Petroleum Geology Conference and Exhibition 2008
14th – 15th January 2008 • Kuala Lumpur Convention Center, Kuala Lumpur, Malaysia

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THE STRUCTURAL AND STRATIGRAPHIC EVOLUTION OF SHALE DETACHMENT SYSTEM IN THE CEDUNA BASIN, AUSTRALIA

M ZAID JAAFAR
PETRONAS Carigali Sdn Bhd, PETRONAS Twin Towers, Kuala Lumpur

The Ceduna sub basin, part of the Bight basin, covers an area of 95,000 sq. km and is located at the southern margin of the Australian continent. The basin was formed by the Mid-Late Jurassic to Early Cretaceous separation of southern Australia from Antarctica.

Four principal tectono-stratigraphic phase have been identified in the Ceduna Sub-Basin. Mid-Late Jurassic rifting was followed by two phases of post-rift thermal subsidence in the Cretaceous with southern margin breakup occurring in the Late Santonian. From the Late Cretaceous through the Cenozoic the passive margin phase was characterized by progradational sediment deposition from a major delta system – the Ceduna delta. Four episodes of thermal subsidence have been identified and these events are related to a massive sediment influx into the passive margin basin. Two major delta complexes have been identified..

Rapid progradation of Turonian –Santonian and Campanian –Maastrictian deltas on the unconsolidated Albian deep marine shale have produced series of syn –depositional listric faults and shale detachment systems. Two episode of shale detachment systems have been recognized - a Mid Albian and a Late Santonian detachment systems. The Mid Albian event is more widespread than the late Santonian event which only dominated the outer margin of the delta. The Mid-Albian event produced a series of southward dipping listric fault systems which are associated with syn depositional growth sequences and contractional toe- thrust systems.

The Ceduna sub-basin shale detachment systems are characterized listric extensional growth faults and roll–over anticlines. Sediment depocentres are controlled by the syn–depositional fault structures with the initial sedimentation infilling the basin center followed by a shift to the outer delta margin after the basin center has been filled, together with reactivation of the fault along the delta margin. Sediment accumulation in the fault hanging-walls caused the propagation of growth faults, hanging wall rotation and the development of roll–over anticlines. Small scale roll-over anticlines dominate the western part of the study area and large scale anticlines dominate the middle sector of the basin.