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Origin of Overpressure in the Malay Basin

The Malay Basin is one of the most prolific hydrocarbon-producing basins in Southeast Asia. Over 12 km of fine-grained Tertiary sediments were deposited during the last 35 Ma, leading to development of overpressure in the deeper parts of basin. Wireline logs have been used to examine the origin of the overpressure, applying classical porosity-based pressure prediction methods. The principal pore pressure prediction methods were the Equivalent Depth method and the Eaton method, using both sonic and density logs. Both methods gave similar results at the onset of overpressure (consistent with disequilibrium compaction) but underestimated excess pressures at greater depths. This discrepancy suggests that another mechanism besides disequilibrium compaction must be responsible for the overpressure in the basin. Unloading processes, such as fluid expansion, appear to be contributing to the observed overpressure in some of the wells. However, in most of the wells, cross plots of sonic velocity and density indicate the possible role of chemical compaction, which would be facilitated by the high geothermal (gradient > 50°C/km) in the basin. Chemical compaction appears to commence around 100-110°C and is independent of overpressure. These observations suggest that chemical compaction and the associated reduction in permeability may need to be taken into account for pore pressure prediction and basin modelling in the deeper parts of the Malay Basin.