

## CHAPTER VI

### DEPOSITIONAL ENVIRONMENTS OF CARBONATE ROCKS

The depositional environments of carbonate rocks in the research areas can be interpreted from the results of petrographic and paleontologic analyses. Fossils from the study areas indicate shallow marine environments, in agreement to the conclusion by Bunopas (1992). The interpreted shallow marine depositional conditions were compared and referred to Wilson, 1975 (Figure 101). The sedimentary environments in the investigated areas are varied. They include facies types from shelf lagoon to open sea shelf conditions. The depositional environments were described in 3 ages viz. Late Carboniferous, Early Permian and Middle Permian as follows:-

#### Late Carboniferous

The rock of Late Carboniferous comprises the Pha Mo (Location TCM 94-1), Pha Mo Noi (Location TCM 94-2), the major part of rock sequence in Phu Khao area (Location TCM 94-3) and Location TCM 94-5. The rock types are bio-pelmicritic wackestone in the Location TCM 94-1 and TCM 94-2. The limestones of these locations consist dominantly of peloids and limited faunas. The dolomitic limestone is also found in the Location TCM 94-2. Microfacies and fossils from the Location TCM 94-1 and TCM 94-2 indicate the shelf lagoon or restricted area. In the field, the bedded limestones of Location TCM 94-3 are intercalated with clastic rocks. This section is biomicritic wackestone. It contains very diverse faunas, indicating deep shelf margin. Location TCM 94-5 is composed of stromatolitic boundstone and foreslope talus, it

can be considered that the depositional environment is a zone of reef which is in the areas of foreslope and organic build-up.

These Late Carboniferous limestones are commonly wackestone. They are deposited in low energy environment. The schematic marine depositional environment of carbonate sediments in Late Carboniferous is present in figure 102.

### Early Permian

The Early Permian rocks are composed of the upper part of rock sequence in Location TCM 94-3, total section of Location TCM 94-4, TCM 94-6, TCM 94-7, TCM 94-8, TCM 94-10 and TCM 94-11. The upper part of rock sequence in Location TCM 94-3 and the bed of sample no. TCM 94-4-1 are packstone and interbedded with clastic rocks. The samples comprise diverse faunas and packed grains, belonging to deep shelf margin. The limestone beds of Location TCM 94-4 are also interbedded with clastic rocks. The rock type is biomicritic wackestone and contains diverse faunas viz. fusulinids, shell fragments, pseudo-algae, crinoids and smaller foraminifers. It is possible that depositional condition is deep shelf margin and receiving the terrigenous sediments from land.

Location TCM 94-6 is dolomitic limestone. It contains no faunas and no terrigenous sediments. It is estimated that the age is Early Permian comparing to the neighbouring Location TCM 94-7. The depositional environment is considered as shelf lagoon in low energy condition. Location TCM 94-7 is biomicritic wackestone which contains limited faunas and no terrigenous sediments. The limestone of this location is deposited on the shelf lagoon in low energy shallow water environment. The rock type of Location TCM 94-8 is grainstone which contains oncoliths and peloids. It indicates

condition between winnowed edge sands and high energy shallow water environment. The rock type of Location TCM 94-10 and TCM 94-11 is biomicritic wackestone which contains diverse faunas, peloids and no terrigenous sediments. It indicates condition on the open sea shelf.

The depositional environments of the limestones belong to the shelf lagoon, winnowed edge sands, deep shelf margin and open sea shelf in low to high energy shallow water. The schematic marine depositional environment of carbonate sediments during Early Permian is shown in figure 103.

#### Middle Permian

The Middle Permian rocks are represented by Wat Sunantharam area (Location TCM 94-9), ranging from Bolorian? to Kubergandian ages. The lower sequence including samples no. TCM 94-9-1 to TCM 94-9-11, is Bolorian? in age. This sequence is micritic limestone and no terrigenous sediments, indicating low energy shallow water in shelf lagoon. The age of middle and upper sequences is considered to be Kubergandian. The middle sequence (samples no. TCM 94-9-13 to TCM 94-9-17) is poorly sorted limestone breccia. It indicates a foreslope deposit in high energy. The upper sequence includes samples no. TCM 94-9-19 to TCM 94-9-30. The rock types of the upper sequence are packstone, grainstone, biomicritic and bio-pelmicritic wackestones. Packstone includes the samples no. TCM 94-9-19, TCM 94-9-20, TCM 94-9-22, TCM 94-9-24, TCM 94-9-25 and TCM 94-9-26. The texture of these samples indicates winnowed edge sands in moderate to high energy shallow water. Grainstone is represented by samples no. TCM 94-9-21 and TCM 94-9-28. Their depositional environments are in the surge area and area with high energy shallow water. Samples no. TCM 94-9-21, TCM 94-9-23, TCM 94-9-27 and TCM 94-9-29

are biomicritic wackestone. They contain very diverse faunas and carbonate mud, indicating the open sea shelf in low energy shallow water environment. The sample no. TCM 94-9-30 is in the uppermost bed of this location. The rock type is bio-pelmicritic wackestone. It is composed dominantly of bioclasts and peloids. The author presumes that peloids came from the erosion of adjacent rocks. This sample indicates the open sea shelf in low energy shallow marine environment based on its texture.

The depositional environments of the Middle Permian rocks belong to shelf lagoon, winnowed platform and foreslope to open sea shelf in low to high energy shallow water. The schematic marine depositional environment of carbonate sediments in Middle Permian is present in figure 104.

The depositional environments of carbonate sediments from Late Carboniferous to Middle Permian ages consist of 6 sub-environments in shallow marine water viz. shelf lagoon, winnowed edge sands, organic build-up, foreslope, deep shelf margin and open sea shelf. Based on the carbonate rock types in Late Carboniferous to Middle Permian ages of the study areas, they gradually change grain size from fine to coarse grains in vertical section (Figure 105). It shows shallowing upward sequence of sea level and indicates regression in general.

1	2	3	4	5	6	7	8	9	
Basin	Open sea shelf	Deep shelf margin	Foreslope	Organic build-up	Winnowed edge sands	Shelf lagoon	Tidal flats	Sabkhas, supratidal marsh	
									<b>Facies profile</b>
Dark shales and siltstones, thin-bedded limestones (mudstone and calcisiltites)	Very fossiliferous limestone (bioclastic wackestone and whole fossil wackestone, calcisiltites)	Fine-grained limestone (dark mudstone, some calcisiltites), cherty in some cases	Sedimentary breccias and resedimented limestones, some shale, siltstone, etc. Slump structures, giant talus block	Massive limestone and dolomites. No terrigenous sediments	Calcarenite (well-sorted grainstones) with ooids, bioclasts, etc., some dolomite, quartz sand admixtures.	Various limestone types (grainstone to mudstone), some thin-bedded terrigenous clastics	Dolomite and dolomitic limestones. Mudstones with peloids, algal mats, lithoclastic wackestone.	Irregularly laminated dolomite and anhydrite, may grade to red beds, caliche, terrigenous clastics sometimes important	<b>Lithology</b>

Figure 101 The major environments of deposition for carbonate sediments. (Wilson, 1975)

## LATE CARBONIFEROUS

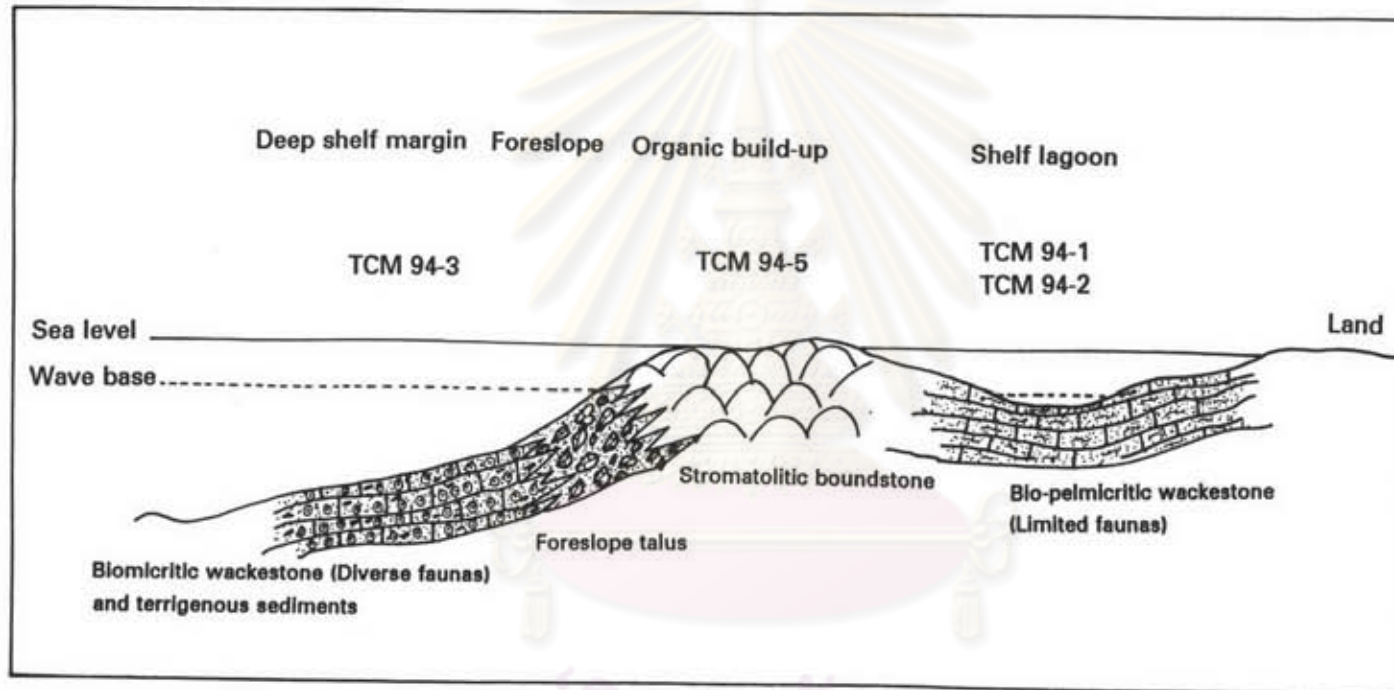


Figure 102 The depositional environment of carbonate sediments in Late Carboniferous.

## EARLY PERMIAN

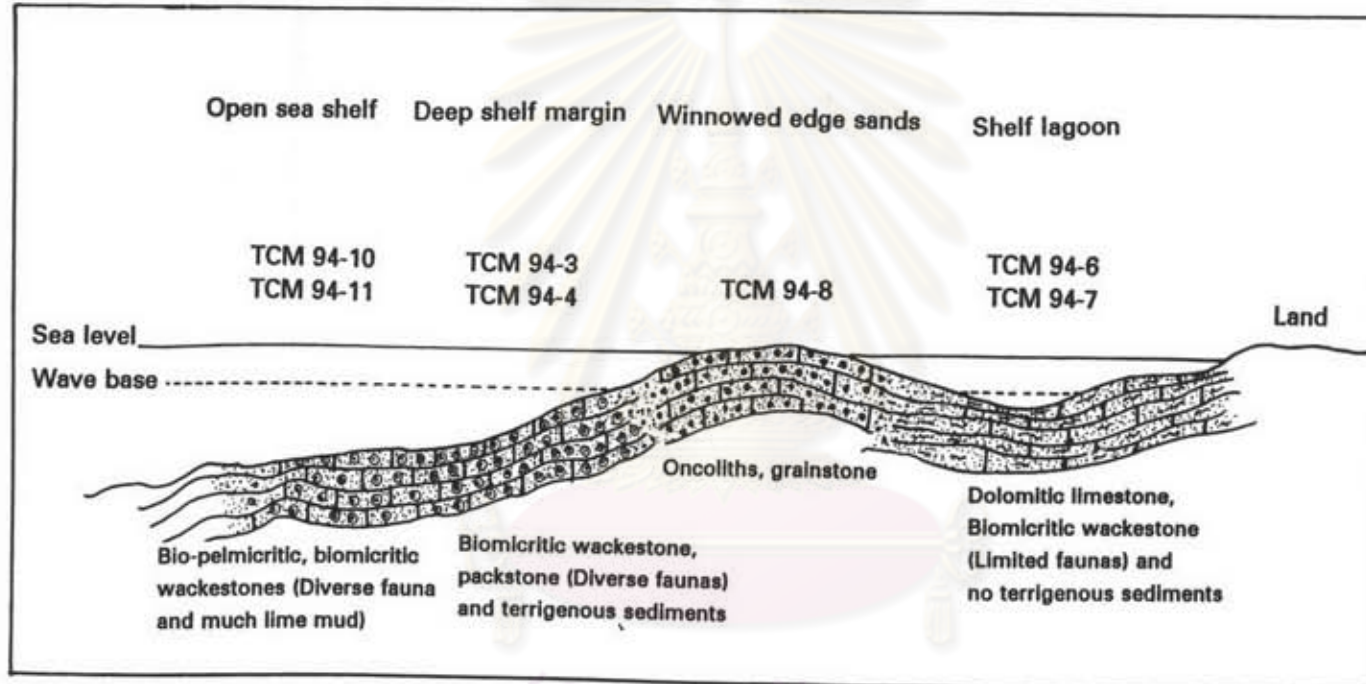


Figure 103 The depositional environment of carbonate sediments in Early Permian.

## MIDDLE PERMIAN

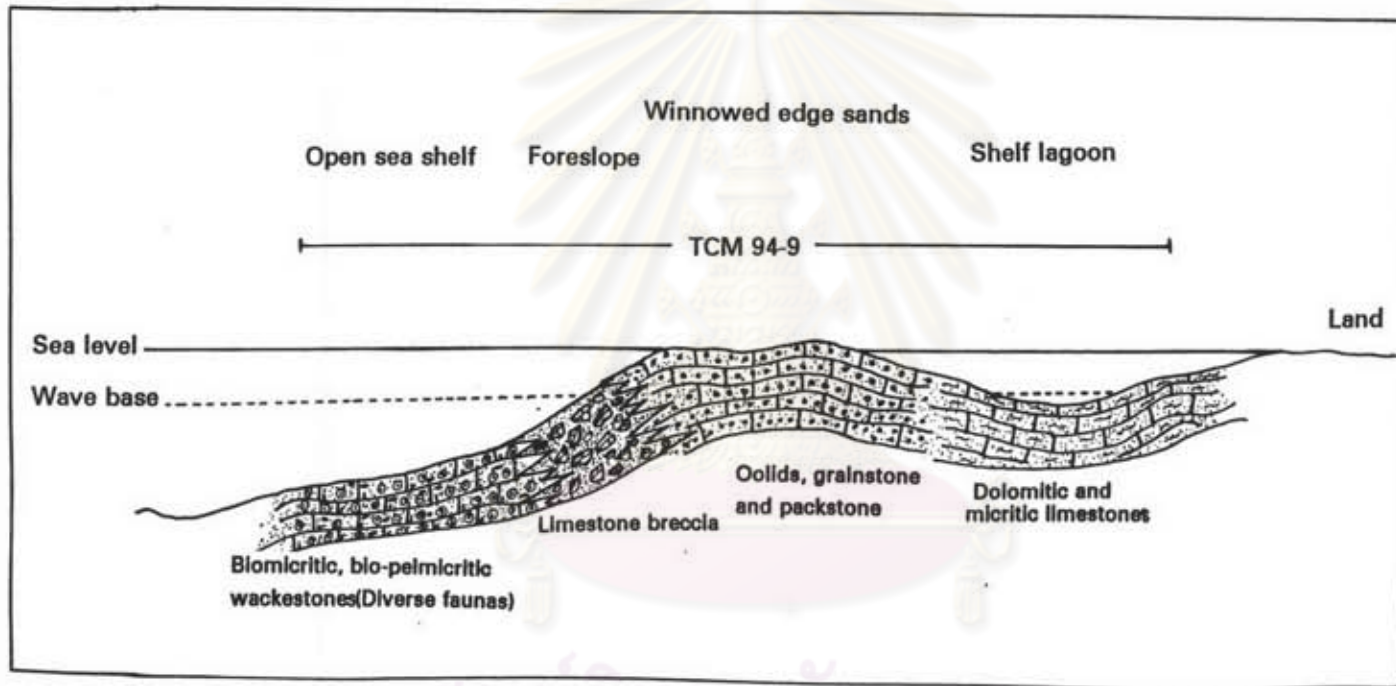


Figure 104 The depositional environment of carbonate sediments in Middle Permian.