

**AAPG Annual Meeting
March 10-13, 2002
Houston, Texas**

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A New Regional Heat Flow and Hydrocarbon Migration Model for the Kutei Basin and Central Makassar Straits

A new heat flow and hydrocarbon generation, expulsion and migration model based on crustal stretching, sequence stratigraphic and geochemical interpretations indicates that there is oil generation potential in deepwater Kutei basin and in the Central Makassar straits. The model takes into account mantle heat flow component, timing from rifting, radiogenic heat flow from continental and oceanic crust, and radiogenic heat flow from sediments. Over 300 on-shore, shelf and deep water East Kalimantan wells provided calibration data. One hundred and four 1D basin models and eight 2D basin models were built to describe local and regional heat flow variations. The models were utilized to calibrate regional heat flow trends, hydrocarbon maturity trends, and hydrocarbon migration fairways. Data, algorithms, and modeling results were integrated into a 3D visualization system which provides an easy way to read composite heat flow numbers, and to study spatial and temporal relationships between different petroleum systems components.

According to the new model, heat flow in the Kutei basin varies from 32-44mW/m² in shallow water to 45 to 52 mW/m² in deepwater at present. There is no significant difference between deepwater heat flow North and South of the Mahakam delta. These results challenge previously published studies suggesting gradual basin-ward cooling and it has put a new perspective on exploration opportunities in the Central Makassar straits where source rocks should be in oil generation window at present.