

Paper 18

Occurrence of noval biomarker fingerprints in Malay Basin sediments: Source implications

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A suite of almost identical biomarker distributions has been observed in sediment extracts from parts of the southern Malay basin. The characteristic biomarker fingerprint is observed in sediments from as young as Group H (Middle Miocene) to as old as Group M (Oligocene). Geochemical analyses carried out on these extracts indicate that they are, in fact, oil stains and not indigenous bitumen.

Biomarker distributions of an oil have been used to infer some genetic attributes of its source origin. Produced oils previously described in the Malay basin have been considered non-marine, and are believed to have been derived from a mixture of coaly and freshwater lacustrine Miocene and Oligocene sediments. The lacustrine biomarker fingerprints are characterised by the presence of gammacerane, C₂₈ and C₂₉ tricyclic terpanes and low Tm/Ts, whereas bicadinanes and oleanane are indicative of oils derived from the coaly sediments.

In comparison, the newly recognised oil stains display significant differences from both the coaly and lacustrine-sourced oils described above. These differences include:

- High concentration of C₂₁-C₃₁ tricyclic terpanes
- Low hopane/sterane ratio
- Lack of higher plan biomarkers
- Low Pr/Ph ratio
- Elevated C₂₉ hopane
- Non-waxy oil,

and therefore suggests a possible occurrence of a third oil family in the basin. The issue at hand is the need to locate where this third oil family could be sourced. As the oils are detected in the Group M sediments, the group M and older sediments could possibly be candidates for the source of the oils. Of these possibilities, a pre-Tertiary carbonate source is perhaps more controversial, but Mesozoic carbonates cannot be ruled out as there is an apparent correlation of biomarker distribution with the carbonates. The widespread occurrences of inorganic-sourced carbon dioxide detected in the northern part of the basin demonstrate the existence of a deep carbonate platform.

Regardless of the source of the third oil family, it is considered that its generation and migration pre-date the Middle and Upper Miocene basin structuration, and any significant oil accumulation would therefore be found trapped stratigraphically.
