Early cements versus pore-water chemical composition in the subsurface of the sabkha of Abu Dhabi

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The coastal sabkha of Abu Dhabi is a complex depositional system in an extremely arid climate. This depositional system is marked by the formation of primary carbonate and microbial deposits, and by the development of secondary evaporite and cement phases. A number of earlier studies have assessed the formation of these secondary phases, yet no research has established a relationship between lateral and vertical variations in the chemical composition of pore water and the nature of, in particular, the precipitating pore-filling cements, re-crystallisation features and dissolution.

This study aims to establish an understanding of the environmental and sedimentary factors that control early post-depositional changes to sediment composition as a result of sediment - pore water interactions. A particular focus is to characterise changes in the chemistry of the pore water throughout a tidal cycle, aiming at understanding how the influx of 'fresh' lagoonal sea water influences the chemistry of the pore water, and which elements are replenished on a daily basis. The initial data presented here is based upon the relationship between the petrographic analysis of sediment samples and lateral and vertical variations in the chemistry of in-situ sampled pore water. The pore water is characterised with respect to pH, salinity, alkalinity, dissolved organic carbon, and the concentrations of a variety of common metallic and non-metallic elements, including (but not limited to) Ca, Fe, Mg, P, S and Sr.

Initial results show that concentrations of Mg, P, and V, and the ratios Mg/Ca and Sr/Ca are highest at the seaward sampling locations. Contrastingly, individual concentrations for Ca, Sr, Fe, Si, and Cu are highest at the most landward locality. In particular the higher concentrations for Ca and Sr might indicate diagenetic processes and are thus enriched as a result of e.g. aragonite dissolution. A striking pattern in Mg concentrations show the highest values for this element within a buried microbial mat. This might point to an enrichment process within this organo-sedimentary layer, that might ultimately contribute to bacterially controlled and/or mediated dolomite formation.