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Mediterranean Sea Surface Temperatures Prior to the Onset of the Messinian Salinity Crisis

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During the late Miocene, the Mediterranean basin experienced significant disruptions in its connectivity to the Atlantic, triggered by a combination of tectonic and climatic factors, evidenced by a drop in sea level. This event, known as the Messinian Salinity Crisis (MSC; 5.97 - 5.33 Ma), led to the deposition of extensive evaporite deposits. The synchronous onset of the MSC across the Mediterranean basin has been validated through astronomical tuning of pre-evaporitic sedimentary successions.

Centered on Sea Surface Temperature (SST) reconstructions during the ongoing pre-MSC restriction, this study focuses on the Alboran and Sorbas basins located within proximity of the Atlantic gateway in the Western Mediterranean, and the Pissouri basin, located in the Eastern Mediterranean. Alkenones and glycerol dialkyl glycerol tetraether (GDGT) biomarkers produced by coccolithophorid algae and Archaea, respectively, have been used for SST reconstructions via the $U^{K'}_{37}$ and TEX_{86} proxies. In the Sorbas basin, the TEX_{86} SST estimates for the 7.3 and 5.9 Ma interval vary between 20°C and 27 °C while in the Alboran basin, the SST estimates range between 17°C and 30°C for the 7.5 - 7.05 Ma interval. In the Eastern Mediterranean Pissouri basin, the TEX_{86} SST estimates vary between 24°C to 31°C during 7.55 - 6.1 Ma interval. At levels where alkenones are present, the coeval $U^{K'}_{37}$ SST estimates are in good agreement with the TEX_{86}-derived SSTs and cover the same temperature range. Intermittent cooling observed at 7.11 Ma in the Alboran basin and at 7.075 Ma in the Sorbas basin, coincides with the restriction of the southern part of the Rifian gateway. An overall cooling trend (more pronounced in the longer Sorbas and Pissouri records) could be predominantly attributed to global cooling affecting the late Miocene. Coupling the existing and newly produced SST records of the Eastern (Agios Myron, Kalamaki, Pissouri), Western (Alboran, Sorbas) and Central (Monte dei Corvi) Mediterranean, we observe a coherent longer overarching cooling trend for the 7.5 - 5.9 Ma interval, punctuated by warmer and colder peaks most probably induced by local deviations in connectivity to the Atlantic and their respective hydrological budget.