

Sequence Stratigraphy of the Tithonian Marine Sediments within the Laterally Confined Rift Settings of the Dampier Sub-Basin, Northwest Shelf, Australia

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Tithonian marine sediments of the Angel Formation in the Dampier Sub-basin have an extensive aerial distribution and have been penetrated by many exploration and development wells. The Angel system has excellent high resolution biostratigraphic control that enables time constrained correlations of sequences from proximal sand rich environments to distal sand poor settings. The younger part of the sequence associated with hydrocarbon bearing reservoirs has been cored extensively and this provides detailed information on the field scale stratigraphies and prevailing depositional processes.

Despite these extensive datasets, the depositional settings and, more importantly, the architecture of the main reservoirs at a regional scale are poorly understood. Interpretations range from shelfal sequences through to either mass [gravity] flows deposited on a tectonically controlled ramp or basin floor. The source direction of the sands in particular are conjectural and the subject of great debate. A variety of mechanisms are postulated ranging from discrete feeder conduits and transfer fans sourced from the tip points of fault relay zones on the western and eastern flanks, through to axial sourcing from the north.

This paper focuses on constructing a depositional model from the sedimentary structures and ichnofossils derived from the core, integrated with the high resolution biostratigraphic data and well log stacking patterns. A sequence stratigraphic model for the sub-basin is proposed that includes a hierarchy of surfaces from regional tectono-eustatic 2nd - 3rd order events through to 4th order and higher cycles. Examples of gross depositional environment maps ranging from semi-regional to field scale are used to highlight some of the proposed sediment source directions and depositional architecture.