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Late Quaternary delta evolution on an uplifted coastal area (Wadi Haida Sultanate of Oman, Arabian Peninsula)

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The Sultanate of Oman is situated in the Northeastern part of the Arabian Peninsula. The coastal morphology allows delineating areas of subsidence and uplift. The study area is located on the eastern shoreline facing the Indian Ocean. The coast is characterized by 6-7 wave cut terraces which are situated up to 400 m above present sea level. Whereas the higher – and therefore older – terraces are mainly erosional, the lower ones are depositional in style. We aim at quantifying the differential land movement along the coast (Rupprechter et al. 2012, Hoffmann et al. 2012). The study presented here aims at revealing the processes that resulted in the formation of the depositional terraces. Relevant processes are: (a) ongoing land uplift; (b) sea-level oscillations; (c) faulting. Historic evidence gave rise to the speculation of recent earthquake activity: the city of Qalhat, situated 7 km south of the study site was probably destroyed by an earthquake at the end of the 15th century (Musson 2009).
The delta under investigation here formed at the mouth of the 15 km long Wadi Haida that drains the adjacent Selma Plateau (up to 2000 m high). The apex is situated 1.6 km from the present shoreline and the delta is some 2 km across. The delta sediments make up the lowermost terrace and are exposed along a cliff section. In the central part the cliff is 12 m high and cliff heights are lower to the North and South, reflecting the convex shape of the delta.
The Quaternary delta deposits were deposited on top of an Eocene limestone. This formation is only observed in the northern part of the study area. In the southern part the formation is located below beach level, due to normal faulting. The lowermost unit related to the delta formation is a mudstone with in-situ coral reefs. The maximum thickness observed is 3 m. The coral reefs are capped by a 1.5 m thick layer of unconsolidated gravel. The sorting is very poor, individual boulders are up to 70 cm in diameter and angular. The unit is interpreted as a debris flow deposit. The reef recovered after deposition of the debris flow and the facies of the next unit is comparable to lowermost one. These reef deposits are again capped by gravel deposits. This unit has a better sorting and the gravel is moderately rounded. The depositional environment is interpreted as fluvial. The uppermost layer is preserved as a thin layer with well rounded gravel in cm-size, mixed with marine species as mollusks and coral fragments. This layer is interpreted as beach deposits. Lateral facies variations of all units are observed.
The study suggests that neotectonic movement in the form of ongoing uplift is the dominant process in the terrace formation within the timeframe the delta was actively prograding from the apex to the sea. Eustatic sea-level variation does not seem to be a relevant factor. Further work will concentrate on a structural mapping of the normal faults observed and on dating of the different units.

References:
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