Messinian Salinity Crisis in Eastern Mediterranean

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ABSTRACT

The Messinian salinity crisis is characterized in the Eastern Mediterranean as in the Western Mediterranean by the deposition of thick evaporites including halite, in the deepest part of the late Miocene basins and by erosional surfaces on their margins. They are the major regional seal of the Levant and Herodotus Basins. They pinch out on the continental margins of the Levant and Africa, around the Eratosthenes Continental Block, on the slope of the Cyprus Arc except on its eastern part. There, they are present on top of the Arc after their uplift along the Latakia Ridge and their disconnection from the Messinian Evaporites of the Levant Basin.

Mapping of the Evaporites reveals important differences between the Levant Basin and the Herodotus Basins. In the Levant Basin they are about 1500m thick and essentially undisturbed. For this reason it is one of the single area in the Mediterranean where a seismic stratigraphy can be established with five well characterized mega sequences. In the Herodotus Basin, the Evaporites are much thicker either by subsidence or by tectonic thickening by internal reverse faults due to the sliding of the deep Nile Delta or to tectonic shortening in connection with the Mediterranean Ridge, an active accretionary prism. To the North the same stratigraphy than in the Levant basin has been recognized extending its regional value. The deep Nile Delta developed essentially in the Herodotus basin being deviated westward by the Eratosthenes Continental Block. A low stand Messinian delta was deposited into the Messinian saline basin as shown by the lateral facies change between channelized clastics and a lower salt. The Messinian clastics concern only the lower part of the Evaporites which indicates an abrupt cessation of the sedimentary input and the transgressive character of the upper salt body. These observations coupled with others from the Western Mediterranean, allowed proposing a new model for the Messinian salinity crisis valid for the whole Mediterranean.

The impact of the Messinian Evaporites on the tectonic of the Eastern Mediterranean is quite different depending of the region. In the Levant Basin, their influence is restricted to the margins where they are sliding with listric faulting and with compensation by Pliocene-Quaternary deposits. In the Herodotus Basin on the contrary, they play a great role in the deformations either due to large scale northward sliding of the deep Nile Delta or to southward thrusting linked to the Mediterranean Ridge.

After the crisis, the Lower Pliocene reflooding is marked by a regional marine erosion on the foot of the margins or on the Cyprus Arc with reworking of Messinian or older deposits.