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Structural evolution of messinian evaporites in the levantine basin

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The Levantine Basin in the South-eastern Mediterranean Sea is a world class site for studying the initial stages of salt tectonics driven by differential sediment load, because the Messinian evaporites are comparatively young, the sediment load varies along the basin margin, they are little tectonically overprinted, and the geometry of the basin and the overburden is well-defined. In this study we analyse depositional phases of the evaporites and their structural evolution by means of high-resolution multichannel seismic data. The basinal evaporites have a maximum thickness of about 2 km, precipitated during the Messinian Salinity Crisis, 5.3 - 5.9 Ma ago. The evaporite body is characterized by 5 transparent layers sequenced by four internal reflections. We suggest that each of the internal reflections correspond to brittle evaporites, possibly interbedded clastic sediments, which were deposited during temporal sea-level rises. All of these internal reflections are differently folded and distorted, proving that the deformation was syn-depositional. Thrust angles up to 14 degrees are observed. Backstripping of the Plio-Quaternary reveals that salt tectonic is mainly driven by the sediment load of the Nile Cone. The direction of lateral salt displacement is mainly SSW - NNE and parallel to the bathymetric trend. Apparent rollback anticlines off Israel result rather from differential subsidence than from lateral salt displacement. Slumps are observed in the south-eastern basin margin, which are coeval to a number of contractional faults, providing a link between slumping processes and salt tectonics. The superposition of 'thin-skinned' tectonics and 'thick-skinned' tectonics becomes apparent in several locations: The fold belt off the Israeli Mediterranean slope mainly results from active strike-slip tectonics, which becomes evident in faults which reach from the seafloor well below the base of the evaporites. Owing to the wrenching of the crustal segments, which are bounded by deep-rooted fault lines like the Damietta-Latakia-, Pelusium- and Hinge line, the setting is transpressional

south of 32°N where the fault lines bend further towards the west. This adds a component of 'thick-skinned' transpression to the generally 'thin-skinned' compressional regime in the basin. , above 1.5 km of evaporites, a mud volcano is observed with the mud source seemingly within the evaporite succession. At the eastern Cyprus Arc, the convergence zone of the African and the Anatolian plates, deep-rooted compression heavily deformed the base of the evaporites, whereas at the Eratosthenes Seamount mainly superficial compression affecting the Post-Messinian sediments and the top of the evaporites is observed.