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Evidence for muddy deltaic compound clinoforms in the Triassic shelf of northern Pangea: insights from the Havert Fm. (SW Barents Sea)

Valentina Rossi, William Helland-Hansen, Christian Eide, and Niall Paterson
Department of Earth Science, University of Bergen, Norway (valentina.rossi@uib.no)

The Barents Sea is a frontier basin, and as such it is relatively unexplored with respect to other basins worldwide. Of its Mesozoic sedimentary infill, the lowermost Triassic is the least studied. Very little is known about the characteristics, in terms of depositional environments and processes, of the sedimentary system.
This study is one of the few works so far on the Induan Havert Formation, which represents the first influx of clastic sediments into the basin from the rising Ural Mountains and the Fennoscandian Shield after the Permian-Triassic boundary. This work is based on a subsurface dataset (cores, well logs and seismic) from the south-western Barents Sea, and it is focused on a process-based investigation of available cored intervals of the Havert Formation. All cored intervals belong to the topset of 300-500 m thick shelf margin clinoforms, and therefore represent the shelfal environment.
Our analysis shows that, throughout the succession, there is evidence of all three major coastal processes (waves, tides, and fluvial currents) influencing deposition. The deposits are overwhelmingly dominated by heteroliths (as indicated by both cores and well-log signatures), and the inferred depositional model is that of a muddy compound-clinoform delta. Six facies associations (from distal to proximal) have been identified based on the sedimentological descriptions. FA1 represents the subaqueous platform to subaqueous foresets; FA2 is interpreted as a lower shoreface; FA3 is interpreted as subaqueous channel incising the subaqueous platform; FA4 records deposition in a tide-influenced open coastline or tidal flat; FA5 records deposition in bays; and FA6 is interpreted as tidal channels at the shoreline. Tidally-influenced facies appear to be more common closer to the shoreline, wave-influence is better expressed at the shoreline and in the subaqueous platform, whereas fluvial influence is expressed as the presence of graded beds and fluid muds associated with river floods.
In the modern, many fine-grained large deltas entering an energetic marine basin are characterized by the development of a compound clinoform. Yet, these systems are very rarely described in the ancient. Therefore, this work provides a new example of a muddy compound clinoform delta from the rock record and thus, it helps refine the sedimentological model. Furthermore, the results of this study help to improve the paleogeographic interpretation of northern Pangea in the early Triassic, and to refine the depositional model of the reservoirs in the Barents Sea.