

Talk 1**Comparative studies of outcrop and modern analogues for characterizing subsurface tidal sandstone reservoirs: sequence stratigraphy, facies analysis and modeling — a multidisciplinary approach**

SHUJI YOSHIDA, HOWARD JOHNSON, ANN MUGGERIDGE, MATTHEW JACKSON, ALLARD MARTINIUS AND RICHARD DIXON

Abstrak (Abstract)

In many parts of the world, tidal sandstone reservoirs host major hydrocarbon accumulations. They are particularly important in the northern North Sea (Norway/UK), Venezuela, Columbia, SE Asia, onshore US/Canada, Yemen and Egypt. However, their characterization and modelling are difficult. This is mainly because they contain a complex array of sedimentary heterogeneities (e.g., mud baffles) at various length scales, and we have very little knowledge on the dimensions and geometries of these heterogeneities. Moreover, unlike wave-dominated coastal settings, it is often very difficult to interpret depositional environment (e.g., tidal delta v.s. estuary) and reconstruct a palaeogeographic map in a tide-dominated setting from a series of 1-D subsurface data, and occasionally, even from outcrop data.

In 1997–1999, at Imperial College, we formed a multi-disciplinary team of reservoir geologists and engineers, and started a tidal sandstone reservoir analogue studies sponsored by the members of the FORCE (Forum for Reservoir Characterization and Reservoir Engineering) consortium. We used several tidal outcrops of the Lower Cretaceous in southern England to characterize these heterogeneities in a hierarchy of scales, viz; (1) sequence stratigraphic analysis (c. 10 m–100s m thick; a scale of entire depositional systems such as palaeovalley), (2) architectural element analysis (c. m–10s m; a scale of individual bars and channels), and (3) facies analysis (c. mm–1 m thick; a scale down to individual laminae). These outcrops contain a wide range of sedimentary heterogeneities, and is interpreted as recording a transgressive infill of an incised valley. As a case study, we will present the Lower Cretaceous Vectis Formation outcrop in the Isle of Wight, southern England.

Many giant oil fields in the northern North Sea, including the Middle Jurassic Beryl Formation (Bruce and Beryl fields) and the Lower Jurassic Tilje Formation (Heidrun and Asgard fields), are interpreted to have been formed under the regional and depositional setting comparable to the Lower Cretaceous outcrops in the UK. These reservoirs contain abundant mud drapes analogous to those found within the UK outcrops. A range of quantitative outcrop data, suitable for validating and/or populating objects for stochastic modelling of tidal reservoirs, is presented for the various facies and sand body types, including shale layer and heterolithic facies dimensions.