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## ABSTRACT

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## UNDER-EXPLORED PETROLEUM SYSTEMS IN THE PALEOZOIC AND MESOZOIC OF THE TIMOR AND ARAFURA SEAS, EASTERN INDONESIA.

The Timor and Arafura Seas extend along a large part of the Indonesian-northern Australian boundary. Relatively well explored within Australian waters since 1971, the first significant test in Indonesian waters was the Abadi 1 gas discovery, drilled by INPEX in 2000. Since Abadi was discovered, industry interest has been stirred, if not shaken, by the availability of the Matahari MC2D seismic survey, linking Australian gas discoveries of Greater Sunrise and Evans Shoal with the Abadi accumulation and the Barakan-1 dry hole (UTP 1995) to the northeast.

This paper examines:

- 1) the structural relationships of the Paleozoic and early Mesozoic rocks that form the foundation for these gas discoveries,
- 2) presents a revised interpretation of Paleozoic/Mesozoic tectonic provinces, and
- 3) discusses the Early to Middle Jurassic Plover Petroleum System and potential for deeper oil-prone Paleozoic oil source rocks, and
- 4) the results of seismic interpretation in open acreage within Indonesian waters to the north and east of the Abadi accumulation.

The Greater Sunrise, Evans Shoal and Abadi discoveries lie on the Sahul Platform, a peri-rift basement high, separated from the Australian craton by a failed Jurassic to Early Cretaceous rift. This rift is identified as the Malita Graben which extends east into the Calder Graben, providing key depocentres and an effective charge kitchen from mature Early to Middle Jurassic Plover Formation source rocks (Organofacies B & D/E), which are regarded as the origin of these gas-condensate accumulations on the Sahul Platform. The latter are reservoired in Plover Formation paralic and shelfal sandstones.



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To the north and northeast of the Abadi discovery, in open Indonesian acreage, new seismic interpretation has revealed the existence of hitherto undiscovered Paleozoic basins, especially on the southeastern margin of the Tanimbar Trough. Based on analogues with the Bonaparte Basin and Goulburn Graben of northern Australia, these Paleozoic Basins could contain high quality and mature oil-prone Organofacies B & D/E source rocks of Cambrian, Devonian and Carboniferous age. In addition, deeply buried Early Cretaceous source rocks may exist along the flanks of the Tanimbar Trough, with similar attributes to excellent quality Echuca Shoals Formation source rocks in the northern Bonaparte Basin, which charged a number of oil discoveries such as the Elang Field in the ZOC.

This paper establishes possibilities for a new oil play from Paleozoic and Early Cretaceous oil source rocks, either within indigenous and/or updip and supercrop reservoir section. This is in addition to more 'traditional' Early - Mid Jurassic Plover reservoir targets, filled with gas and gas-condensate from source rocks of the same age, as discovered at the Abadi and Greater Sunrise accumulations.