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# Mid-oceanic seamount carbonates in Eastern Paleotethyan suture zones

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Mid-oceanic seamount-capping (atoll-type) carbonates make a popular stratigraphic entity in the geology of Japan since they are often seen as various-sized (but usually large and typically huge) exotic blocks within ancient (mostly Permian to early Cretaceous) accretionary complexes distributed in the Japanese Islands. These carbonates consist of very thick and pure (in the sense that it lacked input of continental detritus), usually massive and fossiliferous, shallow-marine limestone, and rest on oceanic-island basalts (OIB) of hot-spot origin, formed in the Panthalassa Ocean. Stratigraphically, they comprise a unique sedimentary succession that records long-term (sometimes over 80 myr.), continuous, shallow-marine environmental and biotic changes during late Paleozoic and early Mesozoic times of the oceanic sector with a stable tectonic setting, and can only be found within the accretionary orogen in the context of Ocean Plate Stratigraphy (OPS). Thus, the mid-oceanic seamount carbonate succession is a "surefire" geological item for the investigation of the ancient subduction zone and suture zone. On the basis of my research expertise working on these mid-oceanic carbonates in Japan over many years, especially in the Carboniferous–Permian Akiyoshi Limestone known as the most typical seamount-capping atoll-type carbonate body in the Panthalassa Ocean, I exported this, essentially "made-in-Japan" and "cultivated-in-Japan", geological concept of "mid-oceanic seamount carbonates within the accretionary orogen" to Southeast Asian geology, for better understanding the general geotectonic subdivision and evolution of the relevant region, especially for clarifying the position of Paleotethyan suture zones and the geohistory of the Eastern Paleotethys Ocean.

In today's Southeast Asia, Paleotethyan mid-oceanic seamount carbonates are distributed in Northern Thailand and western Yunnan, SW China where Gondwana and Tethys meet together. Of these two regions, Northern Thailand is subdivided into three basic geotectonic domains; from east to west the Cathaysian Indochina Block, Sukhothai Zone (a Permian–Triassic island arc developed along the Indochina margin), and peri-Gondwanan Sibumasu Block. In the eastern part of Sibumasu, a geotectonically peculiar area called the Inthanon Zone can be identified on which Paleotethyan oceanic rocks including the Carboniferous–Permian Doi Chiang Dao Limestone of mid-oceanic seamount origin are widely distributed. This limestone succession, sometimes making kilometer-sized huge limestone blocks, is estimated to be 1000 m thick or more, and consists mostly of shallow-marine fossiliferous massive limestone without siliciclastic intercalation throughout. Basalts having intra-plate (oceanic volcanic island) geochemistry are observed at the base of the succession. Foraminifers, especially fusulines, are the fundamental fossil group for establishing its detailed chronostratigraphy, and they clarified that the limestone continuously accumulated from the Visean (middle Early Carboniferous) to the Changhsingian (latest Permian) over the time of 90 myr.

In western Yunnan, the Changning–Menglian Belt is defined between the Lincang Massif (a Permian–Triassic island arc system formed along the easterly Simao Block with Cathaysian affinity) to the east and the peri-Gondwanan Baoshan Block to the west. The Changning–Menglian Belt, subdivided into the East, Central, and West zones, entirely has been regarded as a closed remnant (suture zone) of the Paleotethys Ocean, but actually it is only in the Central Zone where oceanic rocks are distributed. Paleotethyan mid-oceanic carbonates in this belt are called the Banka Limestone, which is over 1200 m in total thickness and generally massive and pure, being free from continental siliciclastic input for the entire succession spanning nearly 90 myr. Foraminiferal (mostly fusuline) biostratigraphy suggested continuous deposition ranging from the Visean to the Changhsingian without significant hiatus in the succession. Thus, the Banka Limestone in western Yunnan is exactly correlated in view of lithostratigraphy, chronostratigraphy, and tectonostratigraphy to the Doi Chiang Dao Limestone in Northern Thailand.

In a broad geotectonic perspective, the Paleotethyan oceanic rocks including the Doi Chiang Dao Limestone, distributed in the Inthanon Zone are considered to form various-sized tectonic outliers upon autochthonous basement rocks of Sibumasu now, which consists of early Paleozoic–Triassic sedimentary, meta-sedimentary, and igneous intrusive rocks. Similarly, those distributed in the Central Zone of the Changning–Menglian Belt are structurally resting by almost flat-lying faults (thrusts) upon siliciclastic rocks of the West and/or East zones, which presumably represent passive-margin (continental slope) sediments of the westerly, Gondwanan Baoshan Block. These mid-oceanic rocks are interpreted to have been once incorporated within an accretionary prism formed by the subduction of the Paleotethyan


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oceanic lithosphere beneath the Permian–Triassic island arc system represented by the Lincang Massif–Sukhothai Zone. The resultant collision of the Cimmerian (peri-Gondwanan) Sibumasu–Baoshan Block to the Cathaysian Indochina–Simao Block, thus the closure of the Paleotethys Ocean in present-day Southeast Asia, at around Triassic–Jurassic boundary time emplaced rocks of the accretionary complexes (containing Paleotethyan oceanic rocks as exotic blocks) onto the marginal part of the Sibumasu–Baoshan Block as large thrust sheets (nappe).