Paper 2

First record of mélange on the Jerudong Line, Brunei Darussalam

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The Jerudong Line is interpreted as a narrow N-S zone of major wrench faulting, which extrapolates to sea as the Morris Fault. Facies differences across the Line between the Miri and Belait Formations suggest an order of 40 km left-lateral post-depositional displacement.

I wish to record new observations along the Jerudong Line, taking advantage of a proliferation of hillside building sites. There is a singular lack of field evidence for transcurrent motion. There are no transverse folds but localized mud diapiric structures are well known. There used to be a coastal outcrop of mudstone containing small blocks of petroliferous sandstone. There is a well developed conjugate set of mud-draped cross-fractures, which, however, can be explained by E-W compression during the anticline formation. In the field, the Jerudong Line resembles a narrow very tight anticline, where dips become near vertical, but rapidly flatten out both eastwards and westwards. No fold closure has actually been observed

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along the mapped anticline.

The Jerudong Anticlinal axis exposes the conformable transition from underlying (younger) Setap Shale, through a mudstone containing thin fine-grained sands, to the conformable base of the sand-dominant Belait Formation.

The geomorphology of Brunei Darussalam is characterized by continuous and persistent sandstone ridges with intervening mudstone valleys, except around the upper reaches of the Brunei River, south of Pangkalan Batu. The vicinity of Masin Hill is characterized by hummocky topography without strike persistence – discontinuous hills separated by flat land. Extensive building site development shows this topography to have resulted from disrupted stratigraphy. Convoluted and rolled blocks up to 2 or 3 m diameter of sandstone are embedded randomly in Setap Shale. In less disturbed zones, there is an interbedded mudstone-sandstone sequence. The outcrops are interpreted as olistostrome (sedimentary mélange) in which yet unconsolidated sand bodies (at a delta front) slid down an unstable depositional slope into a predominantly muddy environment. Turbidites may be expected to occur here, but have not been recorded, although in an identical stratigraphical setting they do occur on SW Labuan Island to the northeast.

The Bukit Masin olistostrome coincides with the southern extrapolation of the Jerudong Line just before it passes into Sarawak. It is possible that the slumps were triggered by syn-sedimentary earthquakes on the incipient Jerudong Fault. The Belait Formation is thin over the anticlines and many times thicker in the synclines. The Jerudong Line must therefore have been active during sedimentation. My observations and interpretation of the mélange are preliminary, meant to encourage a detailed study of this fascinating area.

A note is added on the Setap Shale. A field comparison was made of its outcrops south of Bangar (Temburong district of E Brunei) with those along the Jerudong Line. The latter are conformable with the Belait Formation. The lignitic material of the basal Belait Formation has a reflectance of only 0.3% (immature, above the oil window). The oil in the numerous seeps has moved up along the steep anticlinal limbs from the mature depocentre of the northwards-plunging Berakas Syncline. Road cuts south of Bangar show that identical Belait Formation sits with a distinct angular unconformity on metamorphosed and foliated "Older Setap Shale" (= Temburong Formation ?). Any preserved coaly material is anthracitic and should have reflectivities > 3.0. It has been metamorphosed beyond the oil window and could have contributed no hydrocarbons to the Belait Formation, which unconformably overlies it about 5 km south of Bangar.