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Pre-Aruma Unconformity and Lower Aruma Channel Complexes in Eastern Saudi Arabia

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ABSTRACT

The Pre-Aruma Unconformity (PAMU) occurred during the late Cretaceous. The PAMU and the Lower Aruma channel complexes were interpreted in the post-stack time-migrated seismic volumes in the Eastern Province. The presence and the effectiveness of the reservoir seal and charge were systematically evaluated. As a result, two types of stratigraphic play concepts associated with the PAMU and the Lower Aruma channel complexes have been revealed. The first stratigraphic play concept is the truncation and onlap features immediately below and above the PAMU. Based on the observation from the 3D seismic interpretation, the topography of the PAMU is largely an angular unconformity that truncates the Wasia Formation with various extent; in particular on paleo-structural highs. In some places, the erosion was so severe that it eroded away the Mishrif, Rumaila and the Ahmadi — all three members from shallow to deep. The PAMU is also the depositional foundation of the Aruma Formation, which is a late Cretaceous carbonate unit in the Arabian Plate mega sequence AP9. The second stratigraphic play concept is associated with the Lower Aruma channel complexes, which is a result of erosion in the middle of the Aruma Formation. There are both siliciclastics and grainy facies on the flank and inside of the channels due to the sea level rises. The channel complex features have also been reported in both northern and southern parts of the Gulf (personal communication). Therefore, the Lower Aruma channel complexes offer a new stratigraphic play that can be explored for potentially across the entire Arabian Plate. The top seal for the potential reservoirs associated with the PAMU and the Lower Aruma channel complexes is the Lower Aruma shale. From the basin modeling perspective, the two types of plays discussed here are likely to be charged via vertical conduits from the Lower Cretaceous Sulaiy and, possibly, Jurassic Najmah source rocks.