



Multiple Tectono-magmatic and Metallogenic Episodes of Eastern Thailand and Central Lao PDR

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In eastern Thailand and Laos PDR, a north-south trending magmatic and metallogenic zone (>1,000 km long and 50- 100 km wide), located immediately along the westernmost part of Indochina tectonic block, follows the Loei geosuture along the Western edge of the Khorat Plateau (WKP). This magmatic and mineralization zone shows a remarkable persistence through time (Late Paleozoic to Pleistocene) as a critical focus of magmatism. This orogen-scale locus of magmatic processes provides key insight into a protracted melting and emplacement history with a broad chemistry but common crustal architecture.

Petrochemical and air – borne magnetic data reveal that the oldest magmatism (Devonian?), mainly mafic to ultramafic compositions exposed in the northern WKP are north-south trending. Subsequent WKP magmatism (Carboniferous) is dominated by basaltic to andesitic rocks (Loei area) and probably extends northward to central Lao from Vangviang to Luang Prabang. A third episode of the WKP magmatism (Permo-Triassic) is mainly calc-alkaline volcanism, mostly associated with Fe-Pb-Zu+Cu sulfide and Au mineralization. Voluminous volcanic rocks are widely exposed from Loei and central Lao in the north, Petchabun and Lopburi in the Central and Sra Kaew-Chantaburi-Ko Chang areas. This long (>1,000km) and voluminous volcanic belt occurred by eastward subduction of oceanic slab beneath the Indochina block. Continued subduction of the oceanic crust may have caused the fourth episode of WKP magmatism during early Triassic time. Partial melting of the oceanic slab may have been responsible for the generation of I-type felsic magma with Cu-Fe sulfides +Au

mineralization. These altered and mineralized plutonic rocks are sparsely distributed throughout the WKP with large granitoid emplacement in Loei-Phetchabun-Saraburi areas in Thailand and Vangviang to Vientiane areas of Lao PDR. It is considered that relaxation of the crust after a prolonged subduction beneath Indochina may have produced Late Triassic to Early Jurassic, weakly mineralized A-type magmas of the fifth episode, particularly in the central and southern WKP belt (Chantaburi-Nakorn Ratchasima). Relaxation of the crust may have caused sporadic rift – related basaltic andesite and dyke rocks in the southern (Ko Chang) and central (Chaiyaphum and Pichit) WKP during Late Jurassic. The last episode of WKP magmatism is petrochemically and geophysically characterized by large – volume and remarkably bimodal volcanism of continental rifting tectonics. $^{40}\text{Ar}/^{39}\text{Ar}$ age data suggest the younging – to- the south pattern for volcanism of both the central WKP (the 7-24 Ma one for Lumnarai-Lopburi areas) and the southern WKP (the 0.5 to 2 Ma one for Chantaburi – Trad area).

The overall result reveals that the magmatism and related mineralization in the WKP have been controlled by multiple stages that re-used the same broad orogenic region. The WKP was related to oceanic drifting and rifting in the extensional regime during (Middle-) Late Paleozoic, suturing with Indochina terrane, prolonged eastward subducting in the compressive tectonic regime during Late Permian to Jurassic and crustal relaxation to continental rifting in the extension tectonic regime during Late Cretaceous -Tertiary time.