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MODELLING THE HYDROCARBON SYSTEM OF THE MALAY BASIN

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A 3D basin model was conducted for the Malay Basin, as part of a 2006 integrated regional study. The main objective of the regional study was to identify new plays in the basin, a basin which is now at the mature stage of exploration. Based on available maps and well data, the 3D modelling was undertaken to understand the hydrocarbon distribution and evaluate the remaining potential. A Geographic Information System (GIS) tool was used to integrate basin modelling results with geochemistry data from exploration wells to better understand directions of hydrocarbon migration (Figure 1).

The main source rocks for the basin are the Oligocene-Lower Miocene lacustrine shales, and the Middle-Upper Miocene coal/coaly shale (Creaney et al., 1994; Hoesni and Abolins, 1996; McCaffrey et al., 1998). Compositional kerogen kinetics for both these source rocks were determined. Compared to published 'traditional' Type I and III kinetics, the hydrocarbon generation windows for both source rocks from Malay Basin are found to be narrower and the hydrocarbons generate much later.

In combination with the GIS-based maps, several insights on source rocks maturation, migration pathways and sealing capacity have been made. With a GIS approach, relationships of geochemical attributes (biomarkers and isotopes) can be readily viewed together with the geological interpretation and the basin modelling results.

The generated hydrocarbon from the Middle-Upper Miocene coaly source rocks are found to be confined to the northern and middle part of the basin. Several exceptions are noticeable at a few locations suggesting possible vertical leakage through faults from deeper lacustrine source rocks.

3D modelling and migration analyses collaborate the findings on the origin of these cross stratal migrated hydrocarbons based on the biomarker and isotopic signature. In cases where correlations cannot be made, postulation on several alternative scenarios has been proposed. In general, the modelling confirms that the distribution of oil and gas fields in the Malay Basin is primarily a function of basin morphology in that most of the gas fields (and related high CO_2 content) are located in the basinal depocentre. These fields are within the shallower reservoirs where the gases are derived from overmature coaly source rocks. In contrast, most oil fields tend to be located towards the basin margin, especially to the

southeast basin flank where oil-prone lacustrine source rocks, being at shallower depths of burial, are still in the oil window. In summary, the study results highlight several potential sweetspots in the basin for future exploration.

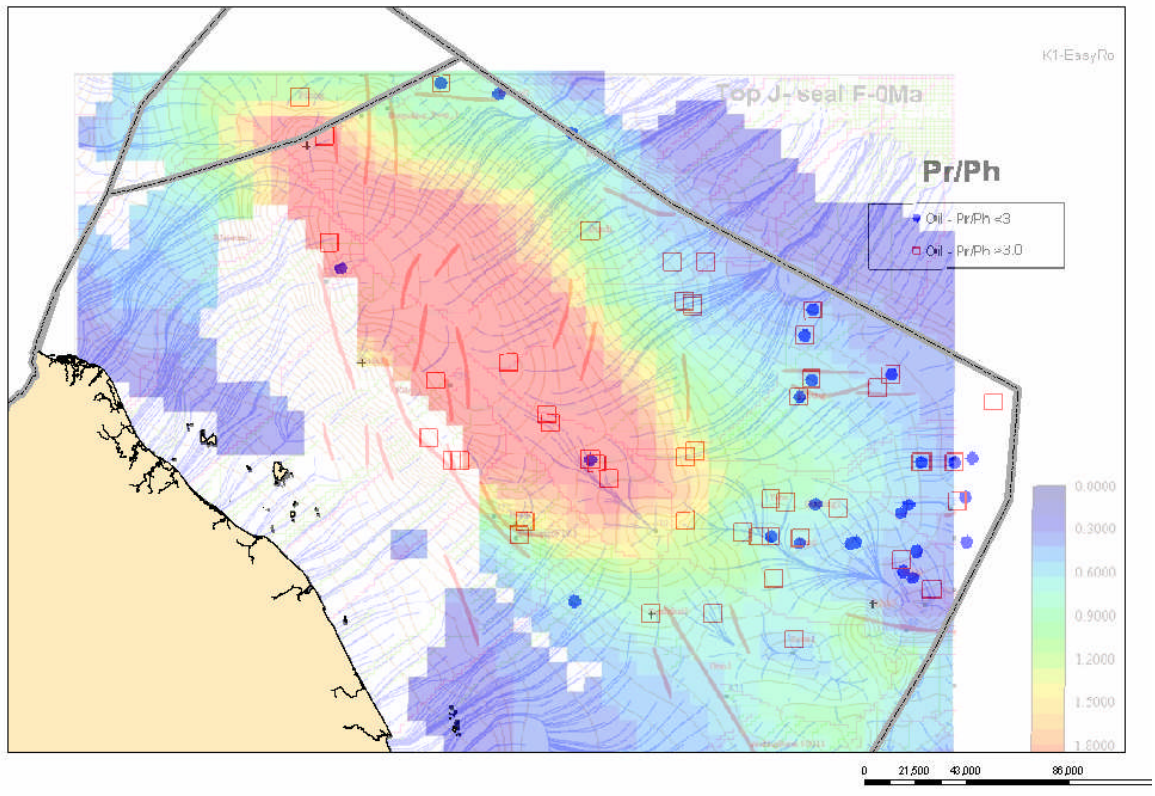

Figure 1. A screenshot example of a GIS-based map consisting of three overlays: (i) migration drainage pattern, (ii) maturation zones for lacustrine source interval and (iii) pristane/phytane ratio for the oils.

REFERENCES

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