal faults of smaller scale are still inactivated but cut by the late coming low-angle thrusts. Some of the normal faults of larger scale were reactivated during the following contractional tectonics and significantly influenced the development of the younger thrusting. The normal fault reactivation can be manifested by three aspects of thrusting structures in western Taiwan, the segmentation of major thrusts, development of major thrust geometry and active thrust faults.

According to the structural analysis on the sequence of thrusting, the normal fault reactivation that formed high angle thrusts had been developed before the coming of low angle thrust. In the outer fold-and-thrust belt, reactivated normal faults, with right-lateral slip component, formed high angle thrusts and play important roles as transverse structures for the development of low angle thrusts; the length of the thrusts are confined by the transverse structures, which formed tear fault or lateral ramp for the terminated thrusts.

In the inner fold-and-thrust belt, pre-existing normal faults have influenced the development of the geometry of thrust and were used as a frontal ramp for the low angle thrusts; the major thrusts were propagating forelandward, stepping up along the normal fault plane, and cutting upward to the surface. The displacement on the next developing thrusting forelandward of the major thrust would further alter the geometry of the major thrust.

Some of the active faults in the most recent tectonics in western Taiwan may be strongly related with the reactivated normal fault, with right-lateral slip component, that occurs in the frontal area of the fold-and-thrust belt or even beneath the low angle thrust. Some normal faults used as high angle ramp for the major thrusts imply a relationship between existence of the normal fault and the triggering of the recent major earthquakes.