# Active Tectonics of the Northernmost Longitudinal Valley Suture: Insights from the Recent Earthquake Clusters

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The recent earthquake clusters in eastern Taiwan, from 2018 to 2024, were accompanied by a series of fault ruptures along the west-dipping faults (e.g., the Central Range Fault), extending from the central to the northern part of the Longitudinal Valley Suture (LVS). To understand the change in the active tectonic system along the Longitudinal Valley, we combined the data from the active geomorphology, relocated earthquake hypocenters, and the 3D crustal velocity model to build a new conceptual model for this region. Our observation suggests that in the northern half of the Longitudinal Valley, a gentle west-dipping fault system exists underneath the valley and the Coastal Range, truncating the previously defined Longitudinal Valley Fault at depth around the latitude of 23.7° N. Such structural interaction alters the surface expression of the Longitudinal Valley Fault (LVF), from an oblique reverse fault system in the south to a strike-slip dominated transpressional fault system in the north. Evidence from geomorphology and earthquakes suggests that most of the active convergents concentrate on the newly developed west-dipping fault system and the deeper truncated LVF. At the same time, the shallow part of LVF takes the active left-lateral motion in the system. The west-dipping fault system underneath the Coastal Range is also likely connecting to the Offshore Eastern Taiwan Thrust Belt off the coast of Hualien, which has been developed from the southern to the central part of the LVS. A multi-layer detachment likely exists within the Offshore Eastern Taiwan Thrust Belt, as this thrust belt system experienced a complex tectonic history. All these changes can be observed in a simple, first-order sandbox model when we consider the syn-tectonic sedimentation and erosion, as well as the geologic heterogeneity in this area. Altogether, our result points out a complex, multi-layer, and cross-cutting seismogenic fault system in the northern half of the Longitudinal Valley, which will be our next main challenge to resolve in the coming decade.