AAPG Datapages/Search and Discovery Article #90254 ©2016, GEO-2016, 12th Middle East Geosciences Conference & Exhibition, Manama, Bahrain, March 7-10, 2016

Modelling Temporal and Spatial Sedimentary Architectural Complexity in Mixed Aeolian-Fluvial Reservoir Successions Utilizing Data from Modern and Ancient Systems

Mohammed A. Al-Masrahy[1], Nigel P. Mountney[2]

[1]Reservoir Characterization, Saudi Aramco, Dhahran, SAUDI ARABIA
[2]School of Earth & Environment, University of Leeds, Leeds, UNITED KINGDOM

ABSTRACT

The presence of stratigraphic complexity and heterogeneity at a scale below seismic resolution, coupled with stratigraphic architectures characterized by notable lateral facies changes, means that prediction of 3D stratigraphic architecture in subsurface fluvial and aeolian reservoirs is challenging. Data from analogous outcrops and modern settings are imperative to provide insight into reservoir heterogeneity arising from stratigraphic variability. In arid regions, it is common for fluvial and aeolian processes and resultant accumulated successions to occur inter- mixed such that preserved sequence architectures exhibit complexity arising from system interactions that operate at a range of spatial and temporal scales from local to regional. This study has quantified how aeolian dune, interdune and dryland fluvial morphological arrangements and their deposits are expressed as a variety of preserved types, in many cases predictably, across the zone transition from aeolian dune-field centers to their margins.

This study comprises three parts: 1) analysis of aeolian dune-field geomorphology through remotely sensed study of 4 parts of the Al Rub' Al-Khali sand sea, Saudi Arabia, which collectively cover an area of 73,200 km²; 2) analysis of types of aeolian-fluvial system interaction in modern dunefield margins through study of the morphological expression and areal distribution of 130 examples of fluvial-aeolian interaction that have been mapped using high-resolution satellite imagery from 60 desert dune fields around the world, such that case-study examples have been classified to propose a framework of ten distinct types of system interaction; 3) analysis of the preserved stratigraphic expression of ancient aeolian-fluvial system interactions via facies and architectural-element analysis of the upper part of the Wilmslow Sandstone and the lower part of the overlying Helsby Sandstone formations (Triassic) of the Sherwood Sandstone Group, Cheshire Basin, UK.

Results of this study have implications for developing an improved understanding of the likely controls on the detailed sedimentary architecture of preserved aeolian-fluvial successions by enabling the proposition and development of a range of dynamic facies models for mixed aeolian-fluvial systems. This work represents an important step in the development of a series of sophisticated models for the characterization of stratigraphic complexity and heterogeneity in aeolian-fluvial reservoirs.