SEAPEX Exploration Conference 2007
Orchard Hotel, Singapore
24th – 26th April 2007

Day: **Wednesday 25th April**
Session: **Indonesia Session**
Time: **1330 – 1400 hrs**

Insights into SE Asian Plate Reconstructions as Guided by the 2005-2006 2D Regional Seismic Surveys, Central-Eastern Indonesia

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Understanding tectonic development of central and eastern Indonesia is still incomplete despite some significant recent progress in revealing onshore geology of the surrounding islands, geochemical signature of extrusive and intrusive rocks, biogeography, gravity, magnetics, Global Positioning System (GPS) and seismic tomography.

Over the past three decades a number of local seismic surveys, focussed primarily on permit prospectivity, have been acquired. In recently three regional offshore 2D seismic surveys have been shot in central and eastern Indonesia. In 2005 some 2,400 line kilometres of the 'New Look' deep recording 2D reconnaissance non-exclusive seismic survey was acquired. In 2006 the preliminary interpretation of new data has led to two basin-wide non-exclusive seismic surveys, the 'Gorontalo' and 'Semai', both adding approximately 11,059 line kilometres.

Subsequent interpretation of these surveys has given new insights into a plate tectonic development of central and eastern Indonesia.

The 'Gorontalo' seismic data has revealed Eocene to Recent sediment thicknesses exceeding 10 kilometres in the Gorontalo Basin which is underlain by a pre-rift section of sedimentary origin. The pre-break-up section also shows evidence of an older collision that may be related to the Gondwanian plate tectonics when the Mangkalihat-NW Sulawesi microplate collided with NE Sulawesi. Integration of this observation with the onshore geology of SE Sulawesi indicates that the collision is likely to be Late Cretaceous in age. The Eocene to Miocene section in the

Gorontalo Basin also displays mainly extensional tectonics with a late compression estimated approximately at 5.5My years.

The ‘Semai’ seismic survey confirms a thick Paleozoic to Mesozoic section displaying a strong strati-structural affinity with the Australian Plate evolution which is overprinted by a 5.5My collisional event coincident with the Gorontalo Basin compression.

Tectonic similarities and similar depositional megasequences indicate that these two geographically separate regions may have a more common plate tectonic history than previously thought. Both regions appear to be underlain by Permo-Mesozoic crustal blocks of Australian origin and have been affected by Palaeocene to Eocene period of stretching during which sand-rich and source rock dominated fluvio-deltaic sediments have been deposited in newly subsiding depocentres. A relatively quiescent period of widespread carbonate deposition followed during the Oligocene lasted until the Middle Miocene. During the latest Miocene oceanic crust formation commenced in the Banda Sea and Southern Palau area increasing sediment supply and restricting most of the carbonate sedimentation to pinnacle growth. This is marked by an uppermost Miocene unconformity which is widespread in eastern Indonesia and offshore Australia. This, however, was commonly thought to be caused solely by a collision of the Eurasian and Indo-Australian plates. Whilst this is still considered to be a primary cause for the formation of this event, an extensional component associated with the Banda Sea and Palau area plate formation cannot be underestimated. If this hypothesis is correct, then the collision of the Banggai-Sula-Obi, Offshore Eastern Sulawesi and Offshore Buton terrains with eastern Sulawesi was coincident with oceanic spreading. Since the Pliocene only the Southern Palau spreading continued causing westerly movement of SE Halmahera and compression of central and eastern Indonesia.