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Matthew Brett¹, S. Flint², Julian Bessa³ (1) Stratigraphy Group, University of Liverpool, Liverpool, United Kingdom (2) University of Liverpool, Liverpool, United Kingdom (3) Sakhalin Energy Company, Rijswijk, Netherlands

Stratigraphic Reservoir Prediction in a Strike-Slip System: Miocene of the East Sakhalin Shelf, Russia

Northern Sakhalin Island was uplifted during the Miocene, due to the northward propagation of a N-S trending, right-stepping strike-slip fault system that gradually cut off sediment supply to the east Sakhalin shelf from the paleo-Amur delta and increasingly contributed sediment to the late Miocene shelf system. Associated NW-SE trending transpression led to growth of large fold structures on the East Sakhalin shelf that form the Piltun and Ashtokh gas fields. Integration of core, well log and 3D seismic data reveal that fold growth during the late Miocene controlled differential accommodation across the shelf, with complex responses to episodes of relative sea level fall. These include onlap of units onto the fold flanks, localisation of incised valleys in synclinal lows and the development of fluvial/estuarine facies. Stacking patterns of wave-dominated shoreface reservoir sandstones also vary from downward stepping, forced regressive geometries during periods of reduced accommodation to more conventional progradation during highstand times. The highest permeability reservoir unit is a lowstand, transgressively reworked deposit of shoreface and local fluvial origin, which can be related to an episode of anticline uplift. Incised valleys observed on seismic trend sub-parallel to local strike-slip faults and local block rotation/uplift may have exerted a control on their positions. Flooding surfaces and some regional sequence boundaries are interpreted as due to eustatic sea level cycles, although current biostratigraphic control is of too low a resolution to provide an absolute age fit to the Miocene oxygen isotope paleo-temperature eustatic sea level curve.