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Evolutionary models of structural transfer zone in onshore and offshore areas, northwestern Taiwan

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Structural transfer zones in the frontal part of a fold-and-thrust belt mark the end of segments of major thrusts and represent the lateral variation in magnitude of displacement, slip direction and style of fault-related structure. On the other hand, in the frontal part of a fold-and-thrust belt of in-sequence and ongoing development, all fault-related structures represent the initial features of the following structural evolution. During the latest stage of the Penglai orogeny in northwestern Taiwan, two sets of fault system developed separately as a series of NW-SE fold-thrust belts and E-W high-angle thrusts. In this study, we demonstrate three evolutionary models of structural transfer zone during the initial stage of different thrust development, in-sequence development of thrust-related folding, interaction between normal fault reactivation and in-sequence development of thrusts, and normal fault reactivation resulting in the inversion structures. We use a grid of seismic profile and well bore data to interpret subsurface structural geometry, build a three-dimensional structural mode, and integrate trishear modeling to analyze the structural evolution.

On the whole, three types of structural transfer zone can be identified based on their distinct development: 1. formation of the structural transfer zones in the inversion tectonic belt were controlled by the arrangement and linkage of early normal faults; 2. the continuity of fold geometry was first influenced by lateral variation in dip angle of low-angle thrust and in turn broken by high-angle transcurrent faulting, forming segmented fold structures during the late compression; and 3. slip along two parallel thrusts with opposite vergence and decreasing dip angle toward the transfer zone formed complex fault-related folds. The variation of P/S ratio along the strike of some thrusts also plays important role in shaping the features of the transfer zone.