MIXED SILICICLASTIC-CARBONATE TERTIARY DELTAIC DEPOSITS IN A PULL-APART BASIN, EASTERN OMAN

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Abstract

Over 1100 m thick mixed siliciclastic-carbonate sediments of the Musawa Formation were deposited in a structurally controlled Paleogene Abat Basin in Eastern Oman. The Abat Basin formed due to transtensional tectonic regimes during Late Cretaceous to at least Late Eocene deformation along the bounding faults and Masirah Transform Fault. The Abat Basin bounded by the Ja'alan fault to the south and by the Qalhat fault to the East recorded a great sediment thickness due to excessive sediment supply from active basin margin faults and very strong tectonic-related subsidence of the basin axis parallel drainage system. Mixed siliciclastic and carbonate sediments of the Abat Basin provide a good opportunity to study interaction of transitional marine depositional processes in a laterally restricted pull-apart basin. The formation shows two main facies successions over ten km distance, grading from a proximal delta-plain to a distal delta-front succession. Four major lithofacies associations based on their depositional significance are identified in the basin, namely the conglomerate lithofacies association, sandstone lithofacies association, overbank-fines lithofacies association, and carbonate lithofacies association. Each of these lithofacies associations are further divided and subdivided into a number of individual lithofacies on the basis of their depositional characteristics. The lithofacies association assemblage represents fluvial-dominated deltaic sediments that accumulated as a local siliciclastic feature in a carbonate dominated subtropical environment. The conglomerate and sandstone lithofacies associations were deposited by channels and shoreface processes, whereas coastal processes in delta-plain setting deposited overbank fines lithofacies association (including coal). The carbonate lithofacies association was deposited in open marine shelf conditions during transgressive events associated with delta-lobe switching.

The lateral lithofacies heterogeneity in a north-south elongated basin is due to changes in the depositional processes and relative sea-level changes controlled by the bounding faults. The lithofacies assemblages show deposition in a fluvial dominated delta that was rapidly prograding on a carbonate shelf.