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Mesozoic Sequence Stratigraphy and Implication for Hydrocarbon Exploration of North Eastern Roebuck Basin, North West Shelf, Australia

The Roebuck Basin, situated in the middle of North West Shelf of Australia, is the least explored and understood one as no significant oil and gas have been encountered. Five exploration wells, extended seismic survey of JNOC (1988) and some AGSO survey lines covered the north eastern part of Roebuck Basin, including the Offshore Fitzroy graben and part of Rowley Sub basin. To better understand the hydrocarbon potential of this basin, seismic stratigraphic, chronostratigraphic and sequence stratigraphic framework had been set up during this study through detailed work on the above database. 6 sequences bounded by 7 Sequence boundaries (Unit 8, CTB-1, RA-1, SA-1, C1-1, C6-2, C13-1 or T4-1) have been recognised in Mesozoic succession.

All these sequence boundaries are characterised by truncation below and onlap/downlap above. Sequence 1 and 2 begin with obvious landward onlap, and consist of lowstand prograding sets, transgressive systems tract, with some of the highstand eroded, whereas sequence 3 and 4 comprise very thin lowstand wedge and transgressive systems tract but well-developed highstand prograding sets. Sequence 5 consists predominantly of transgressive sets and downcut by Conyonalised sequence 6, which begins with intraslope canyons filled by sediments with slide feature in the basinward area, followed by transgressive and highstand systems tracts. Sequence 6 was itself cut by a strong erosive event (C13-1) that only developed in certain areas associated with valleys. Otherwise Sequence 6 is bounded by T4-1.

Contrary to the type 1 sequence boundary with shelf break in Tertiary succession, the Mesozoic sequences show ramp setting, indicating great uncertainty on basin floor fans or the lack of basin floor fans. Thus the exploration strategy in the Mesozoic ramp basin should be different from those with shelf break.