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Messinian Events: View from the Provence Basin (Gulf of Lion, Western Mediterranean)

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Though the late Miocene “Messinian Salinity Crisis” has been intensely researched along the circum-Mediterranean basins, few studies have focused on the central part of the Mediterranean Basin and, especially, the pre-salt deposits. Within the Western Mediterranean, the Gulf of Lion is exceptional in that its sedimentary strata have not been significantly deformed. In addition, the Gulf of Lion is characterized by a relatively constant subsidence with continuous accommodation space for sediment accumulation. This configuration, together with the availability of a wealth of offshore information (seismic profiles, boreholes), enables us to precisely describe the sedimentary geometries on the margin and in the central basin. This study gives new elements for the understanding of the Messinian Crisis:
•The first element is a thick marine detrital series (up to 1000 m) derived from the Messinian subaerial erosion which is partly prolongated in the distal part by a thick unit of deep marine deposits (up to 800 m) prior to the first evaporites. This unit represents in the central basin a pre-evaporite phase corresponding to a prominent “Messinian Erosional Crisis” responding to the major Messinian drawdown (∼1500 m) of the Mediterranean seawater.
•The second important element is the identification of a thick stratum of presumed detritals and evaporites (1500 m) sandwiched between the first detritic event and the mobile halite. This thickness implies that the depth of the basin was already significant at the time of its deposition.
•We also identified a submarine abrasion surface related to the transgressive movement of the coast at the end of the Messinian Salinity Crisis. This surface is located between the mobile halite domain and the preserved subaerial erosional surface that impacted the Miocene shelf. Transition between the subaerial and abrasion surfaces occurs at a constant depth of 1.6s TWTT. This limit represents the position of the shoreline just before the very rapid earliest Zanclean reflooding.

We therefore identified about 3500 m of sediments deposited during the Messinian events (from the first erosional event to the re-flooding of the basin). The shelf recorded a loss of up to 1,000 m thick of sediments. This implies huge amount of sediment transfer from the shelf to the slope and the central basin. Several authors have tried to study the subsidence in the Provence Basin and the isostatic readjustments related to the Messinian Crisis (Ryan, 1976; Steckler and Watts, 1980; Burrus and Audebert, 1990). The view that we outline provides new fodder for the study of subsidence of the Provence Basin and better understanding its structural evolution.

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