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The sedimentary and tectonic consequences of the Messinian salinity crisis on the Algerian margin, southwestern Mediterranean: insights from the MARADJA cruise

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The margin and deep basin off Algeria, although a major part of the European African convergent plate boundary, are among the least-imaged oceanic domains in the Mediterranean. A survey of the continental slope and adjacent deep basin of this area (MARADJA cruise, August-September 2003) allows us to depict the impact of the Messinian salinity crisis there for the first time. We collected multibeam bathymetry data, back-scattering imagery, 3.5 kHz profiles (Chirp), 6-channel and 24-channel seismic reflection, and few cores. We especially focus here on the relationships between crustal thick-skinned tectonics and gravity-driven thin-skinned salt deformation due to the mobile Messinian evaporites and on the transition from the main erosional surface on the slope to the evaporite deposits in the deep basin. We observe (1) that the salt layer abruptly pinches out at the slope break, (2) a sharp transition from the upslope extensional province (normal growth faults) to the contractional province (salt-cored anticlines and diapirs), without midslope transitional province, (3) a very narrow extensional domain, and (4) important and discontinuous detrital bodies at the slope break. Several factors such steepness of the Algerian slope or effects of compressional crustal tectonics are invoked to explain these observations. From a comprehensive seismic line interpretation, we map the acoustic units deposited between the basal erosional surface and the Upper Evaporites and Pliocene deposits, and compare the Messinian palaeo-drainage system to the present-day one and to other similar deposits

found elsewhere in the Mediterranean Sea. In some areas, deformation of the brittle Upper Evaporites and Plio-Quaternary sedimentary cover appears to result from pure gravity gliding/spreading. Offshore, large salt ridges sometimes form a complex 3-D network, suggesting a multi-directional salt-related contraction. Conversely, in tectonically reactivated areas, salt is more passively involved in the crustal convergence, and most salt walls and anticlines outline the NW-SE crustal compressional stress direction. Active faulting also alters Messinian detrital slope and/or alluvial fan-shaped deposits in the Algiers region.