



Geodynamic evolution of the NW Borneo Wedge: Subduction of a crustal asperity model

F. Sapin (1), M. Pubellier (1), J.-C. Ringenbach (2), and T. Rives (3)

(1) Laboratoire de Géologie, ENS Paris, CNRS (CNRS-UMR 8538), 24 rue Lhomond, F-75231, Paris, France
(manu_pub@mailhost.geologie.ens.fr), (2) TOTAL E & P, CSTJF Avenue Larribau, F-64018 Pau Cedex, France, (3) TOTAL E & P Borneo B.V., 2nd Floor RBA Plaza, Jalan Sultan, Bandar Seri Begawan, BS8811, NEGARA BRUNEI DARUSSALAM

The NW Borneo Margin is a complex structural domain where deformation style is a mix of compression and extension features associated with transverse structures. Review of outcrops, geomorphologic and magmatism studies show two imbricate wedges in Sabah/Brunei:

- The Rajang-Crocker Wedge, mainly onshore, is oriented N-S in Sabah, curving to E-W in Sarawak. It is characterized by short wavelength thrusted folds. The age of deformation is Eocene-Oligocene with sequence of thrusting propagating westward. This wedge has been lately refolded by large wavelength anticlines generating well-known geomorphologic domains such as the Crocker Ranges, the Trusmadi Ranges and the Mulu Mountains.
- The offshore NW Borneo Wedge is oriented NE-SW from North Sarawak to Palawan Island. This wedge can be divided into four structurally different domains, two compressive and two extensive basins rooted on the Mid-Miocene Unconformity (MMU). The formation of this wedge is contemporaneous with Mid-Miocene uplifts in the Rajang-Crocker Wedge.

The timing of deformations and relationships between the different morpho-tectonic domains leads to reconsider the evolution of the entire NW Borneo Margin.

The offshore NW Borneo Margin is characterized by the coeval NW Borneo Thrust Belt (offshore Northern Sabah) and the Outer Thrust Zone (offshore Brunei and Southern Sabah) of contrasted structural styles (difference of folds wavelength, occurrence of out-of-sequence thrusting, passive-roofing...). The Outer Thrust Zone is associated both in time and space, to the large Baram-Champion deltaic province. This recent (Late Miocene) deltaic province results of a drastic change of sediment source during the Early/Mid-Miocene (~16Myr) from the SW (Schwanner Mountains) to the SE (Central Rajang-Crocker Wedge).

The new model proposed here integrates the emplacement of the Baram-Champion deltaic province as the result of the docking and subduction into the NW Borneo Subduction of a crustal asperity named "Mulu Block".

The subduction of a crustal asperity generates both large uplifts within the accretionary wedge and greater subsidence of the subducting plate; characterized here by:

- Tremendous uplifts (South of Mulu Area and Central Rajang-Crocker Wedge), modifying the zone of sediment source and leaving a "scar"
- geomorphologic anomaly without structural trend – within the wedge;
- A deep "gluttonous" basin capturing 10km thick sediments into a deltaic province (The Baram-Champion Basin).

New temperature data acquired from outcrop sampling in the central Borneo Wedge area support this new

model, showing two domains: low temperature domain (frontal Balingian and Baram Basins) and high temperature domain (central Borneo Wedge). The jump of temperature is estimated around 100°C and corresponds to what we interpret as the "scar" of the asperity.