Movements of thick evaporites on the flanks of a mid-ocean ridge: the central Red Sea Miocene evaporites

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Thick evaporites ("salt") were deposited in the South and North Atlantic, and Gulf of Mexico basins, in some parts deposited onto the flanks of nascent oceanic spreading centres. Unfortunately, knowledge of the history of evaporite movements is complicated in such places by their inaccessibility and subsequent diapirism. This is less of a problem in the Red Sea, a young rift basin that is transitioning to an ocean basin and where the evaporites are less affected by diapirism. In this study, we explore the vertical movements of the evaporite surface imaged with deep seismic profiling. The evaporites have moved towards the spreading axis of the basin during and after their deposition, which ended at the 5.3 Ma Miocene-Pliocene boundary. We quantify the evaporite surface deflation needed to balance the volume of evaporites overflowing oceanic crust of 5.3 Ma age, thermal subsidence of the lithosphere and loss of halite through pore water diffusion, allowing for isostatic effects. The reconstructed evaporite surface lies within the range of estimated global sea level towards the end of the Miocene. Therefore, the evaporites appear to have filled the basin almost completely at the end of the Miocene. Effects of shunting by terrigenous sediments and carbonates near the coast and contributions of hydrothermal salt are too small to be resolved by this reconstruction.