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Eocene upper shoreface facies from the Circum-Rhodope belt, NE Greece: sedimentological evidence for an ancient rocky shore environment

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The studied Middle to Upper Eocene sequence (ca.60 m) is located in western part of the large Tertiary Thrace Basin. The crudely stratified rocks consist of granuly to cobbly gravel and calcareous matrix. The former originated solely from the underlying Lower Cretaceous Aliki Limestone. The matrix includes various bioclasts plus sand-sized lithics derived from the same limestones. The broken and abraded skeletal debris belong to the heterozoan association and testify to non-tropical environment with normal marine salinity and good bottom oxygenation.

The monomict gravel implies a local source of clastics close to the marine depositional basin. The bulk of extrabasinal material was produced through erosion of a rocky shore during a transgressive phase as is revealed by the present-day proximity of Aliki Limestone exposures, unconformity boundary with the overlying Eocene rocks, variable thickness and limited surface occurrence of the clastic-carbonate sequence. The extraclasts were deposited within the upper shoreface zone which is proved by their poor sorting and good roundness, absence of imbrication and disc-shaped fragments, local occurrence of matrix-supported fabric, and presence of abundant fossil debris.

Th Eocene transgression flooded a cliffed coast consisting of Lower Cretaceous limestones. The uneven bottom profile of the shoreface zone predetermined the formation of a wave ravinement surface (e.g. Cattaneo and Steel, 2003). The ravinement occurred through coastal erosion and wave abrasion as the shoreface shifted landward along with the rising sea level and shoreline retreat. The generated extraclasts were continuously reworked by wave motion and finally deposited as a mixture with shallow water bioclasts (also strongly reworked).

The formation of a thick transgressive sequence was favoured by the interplay of several major factors as a persistent balance between sediment supply and accommodation development is inferred. The lack of vertical lithofacies transitions, small-scale cycles, and internal key stratal surfaces in the Eocene rocks testifies that the upper shoreface deposits were accumulated during a single transgressive phase. The particular absence of convincingly recognized beachface facies can be explained with the so called "cannibalization" mechanism (cf. Sheppard, 2006).

The present-day exposures of the basement and covering rocks are consistent with the assumption of a paleoisland having homogeneous lithology. The prolonged erosional destruction of its rocky coast was gradually terminated and after the cessation of marine wave-cutting processes and contemporaneous deposition the remaining emerged cliffs of Lower Cretaceous limestones were continuously degraded by subaerial processes.

The obtained results may elucidate the geological evolution of the hydrocarbon-bearing Thrace Basin and to promote the basin-wide correlation of its thick (∼9000 m) sedimentary record.

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References

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