

The Indosinian orogeny and the problem of the Triassic basins

Charles S. Hutchison

Dept. of Geology, University of Malaya, Kuala Lumpur

All the major suture zones of South and East Asia, Qinling, Red River-Song Ma, Nan-Uttaradit, and Bentong-Raub, characteristically are associated with Triassic basins. Although debate continues, both the Qinling and the Red River-Song Ma are now interpreted as Devonian-Early Carboniferous (Late Caledonian) sutures that amalgamated the Chinese blocks with Indosinia to form an East Asian Cathaysian Continent. These sutures represent zones of crustal weakness. In the Qinling, the Triassic is represented by thick platform limestones overlain by molasse. The Late Triassic-Early Jurassic (Indosinian) folding thus affected a thin-skinned but clearly continental crust. The Triassic basins of North Vietnam are likewise of molasse underlain by platform limestones and some have important rhyolitic activity. The molasse character is indicated by important coal deposits.

The Semantan-Gemas basin has important differences from the East Asian Continent basins. Permian-Early Triassic volcanic island arc rocks are overlain by a thick Late Triassic (Carnian-Norian) flysch. Truly molasse sediments became important in the Jurassic, and slightly earlier in Singapore. The close association of the Semantan-Gemas flysch with ignimbritic rhyolite is highly characteristic.

In northern Thailand, the Nan-Uttaradit suture is less compressed than at Bentong-Raub, but there appear to be two flysch basins on either side of the suture - the Lampang and Nam Pat basins. The former continues as the Phong Saly depression west of the Luang Prabang and Dien Bien Phu line, which appears to be the northwards continuation of the Nan-Uttaradit suture.

Doubt has been cast on the interpretation of the Lampang Group as a flysch and allodapic limestones farther east have been taken to indicate that the orogeny was pre-Triassic. A re-study of the Lampang Group is necessary before useful comment can be made on this development.

In Peninsular Malaysia, the Late Triassic-Early Jurassic compressive orogeny has been so severe that the 200-220 Ma old Main Range granites, which were generated from an underlying unexposed continental 1,500 to 1,700 Ma old Proterozoic basement, have risen up into an overlying deep water sedimentary sequence (Hawthornden and Schist Series). In the Genting area the overlying country rocks of the Main Range batholith include important mélanged turbidite units which have been strongly deformed and displaced by a series of eastwards dipping thrust.

The Semantan-Gemas Triassic basin is therefore interpreted as the final deepening of the residual Palaeotethys Ocean before its extinction by collision of the Gondwana continental block of Sinoburmalya to the west with the East Asian Continent on the east. The spectacular collision was the Indosinian Orogeny, which caused eastwards subduction of the Sinoburmalya Proterozoic basement and overlying platform strata beneath the island arc which fringed the western miogeoclinal margin of the East Asian Continent. The underthrusting of the continental lithosphere caused crustal thickening in the Main Range area (gravity low) resulting in the spectacular S-type granite batholith, and also caused compression and folding of the Semantan-Gemas strata. A rifting model for the Semantan-Gemas basin is contradictory to the geological information.

The Indosinian orogenic collision would be expected to give a jolt across the whole East Asian Continent and to reactivate the older sutures such as the Qinling and Red River-Song Ma to form shear basins of intermontane character filled with molasse strata.

By analogy, the Early Tertiary collision of India with Eurasia and its continuing underthrusting beneath Tibet has again caused reactivation of the Qinling and Red River-Song Ma suture zones. Both are presently active earthquake strike slip zones characterized by Tertiary grabens.

The Indian collision must have had important reactivation along the older weakness zones in Peninsular Malaysia, but these effects have not yet been fully recognized and documented.
