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Geotectonic subdivision of the Central Plain of Thailand: A perspective from Permian and Triassic successions

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In the last two decades, increasing geological evidence produced a number of substantial understandings on the geotectonic subdivision and evolution of mainland Thailand. Now, we have a consensus of opinion that the Sukhothai Zone (Permian-Triassic island arc system) to the east and the Sibumasu Block (fragment of the eastern Cimmerian continent) to the west are the two major geotectonic domains constituting Northern Thailand. However, their southward extensions to the Central Plain of Thailand are still less clear due to the poor information of basement rocks.

We have investigated several basement rock units distributed in Uthai Thani and Nakhon Sawan provinces of the central part of the Central Plain. Quaternary deposits widely cover the major parts of these provinces, but there are a number of monadnocks consisting of older rocks. In eastern Nakhon Sawan Province, the basements are composed mostly of Permian platform-type carbonates. They are interpreted as parts of the Saraburi Limestone of the Indochina margin.

In central Nakhon Sawan and eastern Uthai Thani provinces, there are some, N-S trending monadnock ranges. Of them, we newly studied a carbonate unit composed of several limestone mountains. It consists of massive, shallow-marine limestone, and bioclastic grainstone and packstone are the major microfacies. In places, boundstone made by skeletal metazoans is observed. Late Triassic foraminifers occur from it. Based on the foraminiferal contents and lithology, it can be correlated to a limestone member of the Lampang Group in the Sukhothai Zone of Northern Thailand. In the same area, intermediate-acidic volcanic/volcaniclastic rocks of possibly Permian age are distributed. In Northern Thailand, a similar rock unit widely underlies the Sukhothai Zone.

Slightly to the east of the Late Triassic limestone, there are ranges of small mountains consisting mainly of fine-grained siliciclastics. Characteristically this unit contains chert successions in some parts; one of which distributed around Nakhon Sawan city is called the Khao Gob Chert. Permian radiolarians are found from some of the chert successions. Their lithological characters and age suggest that they can be correlated to the Permian Khanu Chert exposed to the north in the Sukhothai Zone. Moreover, granitoids in the same mountain ranges are of I-type characterizing the Eastern Granitoid Belt, which corresponds in Northern Thailand to the Sukhothai Zone.

In western Uthai Thani Province, there is a remarkable range consisting of karstified limestone, which is called the Uthai Thani Limestone. It is generally weakly metamorphosed and deformed, but Permian age is evident based on the occurrence of rare and poorly preserved fusulines from some localities. The Uthai Thani Limestone can be distinguished from the Late Triassic limestone just to the east by its distinctive NNW-SSE extension and by having different deformation and metamorphic records. It is more reasonable to correlate it with the Sai Yok and the Ratburi limestones widely distributed in the Sibumasu Block of Western and Peninsular Thailand. Moreover, granite in western Uthai Thani Province exhibits an S-type affinity of the Central Granitoid Belt, which corresponds to the eastern part of the Sibumasu Block.

All these lines of evidence suggest that central Nakhon Sawan and eastern Uthai Thani provinces belong to the southern extension of the Sukhothai Zone of Northern Thailand. In contrast, western Uthai Thani Province where the Uthai Thani Limestone and the S-Type granitoids crop out can be labeled as a part of the Sibumasu Block. Thus, we conclude that, in the Nakhon Sawan-Uthai Thani area there is a remarkable gap in terms of geotectonic properties of basement rocks between the Late Triassic limestone and the Uthai Thani Limestone. It corresponds to the southern extension of the Chiang Rai Tectonic Line in Northern Thailand, which separates the Sukhothai Zone to the east and the Sibumasu Block to the west.

Keywords: Central Thailand, geotectonic subdivision, Sukhothai Zone, Sibumasu Block, Permian, Triassic