

EGU21-5702

<https://doi.org/10.5194/egusphere-egu21-5702>

EGU General Assembly 2021

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



The architecture and evolution of shallow water delta mouth bars: examples from the Lower Cretaceous of Spain

Matthew Watkinson¹, Grant Cole², and Rhodri Jerrett³

¹University of Plymouth, School of Geography, Earth and Environmental Sciences, United Kingdom of Great Britain – England, Scotland, Wales (mpwatkinson@plymouth.ac.uk)

²Robertson, CGG Services, Tyn-y-Coed, Llanrhos, Llandudno, LL30 1SA, UK

³Department of Earth and Environmental Sciences, University of Manchester, Oxford Road, Manchester, UK

Improved understanding of delta mouth bar morphodynamics, and the resulting stratigraphic architectures, is important for predicting the loci of deposition of different sediment fractions, coastal geomorphic change and heterogeneity in mouth bar reservoirs. Facies and architectural analysis of exceptionally well-exposed shallow water (ca. 5 m depth) mouth bars and associated distributaries, from the Xert Formation (Lower Cretaceous), of the Maestrat Basin (east-central Spain), reveal that they grew via a succession of repeated autogenic cycles. The formation is part of a mixed clastic-carbonate succession deposited during a time of active faulting and incipient salt tectonism, but in an area away from their direct influence and where wave and tidal reworking were minimal.

An initial mouth bar accretion element forms after avulsion of a distributary into shallow standing water. Turbulent expansion of the fluvial jet and high bed friction results in rapid flow deceleration, and deposition of sediment in an aggradational to expansional bar-form. Vertical bar growth causes flattening and acceleration of the jet. The accelerated flow scours channels on the bar top, which focuses further expansion of the mouth bar at individual loci where the channels break through the front of the mouth bar. Here, new mouth bar accretion elements form, downlapping and onlapping against a readily recognizable surface of mouth bar reorganization. Vertical growth of the new mouth bar accretion elements causes flattening and re-acceleration of the jet, leading to channelization, and initiation of the next generation of mouth bar accretion elements. Thus the mouth bar grows, until bed-friction effects cause backwater deceleration and superelevation of flow in the feeding distributary. Within-channel sedimentation, choking and upstream avulsion of the feeding channel, results in mouth bar abandonment. In this study, mouth bars are formed of at least two to three accretion elements, before abandonment happened. The results of this study contrast with the notion that mouth bars form by simple vertical aggradation and radial expansion. However, the architecture and facies distributions of shallow water mouth bars are a predictable product of intrinsic processes that operate to deposit them.