

## **Facies, textural characteristics and depositional model for the Tertiary boulder beds of Batu Arang, Selangor**

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The Tertiary Boulder Beds exposed at a hill-cut west of Batu Arang town can be distinctly divided into three units — a Red Conglomeratic Unit at the bottom, an intermediate zone of flat bedded, pebbly and gray coloured siltstone and mudstone and a Gray Conglomerate Unit at the top. An interbasinal angular unconformity separates the Red Conglomeratic Unit and the flat-bedded sandstones from the overlying Gray Conglomerate Unit. Facies and textural characteristics of the different units suggest that each unit have been deposited by different, temporally separated depositional regimes within a basin governed by fault-related movements.

The Red Conglomeratic Unit comprise a multi-stacked upward-fining cycles of red, well-rounded and sorted orthoconglomerate at the base, overlain by subordinate lenses of sand, silt and mud at the top of each cycles. These cycles are not laterally uniform but instead display terminations and diffused interfingering of sub-facies. Gravelly scour-fills, mudstone-pebbly conglomerate interbedding and normal and reverse-graded lenses are not uncommon. The maximum size for clasts of this unit ranges from 45 cm to 55 cm. Clast imbrication is common. The lenses of the petromict conglomerate comprises clasts of quartzite, sandstone, chert, vein quartz, phyllite and schist, with sandstone being the dominant clast-type. The presence of syn-depositional structures like listric faults, conjugate normal faults and wedge-shaped tensional fissures within this unit suggest that tectonic activities has influenced the sedimentary pattern within the basin. The Red Conglomeratic Unit is interpreted as a subaerially water-laid, alluvial fan deposit.

The flat-bedded, gray-coloured pebbly sandstone and siltstone overlies the distinct palaeosol horizon of the Red Conglomeratic Unit. The contact is conformable or para-conformable. The deposition of these flat-bedded layers indicate a marked change in the depositional regime operating within the environment. The gray colouration of the beds indicate that deposition occurred subaqueously in a reduced environment. This unit is interpreted to be upper flow-regime flat bed.

The Gray Conglomerate Unit is a dark gray conglomeratic unit which exhibit 'paraconglomeratic texture'. This poorly-rounded and poorly-sorted unit contains a lot of outsize, angular and elongated clasts, and is supported by sand and pebbles. Its petromict composition includes clasts of sandstone, quartzite, schist, phyllite, vein quartz and shale. Maximum clasts sizes exceeded 1 m. This unit is interpreted to be a debris flow deposit, deposited into a subaqueous environment.

The facies characteristics and stratigraphic relationships of the different units of the Boulder Beds of Batu Arang reflect the intimate interplay between depositional processes and tectonism in the stratigraphic development of the succession.