Depositional Environment and Sea-Level History of the Abu Dhabi Sabkha in the Vicinity of Al-Qanatir Island, United Arab Emirates

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The giant coastal sabkhas of the U.A.E. are one of the few areas of the world where the geoscientist can observe the interplay between siliciclastic, carbonate, and evaporite sedimentation. Supratidal (upper, middle and lower sabkha) to intertidal (upper, middle, and lower intertidal microbial mat), and lowermost intertidal to shallow subtidal (peloid-skeletal tidal-flat) environments were studied along the Abu Dhabi coastline in the vicinity of Al-Qanatir Island.

Age dating results from samples of nine hardgrounds, three microbial mats, and one anhydrite layer show an age range from about 3,500 years before present (upper sabkha environment: hardground) to about 900 years before present (intertidal environment: microbial mat); thereby supporting the seaward progradation of the facies belts since the last Flandrian sea-level highstand (formation of Cerithid gastropod stranded beach ridges) about 4,500 years before present.

Significant amounts of dolomite (fine-crystalline, subhedral to euhedral dolomite rhombs embedded in organic matter) were found within subsurface crinkly-laminated microbial mats. Sulfate-reducing bacteria of the microbial mat environment are interpreted to be responsible for the precipitation of dolomite.

The distribution of radiocarbon ages indicates a complex stratigraphic history in which chronostratigraphic time lines clearly cross-cut depositional lithofacies and diagenetic boundaries. This is significant in that depositional lithofacies and diagenetic facies are commonly used in ramp settings to correlate continuous sedimentary packages. Careful attention to chronostratigraphic relationships elucidates complex stratal geometries that may have been previously missed. Furthermore, the analysis of modern analogs is one of the few means by which high-resolution spatial complexity of stratigraphic systems can be described. If the horizontal dimensions of facies belts are less than the typical well spacing, modern analogs, together with seismic and production data help to construct realistic geologic and simulation models of subsurface reservoirs.