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Tertiary stratigraphy, structure and tectonic evolution of Southern Sabah: implications to the tectono-stratigraphic evolution of Sabah, Malaysia

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Integrated surface mapping, dating and radar image interpretation of strata in southern Sabah, Malaysia has made it possible to revise the lithostratigraphy, chronostratigraphy, structure and tectonic evolution of the area. The recognition in the field of an Early Miocene regional unconformity, which may be equivalent to the Deep Regional Unconformity recognised offshore, has allowed the development of a stratigraphic framework of groups and formations which correspond to stages in the sedimentary basin development of the area. Below the Early Miocene unconformity the succession can be resolved into deposits of an accretionary complex of Eocene age overlying an ophiolitic basement, and late Palaeogene deep water succession which formed in a forearc basin.

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The late Palaeogene deposits underwent syn-depositional deformation, including the development of extensive melanges, all of which can be demonstrated to lie below the unconformity in this area. Some localised limestone deposition occurred during the period of uplift and erosion in the Early Miocene, following which there was an influx of clastic sediments deposited in delta and pro-deltaic environments in the Middle Miocene. These deltaic to shallow marine deposits are now recognised as forming two coarsening-upward successions, mapped as the Tanjong and Kapilit Formations. Their map distribution have been revised. The total thickness of these two formations in the southern Sabah Basin amounts to 6,000 m, only half of the previous estimates.

The Tanjong and Kapilit Formations are deformed into broad NW-SE-trending synclines separated by narrow anticlines. The anticlines are sub-parallel to major faults and associated with high angle reverse faults, and positive flower structures. Secondary fold-faults formed oblique to the major faults. The structural style suggests that the NW-SE trending faults acted as major left-lateral transpressional zones. The faults may in part be reactivated basement structures. The Early Miocene unconformity is interpreted to be the result of deformation and uplift following underthrusting of continental crust of the South China Sea which terminated Paleogene subduction beneath North Borneo. Renewed subsidence is related here to rifting in the Sulu Sea which led to the development of a major Miocene depocentre above the older forearc accretionary complex. The major transpressional deformation probably occurred during the Late Pliocene, and is possibly related to propagation of deformation from Sulawesi towards NW Sabah. This strike-slip deformation which uplifted the area is termed here the Meliau Orogeny. Renewed extension during the Quaternary has caused some sequence repetition. The 'circular basins' of the Meliau, Malibau and Tidung areas, are interpreted as remnants of a single large basin, deformed in the NW-SE trending transpressional fault zones.