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Anthropogenic CO_2 recorded in the isotopic composition of a modern prograding carbonate ramp (Arabian Gulf, Abu Dhabi)

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The southern Arabian Gulf provides one of the few modern examples of a carbonate ramp prograding into a shallow epeiric sea. It is thus an excellent analogue for similar depositional systems that are so abundant in the geological record.

Modern coastal sediments range from deep intertidal skeletal sands and muds to intertidal microbial mats and supratidal sabkha evaporites. Progradation rates of the modern coastline near Qanatir Peninsula, Abu Dhabi, have been constrained by radiocarbon dating of intertidal marine calcareous shells and microbial mats that are now buried beneath the modern sabkha. These dates range back to 1300 years BP and indicate progradation rates of more than 1m/year.

The carbon and oxygen isotopic composition has been determined for various modern and sub-recent gastropods, bivalves and benthic foraminifera. In all groups the $\delta^{18}O$ values of the recent representatives are similar to, or up to 0.5 per mil lower, than those from the ancient shells. This indicates a slight increase in temperatures and/or a decrease in salinity of the coastal waters. The $\delta^{13}C$ values of the modern shells are more than 2 per mil lower than those of skeletal aragonite older than 800 years. This difference is similar to the decrease in the $\delta^{13}C$ values of atmospheric CO_2 and the dissolved inorganic carbon of sea-surface waters due to the addition of fossil fuel CO_2 to the coupled atmosphere-ocean system since the beginning of the industrial revolution.

Our results show that lateral variations in isotopic compositions of rapidly prograding carbonate systems can be the result of temporal rather than spatial environmental change. This should be considered when evaluating gradients in isotopic composition,

sedimentology and biofacies of deposits from ancient epeiric seas.