

Lacustrine Petroleum Systems in the Papua New Guinea Foreland

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Oil production in Papua New Guinea (PNG) is entirely sourced from the PNG Foldbelt, and the source rocks for these oils are likely to be marine Upper Jurassic shales of the Imburu Formation. In the PNG Foreland, commercial oil accumulations are yet to be discovered, but the occurrence of lacustrine oils in this region provides a new target for oil exploration. One uncertainty in evaluating this exploration play is the stratigraphic and regional distribution of lacustrine source rocks.

Exploration drilling in the PNG Foreland over the last decade has yielded oil shows with a lacustrine signature at Bujon-1, drilled by Philips Petroleum in 1994, and a biodegraded oil column at Koko-1, drilled by Oil Search Ltd in 1999. The lacustrine signature of these oils is evident from a number of geochemical characteristics such as the presence of β carotane, abundant gammacerane, C_{26}/C_{25} tricyclic terpane ratios > 1 , abundant 3β -methyhopanes and tetracyclic polyprenoids. In addition, a palaeo-oil column intersected by Koko-1 has similar source characteristics to the current-day oils but is not biodegraded. This indicates at least two charge episodes of oil from lacustrine source rocks at Koko-1, and a biodegradation event subsequent to the later charge. A review of data reported to Phillips Oil on hydrocarbon shows in Adiba-1 in

the southern part of the Foreland, indicates that the geochemistry of this oil may be similar to the lacustrine oils identified from Koko-1 and Bujon-1.

A single sample from an over-mature Triassic section intersected at Kanau-1 and containing Type I/II organic matter was tested using organic petrological and geochemical analyses. Whereas the analyses indicate the Kanau-1 sample is not a potential lacustrine source rock, other parts of the Triassic section can not be excluded as a potential source for lacustrine oil.

New organic petrological data from Magobu Island-1 has revealed the presence of an alginite-rich interval with lacustrine affinity within the Early Jurassic sequence. Extract work is currently underway to confirm the lacustrine signature of this rock with the aim of potentially correlating it to the lacustrine oils in the region.

The information collected to date is also being synthesised into a series of basin models examining the charge history and testing theories on the location of likely depocentres of oil prone source rock. One of the goals of this work is to explain the multistage charge and biodegradation events observed at Koko-1.

The new data and review of previously acquired data have revealed that oils with a lacustrine signature may not be confined to the Koko-Bujon area, and that potential lacustrine source rocks also occur in the Fly River Delta area. This has encouraging implications for the regional extent of the lacustrine oil play and is a key input for developing an oil exploration strategy for the Foreland area.

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