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Important Conclusions on the Messinian Salinity Crisis Depositional History of the Eastern Mediterranean Basin

Pinar Gunes, Ali Aksu, and Jeremy Hall
Earthsciences Department, Memorial University, St. John's, Newfoundland, Canada (pnrgunes@gmail.com)

The interpretation of a comprehensive set of high-resolution multi-channel seismic reflection profiles, multibeam bathymetry data and the litho- and bio-stratigraphic information from exploration wells across the Antalya Basin and Florence Rise revealed important conclusions on the Miocene to Recent tectonic evolution and the Messinian Salinity Crisis depositional history of the eastern Mediterranean Basin. This study clearly demonstrated the presence of a 4-division Messinian evaporite stratigraphy in the eastern Mediterranean, similar to that observed in the western Mediterranean, suggesting the existence of a similar set of depositional processes across the Mediterranean during the Messinian Salinity Crisis. However, the stratigraphic and depositional similarities of the evaporites between the eastern and western basins do not necessitate synchroneity in their depositional histories. The fact that the only saline water source for the eastern Mediterranean is the Atlantic Ocean and that the Sicily sill creates a physical barrier between the eastern and western Mediterranean impose several critical conditions. A simple 2-D model is developed which satisfies these conditions. The synchroneity of evaporite deposition across the eastern and western basins broke down as the Sicily Gateway became largely subaerial during a period when the Calabrian Arc area experienced uplift associated with slab break-off: the Sicily sill must have remained within a "goldilocks" zone to allow the right amount of saline water inflow into the eastern Mediterranean so that evaporites (massive halite) could be deposited. During this time, the sea level in western Mediterranean was at the breach-level of the Sicily sill, thus no evaporite deposition took place there. The model suggests that the eastern and western basin margins experienced a nearly synchronized gypsum deposition associated with the initial drawdown of the Mediterranean level, followed by the resedimentation in the deep basins of the terrigenous and early evaporite deposits as the drawdown intensified. The model suggests that further restriction of the inflow occurred across the Betic and Rif gateways as these regions also largely became subaerial associated with the uplift of the Gibraltar Arc region caused again by the lithospheric slab break-off. However, similar to the Sicily Gateway, the Betic and Rif gateways must also have remained within the "goldilocks" zone to allow the right amount of saline water inflow into the western Mediterranean so that massive halite could be deposited. The re-opening of the Betic and Rif gateways reflooded the western Mediterranean first, then the eastern Mediterranean allowing the deposition of a mixed evaporite-siliciclastic unit, followed by the transgressive sediments with a distinctive brackish water Lago Mage fauna.