MODELLING RESERVOIR DELIVERABILITY WITHIN THE NORTHERN BEAGLE SUB-BASIN, WESTERN AUSTRALIA

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Reservoir deliverability* is a critical component affecting the viability of petroleum systems within a sedimentary basin. Calculating deliverability relies on estimates of reservoir pressure, permeability and thickness as well as fluid viscosity, all of which are difficult to predict in a frontier basin. Burial and erosional processes exert a fundamental control on these rock and fluid properties. If this erosion is not uniformly distributed across an area then complex variations in deliverability may result. This paper presents a novel approach to quantifying predictions of reservoir deliverability within the Northern Beagle Sub-basin of Western Australia, via the use of a 3D basin-scale model that provides spatial and temporal estimates of variations in rock and fluid properties.

Active extension began in the Northern Beagle Sub-basin during the Early Jurassic and resulted in deposition of proposed source and reservoir intervals. A thick (>5km) succession of progradational Middle Jurassic deltaics overlies the early Jurassic petroleum system. During the Late Jurassic, the basin underwent a complex phase of erosion (attributed to rift flank uplift), which resulted in upwards of 3km of sediment being locally removed on footwall blocks of active faults, as well as over structural highs. In other areas, however, such as contemporaneous structural lows, amounts of erosion are minimal. This complex spatial pattern of erosion has implications for both the thermal history (affecting fluid viscosity), as well as reservoir quality (permeability).

The final product generated from this workflow was an integrated, basin-scale 3D model of reservoir deliverability for the Northern Beagle Sub-basin.

* Reservoir Deliverability $\boldsymbol{Q}$ = $(\Delta \boldsymbol{p}\ \boldsymbol{KH})/\boldsymbol{\mu}$, where
$\Delta \boldsymbol{p}$ = Reservoir Pressure – surface Pressure
$\boldsymbol{K}$ = Reservoir permeabilty
$\boldsymbol{H}$ = Reservoir Thickness
$\boldsymbol{\mu}$ = Fluid viscosity