Pre-Tertiary Basement of Borneo: What and Where?

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In current stratigraphic-tectonic analyses of Borneo, only two basement terrains have been conceptualized: the West Borneo Basement of Sarawak and West Kalimantan, and the Crystalline Basement of Sabah.

The West Borneo Basement, together with its miogeoclinal Kuching Zone of shelf sediments and subduction complex along the Lupar Line, is sufficiently well documented to form an anchor for tectonic modelling. The Late Cretaceous through Eocene Belaga Formation may be interpreted as an accretionary prism formed along the convergent margin of this basement and deformed by 50° post Middle Cretaceous counter clockwise rotation of the West Borneo Basement.

The tectonic evolution of the rest of Borneo is obscure. A major question is how far east to extend the west Borneo Basement. It is unwarranted to extend it farther east than the landward extension of the Pater Noster Fault, which forms the western margin of the Kutei Basin of Kalimantan, or beyond the Tinjar Fault zone.

The Crystalline Basement of Sabah is entirely of ophiolitic rocks, but unfortunately the basaltic layer of the ophiolite has by tradition

been included in the Cretaceous Chert Spilite Formation. They must be taken together . The ophiolite represents uplifted oceanic or marginal basin lithosphere. However, in the Segama Valley, potassium-rich granites have sporadically intruded and contact metamorphosed the ophiolitic rocks. Both the granites and the hornfelsed ophiolite have yielded Jurassic K:Ar radiometric dates. These granites could have had their origin only in underlying continental or mature island arc basement, about which nothing is known, because it does not outcrop. It is reasonable to assume that the ophiolitic "Crystalline Basement" is supported by sialic basement by analogy with New Caledonia and Cuba, for example. However it is important to clearly define that the Crystalline Basement of Sabah is of ophiolite, both metamorphic and unmetamorphic, but that it is cut by granites in a few places. These granites should not be included in the ophiolitic basement. Since the ophiolites form the basement for the Tertiary sedimentation, it seems preferable to redefine the "Crystalline Basement", together with the basaltic part of the "Chert Spilite Formation", as the Ophiolitic Basement, because the term Crystalline Basement conveys a false tectonic connotation. The rest of the Chert Spilite Formation represents sedimentary strata that overlie the ophiolite, most of which are pelagic, but some are clearly of very shallow water formation, and some even indicate that the ophiolite was uplifted and eroding, for example in the Labuk Valley where the "Chert Spilite Formation" contains serpentinite, conglomerates and sandstones. However there is so much melange in Sabah that the sequence of tectonic events may never be resolved.

Another basement terrain outcrops in the Mangkalimat Peninsula and adjoining Sungei Mahakam system, where apparent island arc terrain contains definite early Devonian limestones. This terrain forms the eastern and northern margin of the Kutei Basin. One might speculate that it extends into interior Kalimantan.

The Pater Noster Block is separated from the West Borneo Basement by the Barito Basin and the Meratus ophiolite. It appears to represent a stable basement terrain, about which little is known.

The Central Luconia-Balingian-Tatau terrain has evidence of shallow water deposition throughout much of the Tertiary, indicative of underlying sialic crustal basement. The collision of this terrain with the Belaga Formation accretionary wedge, as the West Borneo Basement rotated counter clockwise, may have resulted in the Bukit Mersing ophiolite uplift and the acid igneous volcano-plutonic province at Bukit Piring, southwest of Tatau.

The long persistence of shallow water carbonates (Eocene through Lower Miocene) from Mulu, Batu Gading to Tujoh-Siman area east of the Usun Apau Plateau, also suggests an underlying sialic basement. Extension eastwards, beneath the Kelabit Formation towards the Kalimantan Borderland, is necessary to explain the abundant occurrences of salt seepages in that region. Perhaps the underlying basement is a continental fragment rifted from the South China margin and the buried anyhdrite deposits may record the early rifting episode. Unfortunately the Kelabit Highlands are remote and the geology poorly known, but the salt industry of the region is well documented. The Tinjar Fault and its tectonic complexities represents a transform fault margin between this terrain and the Balingian-Luconia terrain to the west.

Collision interplay between these basements terrains is more likely

to explain the Quaternary Plateau ignimbrites and basalts of the Hose Mountains, Linau Balui Plateau, Niewwenhuis Mountains, and Usun Apau Plateau, which cannot satisfactorily be ascribed to subduction at the so called Northwest Borneo Trench.

The existence of these sialic basement terrains in central Borneo detracts from the usefulness of the Northwest Borneo Geosyncline concept, and the inclusion of the Sapulut, Trusmadi, Crocker and Temburong Formations of Sabah in the Rajang Group of Sarawak does not appear to be warranted.

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