

Geological Society of Malaysia — Petroleum Geology Seminar 1989

STRUCTURAL STYLE AND TECTONICS OF WESTERN AND NORTHERN SABAH

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The western and northern part of Sabah consisting of sedimentary and igneous rocks of Early Cretaceous to Pliocene age have undergone several episodes of deformation related to the opening of the South China Sea Basin. The western and northern part of Sabah are characterised by a linear regional pattern of long parallel ridges trending approximately N20E and N110E respectively. These linear ridges are cross-cut by several strike-slip faults trending approximately N-S, NE-SW and NW-SE. In Western Sabah these ridges are represented by sedimentary rocks of the Crocker and Trusmadi Formations, while in Northern Sabah they are represented by the sedimentary rocks of the Crocker, Kudat and Bongaya Formation.

The earliest episode of deformation which was responsible for the deformation and uplift of the basement rock (Chert-Spilitic Formation) here, probably occurred during Early Eocene time as indicated by the common appearance of limestones during this time. This deformation is characterized by tightly folded chert beds with randomly orientated fold axes, sheared and brecciated igneous rocks, seen mostly in Northern Sabah. This early deformation is thought to have controlled the development of an elongate basin trending approximately N-S in Western Sabah and E-W in Northern Sabah as indicated by paleocurrent measurements.

The elongate basin in Western and Northern Sabah became the site for the deposition of the Crocker, Kudat and Trusmadi Formations during Middle Eocene to Early Miocene times. These sediments were subsequently deformed during Middle Miocene times to form a series of imbricate thrust slices (1-2 km wide). These thrust slices are commonly represented by large asymmetric folds verging towards the west and north in Western and Northern Sabah respectively. Shaly units (red and grey shales of about 20-30 m thick) within these formations provided the decollement surface for the development of this imbricate thrust structure. These decollement surfaces are generally characterised by a sheared and disrupted beds. In Northern Sabah, blocks of basement rocks, Crocker and Kudat Formations mixed together in a sheared grey shale matrix probably represents major fault zones.

The presence of the two major regional trends indicates at least two major compressional directions, a NW-SE compressional direction in Western Sabah and a N-S compressional direction in Northern Sabah. The timing of both deformations is uncertain due to poor age control of the sediments in Western and Northern Sabah. Structural evidence around the hinge of both trends showing the occurrence of refolded fold however suggests that these compressional directions probably occurred progressively from NW-SE to N-S directions.

The NW-SE and N-S compressional directions controlled the development of NE-SW and E-W trending basins in Western and Northern Sabah respectively for the deposition of younger sediments during Upper Miocene to Pliocene times. The continued N-S deformations in Northern Sabah affected the Bongaya Formation to form gentle folds trending E-W and extensional faults trending N-S. Both compressional forces continue today as shown by the presence of active mud volcanoes in Western and Northern Sabah.