



The Messinian salinity crisis in the marginal basins of the peri-Mediterranean orogenic systems: examples from the central Apennines (Italy) and the Adana Basin (Turkey)

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The Messinian salinity crisis (MSC), which happened between 5.96 and 5.33 Ma, affected both deep and marginal basins in the Mediterranean area. The Messinian stage was one of the most important building phases for the post-collisional Apennine orogenic system. In the central Apennines, more than 70% of the present chain was affected by compressional tectonics during the MSC, whereas 50% was built mainly at the end of the crisis, during the Lago-Mare episode. At that time, the Adriatic-verging orogenic system recorded the effects of the MSC in marginal basins developed in different structural settings, from the foreland domain (Adriatic side) to the back-arc basin (Tyrrhenian side).

Despite their different structural settings, all the basins across the Apennine orogenic system (foreland, foredeep, thrust-top, and back arc basins) recorded similar stratigraphic features associated with the MSC. One of the most important is the Messinian erosional surface (MES), which has been recognized all over the Mediterranean and has been related to the drawdown of the Mediterranean water-table just after deposition of the Primary Lower Gypsum (about 5.6 Ma). Even the Maiella Messinian sections, which developed on the Adriatic side of the central Apennines in a stable foreland area, show the main MSC stratigraphic features: (1) Primary Lower Gypsum; (2) MES; (3) Resedimented Lower Gypsum and authigenic carbonates; (4) a younger erosional surface (MES2); and (5) Lago-Mare facies. Some of these features are recognizable across the central Apennine thrust-and-fold belt and in the Tyrrhenian back-arc basin.

The MSC affected southern Turkey in marginal basins connected with the late Miocene evolution of the Taurus Mountains and the more external Kyrenia Range and Misis Mountains. The Adana Basin, which developed in a tectonically active area as a Miocene thrust-top basin, is one of the best onshore basins of southern Turkey for exposing the effects of the MSC. In the western part of the basin (Karayayla and Topçu sections), a cyclical succession of anhydrites and black shales record the main evaporative event of the Mediterranean (Primary Lower Gypsum). Most gypsum deposits that crop out in different sections of the Adana Basin (Topçu, Tepeçaylak, Gökkuyu, Adana, etc.) pertain to a unit characterized by Resedimented Lower Gypsum. The base of this unit corresponds to an erosional surface cutting down to either the Primary Lower Gypsum (Topçu section) or the pre-evaporitic Tortonian-early Messinian deposits (Gökkuyu and Adana sections). This erosional surface correlates with the MES of the Mediterranean area. As in the Maiella Messinian sections, a younger erosional surface (MES2) affects the Messinian succession of the Adana Basin. Above the MES2 a continental unit consisting mainly of fluvial coarse-grained deposits rests unconformably on Primary Lower Gypsum (Karayayla), Resedimented Lower Gypsum (Topçu, Tepeçaylak, Adana), and pre-evaporitic marls (Gökkuyu).

Because the Messinian erosional surfaces affected both stable (Maiella foreland basin) and tectonically active areas (Adana thrust-top basin), they had to be forced by eustatic changes, which occurred during the MSC at about 5.6 Ma (MES) and 5.45 Ma (MES2). Contrarily, minor features in the MSC deposits, such as grain size variations, should be considered as local effects mainly due to tectonic activity.

