Permo-Carboniferous glacial narine deposit in peninsular Thailand

Tianpan Ampaiwan[1], Ken-ichiro Hisada[2], Punya Charusiri[3]

[1] Earth Evolutional Sci, Univ Tsukuba, [2] Inst. Geosci., Univ. Tsukuba, [3] Dept. Geol., Fac. Sci., Chula. Univ.

It has been known that during Carboniferous to Permian there was the longest period of continuous glaciations on Gondwana continent, which were recorded in sedimentary sequences of not only continental glacial succession but also glacial marine deposit. Thus, the Permo-Carboniferous glacial facies is a key lithology for correlation between Gondwana-derived terranes after Permo-Carboniferous. In the Southeast Asia region, it is proposed that the Sibumasu continental block (Shan State of Myanmar, Northwest Thailand, peninsular Myanmar and Thailand, and western Malaysia and Sumatra), carrying glacial marine deposit, was detached from Gondwana margin in the Early Permian.

Although there are many criteria useful for recognizing glacial deposit, dropstone and dump structures are important distinguishing features of ice-rafted sediment that disturbs bedded or laminated sediment. Dropstone bends, penetrates, and ruptures laminae. Dump structure is formed when large quantities of debris are released by the break-up of icebergs. A combination of facies analysis and identification of dropstone and dump structures from the Permo-Carboniferous Kaeng Krachan Group in Phuket and adjacent islands confirms earlier suggestions of their glacial origin. Fourteen lithofacies, composed of one diamictite, seven sandstone, four mudstone, one carbonate, and one coquina facies, have been identified and grouped into seven facies associations (FAs). These record the predominance of glacially influenced marine and debris flow deposits. The lowest-situated facies association (FA I; up to 200 m thick) is characterized by laminated mudstone intercalated with ripple siltstone, deposited by plumes of suspended sediment in low-energy depositional setting below wave base of outer shelf and associated with local slumping. FA I is overlain abruptly by faintly bedded diamictite of FA II (up to 500 m thick). Appearances of resedimentation textures and dropstone structure strongly indicate debris flow deposit associated with rain-out sediments from icebergs. From the field evidence, FA II is overlain with fault contact by FA III (about 300 meters thick) consisting of laminated mudstone with isolated clasts, sandstone and siltstone with cross lamination, ripple, and graded bedding, and diamictite. By the presence of dropstone and dump structures as well as Cruziana Ichnofacies together with lithofacies data, deposition of suspended sediment plumes associated with rain-out sediment from icebergs on outer shelf is identified for FA III. FA III conformably underlies FA IV (up to 400 m thick) composed of laminated mudstone with dropstone and debris flow diamictite deposited on the outer shelf. This association is gradually overlain by FA V of debris flow diamictite (up to 700 m thick). Although there is no clear field evidence, on the basis of stratigraphic relationship, FA V probably underlies FA VI, which is characterized by planar, low angle, and, herringbone cross-bedded sandstones, and cross-bedded conglomeritic sandstone deposited on a tide-dominated shoreline. The uppermost association is FA VII, in which tidally influenced plume of suspended sediment and reworks of coarse-grained sediment are evidenced by occurrences of laminated mudstone and diamictite lenses. Brachiopod assemblage in FA VII indicates Sakmarian age of Early Permian, which is overlain by Middle Permian limestone

These facies associations reveal environment of depositions influenced by dynamic glaciation. A model of deposition is simply reconstructed by consideration of glacial driving; non-glacially influenced FA I, glacially influenced FA II and III when glacier advanced, glacially less influenced FA IV and V when glacier retreated, and non-glacially influenced FA VI and VII. These glacially influenced shallow marine environments strongly indicate that Sibumasu was located in the margin of Gondwana and possibly attached with the Gondwana continent until the Early Permian.