

Geotectonic subdivisions and evolution of Southeast Asia: Present understandings and remaining problems

Katsumi Ueno[1]

[1] Dept. Earth System Sci., Fukuoka Univ.

For understanding the geotectonic history of Southeast Asia, it is especially important to make clear the distributions, boundaries, and geohistories of two continental slivers: Cathaysia and the Cimmerian continent, together with the Paleo-Tethys once existed between them, based on multidisciplinary geological studies. In this presentation, an up-to-date Paleozoic-Mesozoic geotectonic evolution model for Southeast Asia established by using data mainly from Thailand is discussed.

Thailand is essentially subdivided into three geotectonic domains: from east to west, the Indochina Block (IB), Sukhothai Zone (SZ), and Sibumasu Block (SB), bounded by the Nan-Uttaradit Suture (NUS) and Chiang Rai Tectonic Line (CRTL), respectively. Of them, IB is one of Cathaysian blocks, which rifted from Gondwanaland in Devonian time. Its post-Devonian fossil faunas were of typical Tethys-type. SZ is considered as representing an island arc formed by the subduction of a Paleo-Tethyan oceanic lithosphere toward beneath IB. Permo-Triassic acidic to intermediate volcanic rocks and subduction-related I-type granitoids are widely distributed.

West of CRTL is essentially labeled as the Cimmerian Sibumasu Block, but in its eastern margin in Northern Thailand, there is a geotectonically unique area called the Inthanon Zone (IZ). In this zone, two, highly contrasted sedimentary rocks formed within the Paleo-Tethys Ocean are found: the Doi Chiang Dao Limestone of Early Carboniferous to earliest Triassic seamount-type carbonates and the Fang Chert of Middle Devonian to Middle Triassic pelagic chert. Both of them represent sediments of the pelagic Paleo-Tethyan domain and are now incorporated as large exotic blocks within siliciclastics that in places exhibit chaotic facies.

In contrast to the oceanic rocks in IZ, SB proper shows Paleozoic stratigraphy and faunal successions close to those observed in eastern Gondwanaland. In particular, Early Permian strata suffered strong influence in sedimentation from the Gondwana Glaciation. In the Middle-Late Permian, however, platform carbonate deposition prevailed on SB. These lines of evidence suggest that SB rifted from Gondwanaland at around latest Early Permian time. This is also supported by the existence of coeval continental rift basalt in the Baoshan Block, one of eastern Cimmerian blocks in West Yunnan, China.

Lower Paleozoic sedimentary rocks that characterize SB proper are also distributed in IZ. They presumably form the structural basement of IZ, underlying the Paleo-Tethyan oceanic rock-bearing siliciclastics. It implies that these oceanic rocks were once incorporated within accretionary complexes formed along SZ, then thrust over SB as nappes when SB collided with IB+SZ at around Triassic-Jurassic boundary time.

Geotectonic evolutionary history of mainland Southeast Asia is summarized as follows. In the Early Devonian, several Cathaysian blocks separated from Gondwanaland, forming the Paleo-Tethys Ocean behind them. By the Carboniferous, the Paleo-Tethys expanded to form a large ocean basin, and the Cathaysian blocks moved northward to the paleo-equatorial region, developing high-diversified paleo-tropical Tethys-type faunas. Almost at the same time, a Paleo-Tethyan oceanic lithosphere started subducting along a margin of IB. The Nan Back-arc Basin opened along a margin of IB by the Early Permian, resulted in detaching SZ as an island arc. This back-arc basin later closed to form NUS, almost simultaneously when SB collided with IB.

At around Early Permian time, SB rifted from the northern graciated margin of Gondwanaland and started drifting northward, and the Neo-Tethys opened behind it. As the Neo-Tethys grew up, the Paleo-Tethys gradually decreased its extent and finally destructed by the collision between SB and IB at around T-J boundary time. This orogenic movement had emplaced large thrust sheets consisting of rocks forming accretionary complexes developed along SZ onto SB to form IZ.