A Quantitative Approach to the Characterization of Sedimentary Architecture in Mixed Eolian-Fluvial Reservoir Successions*

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Search and Discovery Article #41669 (2015)**
Posted August 24, 2015

*Adapted from poster presentation given at AAPG 2015 Annual Convention and Exhibition, Denver, Colorado, May 31 – June 3, 2015

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Abstract

Eolian and fluvial processes operate coevally in most desert-margin settings to generate a range of styles of sedimentary interaction that are documented from both modern arid systems and analogous ancient preserved outcrop and subsurface successions. Such styles of system interaction give rise to considerable complexity in terms of sedimentology and preserved stratigraphy. The physical boundary between geomorphic systems in hot deserts is dynamic such that facies belts undertake considerable lateral shift over time with the result that preserved sequence architectures exhibit complexity arising from system interactions that operate at a range of spatial and temporal scales from local to regional. An improved understanding of factors that govern these multiple scales of interaction is important for prediction of preserved stratigraphic architecture and therefore for assessment of fluid-flow properties and for development of well placement strategy in mixed eolian-fluvial reservoir prospects. A database has been developed to record the temporal and spatial scales over which eolian and fluvial events operate and interact in a range of modern and ancient desert-margin settings. Data have been collated using high-resolution satellite imagery, field observation and subsurface data. Ten distinct styles of eolian-fluvial interaction are recognized: fluvial incursions aligned parallel to the trend of linear chains of eolian dune forms; fluvial incursions oriented perpendicular to the trend of eolian dunes; bifurcation of fluvial systems around eolian dunes; through-going fluvial channel networks that cross entire eolian dune-fields; flooding of dune-fields due to regionally elevated water-table levels associated with fluvial floods; fluvial incursions emanating from a single point source into dune-fields; incursions emanating from multiple sheet sources; cessation of the encroachment of entire eolian dune-fields by fluvial systems; termination of fluvial channel networks into playas within eolian dunefields; long-lived versus short-lived styles of fluvial incursion. The database of case-study examples is employed to develop a series of quantitative facies models with which to account for dynamic spatial and temporal aspects of eolian-fluvial system behavior. Models can be used to predict the arrangement of architectural elements that define gross-scale system architecture in a variety of mixed eolian-fluvial reservoirs.
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Abstract

The study reveals that

Aim and Objectives

The study aims to...

Introduction

This study represents a significant step forward in understanding the...

Data and Methods

The study employs a combination of...

Summary

The study's main findings...

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Mixed Aeolian-Fluvial Reservoirs

Implications for Aeolian Reservoir Prediction and Modelling

Conclusions

References