EGU21-2895, updated on 02 Dec 2021
https://doi.org/10.5194/egusphere-egu21-2895
EGU General Assembly 2021

Internal mouth-bar variability and differential preservation of coastal-process indicators in low-accommodation deltaic settings

Anna van Yperen[1], Miquel Poyatos-Moré[1], John Holbrook[2], and Ivar Midtkandal[1]
[1]Department of Geosciences, University of Oslo, Oslo, Norway (a.v.yperen@geo.uio.no)
[2]Department of Geological Sciences, Texas Christian University, USA (john.holbrook@tcu.edu)

Mouth bars are fundamental architectural elements of deltaic successions. Understanding their internal architecture and complex interaction with coastal processes (fluvial-, tide- and wave-dominated) is therefore paramount to the interpretation of ancient deltaic successions. This is particularly challenging in low-accommodation systems because they are commonly characterized by a thin, condensed and top-truncated expression. In this study we analyze the exhumed Cenomanian Mesa Rica Sandstone (Dakota Group, Western Interior Seaway, USA), which encompasses a fluvio-deltaic system along a ~450 km depositional dip-parallel profile. The study targets the proximal deltaic expression of the system, using 22 sedimentary logs (total of 390 m) spatially correlated within a ~25 km2 study area at the Tucumcari Basin margin. Analysis of facies distribution, depositional architecture and stratigraphic surfaces mapping reveals a 6–10-m-thick, sharp-based and sand-prone deltaic package, comprising several laterally-extensive (>1.4 km width) mouth bars. Within those, we distinguish four different along-strike sub-environments based on differences in grain size, sedimentary structures, bed thicknesses, and bioturbation indices; these are mouth bar axis, off-axis, lateral fringe to distal lateral fringe deposits, and overall reflect waning depositional energy with increasing distality from the distributary channel mouth. The interpreted mouth-bar components also show internal variability in dominant process regime, with overall river dominance but local preservation of tide influence in the lateral fringe and distal fringe environments. However, mouth-bar deposits amalgamate to form an extensive sand-rich sheet body throughout the study area, in which interflood mudstone to very-fine grained sandstone beds are nearly absent. This indicates a low accommodation/supply (A/S) setting, which promoted recurrent channel avulsion/bifurcation and thus reworking of mouth-bar fringe and distal-fringe sediments, where background coastal processes tend to be better recorded.

Trends in along-strike changes in sedimentary characteristics from axial to lateral environments are also recognized in other wave- and river-dominated deltaic settings as well, where axial components consist of higher energy facies associations resulting from high-density currents, whereas heterolithics become dominant towards the fringes, where there is an alternation of low- and high-density deposits combined with an increased recording of finer-grained facies associations. Complemented with our study, this suggests that internal hierarchy of mouth bars is evident and observed regardless of dominant coastal processes. Consequently, subdivision of mouth bars into different components can reduce complexity of models deriving from a myriad of

facies subdivisions, and guide prediction of facies changes and sand distribution in future studies of proximal deltaic settings. Finally, results of this study evidence internal process-regime variability within mouth-bar components. This cautions against relying solely on the preserved deposits at one given location in a system to infer dominant and subordinate coastal processes (e.g. tidal indicators), with a consequent risk of underestimating the true mixed-influence nature of low-accommodation deltaic settings.