Lithostratigraphy, facies, mineralogy and diagenesis of the retrograding, syntectonic Neogene Barzaman Formation (Al-Khod, Sultanate of Oman)

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The Barzaman Formation is 150-200 m thick and subdivided into five lithostratigraphic/facies intervals recording syndepositional thrusting and changes from shallow marine to terrestrial environments and from arid/semiarid to more humid conditions.

(1) The basal lower conglomerate and sandstone unit is >36 m thick, marked by beige and gray/greenish colors, thick-bedded pebbly, calciclastic litharenites which may display parallel lamination and thick-bedded matrix-supported pebble to cobble conglomerates with subrounded clasts of chert, basalt, gabbro, quartzite and carbonates. Pores may be lined by isopachous, microcrystalline calcite cement. The depositional environment is shallow marine with one coarse-grained fill of a high-energy tidal inlet.

(2) The light-colored carbonate facies unit is 1-15 m thick, consisting of thick-bedded coral limestone, a very thick limestone coral and algae debrite and some minor beds of conglomerate and sandstone. The corals may be partly silicified by brown-stained silica. This unit was deposited in a warm, shallow marine, nearshore environment with clear water which may indicate an arid climate.

(3) The varicolored thick sandstone and conglomerate facies unit is 14-28.5 m thick. These clastic deposits are similar to those of unit 1, but more colorful, slightly coarser grained (presence of boulders) and include also thin and medium beds. The sandstones may exhibit cross-bedding. The depositional environment is shallow marine as indicated by coral debris.

(4) The claystone and conglomerate facies unit is 19 m thick. The clastic sediments are similar to those of unit 1, but pebbly sandstones are comparatively rare, and claystone beds are present, including a 20-cm-thick cellular claystone (palygorskite, vermiculite with some calcite) as well as light gray, medium-bedded claystone beds, consisting mainly of palygorskite with some saponite and/or clinohlore, associated with minute, euhedral dolomite or ankerite crystals. All claystone beds are evaporitic, lacustrine deposits of ephemeral ponds and pools on wadi floors whereas the coarser beds represent wadi conglomerates. Some beds are imbricated slide units. The paleoclimate was hot, semiarid or arid.

(5) The dolomitic conglomerate facies unit may measure >61 m in thickness. The respective pebble
conglomerates consist of clasts that seem to “float” in cement. The cements of the basal >10 m are brown-stained silica and some white dolomite. The silica content gradually decreases upward. The upper part is dominated by white dolomite and some calcite. The dolomite cement may have formed under phreatic conditions (groundwater) during the Late Miocene to Pliocene when the arid/semiarid Miocene climate became more humid.

Close to the base of unit 4, the upper part of an east-dipping syndepositional thrust is exposed (Mattern et al., 2018). Faulting approximately coincides with the change from marine to terrestrial conditions. In addition, the syndepostional tectonic activity may explain aspects of slope instability: debrite in unit 2, slide units in unit 4.

References