Late Cretaceous post-obduction siliciclastic sediments of Oman Mountains, north Oman

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Abstract

Thick siliciclastic sediments were deposited subsequent to Late Cretaceous (late Campanian-early Maastrichtian) Samail Ophiolite and Hawasina Complex obduction in north Oman. Siliciclastic sediments deposited in a foreland basin created during the emplacement phase of the ophiolite are termed as syn-obduction sequence of the Aruma Group. Subsequent to the ophiolite emplacement another group of siliciclastic sediments was deposited named as post-obduction sediments of the Qahlah, Al-Khawd, and Thaqab formations. The post-obduction siliciclastic sediments are exposed in isolated outcrops along the Oman Mountain front stretching from Ja'alan in south to Rawdah area in the north along the Batinah coast for about 500 km. Siliciclastic sediments of time-equivalent formation named as the Fayah Formation was deposited in mélange zone of Batain region in Northeast Oman associated with the Masirah Ophiolite.

The sediments of these formations are exposed in isolated outcrops in Oman Mountains and are highly variable in thickness. This paper describes the lithofacies association of the post-obduction siliciclastic rocks from various parts of the Oman Mountains to interpret the depositional setting, compositional variations to know about the unroofing history of the orogenic belt, and lateral variations in formation thicknesses to understand the depositional geometries developed in response to obduction. These sediments are underlain by the Cretaceous ophiolite rocks and unconformably overlain by the Maastrichtian/Paleogene carbonate rocks. The Qahlah/Al-Khawd Formation is comprised of a mixed lithofacies association of conglomerate and sandstone, including i) Massive matrix supported subfacies (Gms), ii)Massive, matrix-(sand) to clast-supported conglomerate subfacies (Gm), iii) Crudely-stratified conglomerate subfacies (Gcs), iv) cross-stratified conglomerate subfacies (Gt&Gp). The sandstone lithofacies is comprised of i) Pebbly sandstone subfacies (Ssp) and ii) Cross-bedded sandstone subfacies (Sst). The sediments were deposited in isolated segmented depressions each characterized by its source terrain depending on lithologies exposed in source area. Lithofacies associations, clast sorting and grain roundness suggest deposition in stream-dominated alluvial fans. Presence of *Loftusia*-bearing carbonate beds and bivalve-bearing conglomerate beds in different sections indicates occasional interruption of alluvial deposition by marine transgression. The marine transgression was wide spread though preserved only in few places, such as in Qalhat section near Sur.

The Fayah and Thaqab formations were deposited in isolated mélange zones in north and northeast Oman Mountains and are comprised of lithofacies associations which are closely associated with slope and sub-marine fan systems. The lithofacies association is comprised of five distinct facies associations; namely, i) coarsening-up sandstone, ii) conglomerate, iii) debris- flow, iv) turbidite, and v) inter-bedded sandstone and shale lithofacies. These sediments were deposited along a slope setting, possibly as olistostrome formed due to submarine slumping and sliding. Dewatering structures are common. These sediments were deposited in shallow water conditions by channelized flows. Based on the lithofacies associations described above, especially the dominance of debris-flow units and turbidites, the greater part of the Fayah and Thaqab formations are interpreted as having been deposited under a sub-marine fan setting. Only the upper part of the formation was deposited in shallow water setting before the onset of overlying carbonate deposits. The sub-marine fan system was active during the last stages of the Tethys Ocean closure at the time of onset of the Batain nappe.