

Permian facies of Northern and Northeastern Thailand: Implication for geotectonic evolution

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Extended Abstract

The Permian sediments are distributed extensively in every parts of Thailand. They were popularly known as the Ratchaburi Limestone whose type area is in the Ratchaburi province, western Thailand. Subsequent works in northern and northeastern Thailand led Bunopas (1981) to doubt the equality of these limestone units. He proposed the names Ngao and Saraburi Groups for the Permian limestones in northern and northeastern Thailand respectively. It is now widely accepted that the Ratchaburi Limestone, based on its fusuline contents, is quite different from the comparable limestones in the north and northeast. The former belongs to the peri-Gondwana realm, whereas the latter two belong to the Tethyan realm.

Although the Permian carbonates in northern and northeastern Thailand are similar in term of its faunal contents. They lithofacies are different as they were deposited in different tectonic settings.

1. Lithofacies and Paleoenvironments

In order to better understand the Permian paleogeography and tectonic evolution of northern and northeastern Thailand, detailed lithofacies and paleoenvironments of the Permian sediments of typical localities are discussed from west to east respectively.

1.1 The Lampang-Phrae area

The most complete Permian sections is in the Lampang province, particularly the

Kiu Lom section. The Permian sequence consists of Kiu Lom and Pha Huat Formations respectively in ascending order. The Kiu Lom Formation, more than 400 m. thick, is characterized by a sequence of siliciclastics, limestones and volcanic rocks. Fusulinids in the limestones indicate Early Permian (Late Asselian to Early Sakmarian) age (Fortaine and Vachard, 1988). The Pha Huat Formation overlies the Kiu Lom Formation conformably. It is 300 m. thick consisting of two limestone members separated by a volcanoclastic unit. Its fusuline fauna indicates Middle Permian (Murgabian) age. The Pha Huat Formation is in fault contact with the basal Triassic Phra That Formation.

The Late Permian Huai Thak Formation, about 250 m. thick, overlies the tuffaceous sandstones and silicified limestones of the Pha Huat Formation at Doi Pha King. It consists of thin-to thick-bedded wackstones and packstones containing brachiopods (*Oldhamina* sp.) and fusulines (*Palaeofusulina* sp.) of Dorashamian age. The Permian sediments in the Lampang area indicate that they were deposited in shallow marine platform

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environment within volcano-plutonic arc setting.

East of Lampang in the Phrae province, the Huai Thak Formation is distributed extensively and it unconformably overlies the metamorphosed slaty and phyllitic shale, siltstone and quartzitic sandstone of presumably Early to Middle Permian age.

1.2 Nan-Uttaradit areas

The Permian sediments in the Nan-Uttaradit areas contrast significantly from the afore-mentioned area and the area in the northeast. In the Ban Had Ngiu and Ban Nam Muab areas siliciclastics and intervening carbonates with interstratified and intruded basaltic andesite and ultrabasic rocks are the main lithologic types. Fusulinids found in the limestones indicate Early Permian in the lower part and Middle Permian in the upper part. Bedded cherts (Late Middle to Late Permian) with associated ultrabasic rocks are also common locally (Sukhawatananan & Asawapatchara, 1978). These sequences are unconformably overlain by Late Permian siliciclastics and carbonates correlatable to the Huai Thak Formation of Lampang-Phrae areas.

The Permian sequences in this area indicate deposition in the deep basin on the oceanic crust below the CCD and the shallow shelf sea area.

1.3 Phetchabun-Loei areas

The Phetchabun-Loei area consists of siliciclastics and carbonates deposited in the

various environments ranging from marginal marine to shallow marine, slope and basin center. Basically, the platform carbonates (Pha Nok Khao and Khao Kwang Formations) and the slope and basin carbonates and siliciclastics (Nam Duk Formation) can be distinguished. Typical diagnostic environments can be distinguished, viz., the basin-margin slope and the basin plain. No true oceanic crust is represented in the Nam Duk basin suggesting that the basin is narrow and is not a true deep basin.

2. Sedimentary basins and Tectonic evolution

Since Carboniferous, the area of northern and northeastern Thailand is regarded as the back-arc region bordered by subducted oceanic plates now known as the Mae Sariang and Song Ma fault zones from west to east respectively. This region was undergone the rifting stage and most of the areas were covered by the sea forming several known Permian basins. This rifting eventually produced the new oceanic crust identified in the Nan-Uttaradit and Chiang Rai areas. Stratigraphic and radiometric age-dating evidences indicate that the Lampang and Phrae area was deformed in the Middle to Late Permian (Chonglakmani and Helmcke, in press). This requires the closure of the Nan-Uttaradit ocean and the area was the main provenance for supplying the siliciclastic turbidites to the Nam Duk basin in the east.