Title : Morphotectonic Analysis Along Eastern and Western Fault Segments of Phrae Basin, Phrae Province

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ABSTRACT

The Thoen Fault Zone is a series of normal faults trending in a northeast-southwest that extends through Phrae and Lampang Provinces, with a total length of approximately 180 km. While the overall tectonic activity of the Thoen Fault Zone is categorized as moderate to high, its activity varies spatially, as evidenced by seismic events and distinct topographical features. This study evaluates the relative tectonic activity along the eastern and western fault segments of the Phrae Basin and its impact on geomorphic evolution. The assessment was conducted across 23 sub-basins using five geomorphic indices: Stream Length-Gradient Index (SL), Mountain Front Sinuosity (Smf), Basin Shape Index (Bs), Asymmetry Factor (Af), and Valley Floor Width-to-Height Ratio (Vf). By controlling lithology and precipitation variables, the Relative Index of Tectonic Activity (RIAT) was calculated to classify the tectonic activity levels within the study area. The results indicate varied tectonic activity across the sub-basins: Class 1 (Very Low) accounts for 26.09%, Class 2 (Low) for 43.48%, Class 3 (Moderate) for 17.39%, Class 4 (High) for 8.70%, and Class 5 (Very High) for 4.35%. The RIAT values range from 4.20 in the Nam Mae Thang sub-basin to 1.60 in the Huai Rong Pha sub-basin, with an overall average of 2.48. While many areas exhibit low to moderate activity, significantly high-activity zones were identified, particularly along the Nam Mae Thang and Nam Mae Man fault segments. Conversely, segments such as Huai Hom, Huai Bo Thong, Doi Pha Klong, and Huai Nam Mae Sang show lower activity levels. The observed spatial inconsistency in tectonic activity between the eastern and western fault segments is attributed to differences in fault types and slip rates across the region. This study provides a critical framework for assessing fault activity and as a model for morphotectonic analysis in other intermontane basin environments.

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