AAPG Datapages/Search and Discovery Article #90213 CSPG© 2015 CSPG/CSEG/CWLS Convention 2004, Innovation, Collaboration, Exploration: Building to the Future, Calgary, AB, Canada, May 31-June 4, 2004

# Physical Modelling of Primary Stratigraphic and Structural Controls on the Evolution of the Papuan Fold Belt, Papua New Guinea, with Implications for Hydrocarbon Exploration

Katie Lucas* and John M. Dixon
Queen's University, 99 University Ave. Kingston, ON K7L 3N6
lucas@students.geol.queensu.ca

## ABSTRACT

The Papuan Fold Belt, Papua New Guinea, is under active hydrocarbon exploration. Reservoirs located to date are in relatively thin sandstone units encased in thick shales, with the hydrocarbons occurring in anticlinal traps and footwall cutoffs below thrust faults. Some of the largest structures are interpreted to have resulted from thrust inversion of extensional faults formed during crustal rifting, yet little constraint has been placed on the sub-surface structures of the belt, leading to a wide range of possible play types.

Scaled physical analogue modelling by the centrifuge technique has been used to investigate the primary stratigraphic and structural controls on the Papuan Fold Belt. The models are constructed of plasticene modelling clay and silicone putty which are mechanical analogues of competent rocks such as limestone and sandstone, and incompetent rocks such as shale, respectively. They comprise a mechanical stratigraphy representing the Darai limestone, the Ieru shale, the Toro sandstone and the Imburu shale. Facies changes and syn-depositional faults have been built into the models to investigate how these factors control folding and thrusting and the styles of hydrocarbon traps within the Papuan Fold Belt.

The models show that the strength and thickness of the lower décollement horizon, the Imburu shale, can determine whether the structural style will be fold or thrust dominated. Variations in the strength of the Ieru shale control the amount of structural coherence between the major competent units. Deformation in models which include simulated syn-depositional faults indicate a relationship between the timing of faulting and sedimentation with respect to the overall deformation of the Papuan Fold Belt. The models can be applied to specific structural domains of the Papuan Fold Belt in order to further understand the subsurface structure and aid in the exploration of regions that are hydrocarbon bearing.