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Flow and dissolution of Messinian salt along the eastern margin of the Levant Basin: deciphering enigmatic structures

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Extensive slumps and landslides overlie enigmatic structural features of Messinian evaporites and the overlying Plio-Quaternary sequence at the base of the continental slope of the Levant. These composite structural features were traced along a strip $\sim$20 km wide that stretches some 200 km off Israel and Lebanon. The deformation of the Plio-Quaternary strata comprises tilted blocks and detachment faults, that were encountered where the Plio-Quaternary deposits are the thickest. These slumps overlie a deformed section of the Messinian evaporitic series that occurs in the pinching-out zone of these strata. These structures have been known for more than 30 years and their origin was considered unresolved, however, recent discovery of numerous reverse faults that offset only the Messinian evaporites and the overlying strata some 30-50 km west of the deformation zone, seems to illuminate the process that formed these enigmatic structures. We suggest that the enigmatic structures are associated with the wedging out of the Messinian evaporites. The initial deposition of the Messinian evaporitic sequence took place in a hypersaline lake that covered the deeper parts of the Mediterranean Sea, where the configuration of the bottom of the lake is represented by seismic reflector N, whereas the top of the evaporitic sequence, reflector M, was deposited in the proximity of the lake level. The shaoling of that lake are represented by the wedging out of the evaporites and the merging of reflectors M and N, which can be discerned at reflection time of 2.4 seconds, or approximately 2 km. Slight basinal subsidence of the Levant Basin during the late Pliocene due to sedimentary loading probably initiated westwards flow of the Messinian salt, as indicated by numerous eastwards-dipping reverse faults. This flow tapered off at the eastern edge of the salt

deposit, where the flow of the salt was compensated by subsidence of the overlying strata. This subsidence generated geotechnical faulting that enabled the penetration of water into the evaporitic layer and dissolved it gradually. The dissolution removed portions of the evaporites, and left behind irregular relicts of the evaporitic layer, further enhancing the subsidence of the overlying strata. Consequently, attributing the structures at the base of the continental slope of the Levant either to some questionable megashear or to enigmatic subduction, as had been previously presumed, is poorly founded.