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Paratethys forcing of the Messinian Salinity Crisis

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During the Messinian Salinity Crisis (5.97-5.33 Ma), there is increasing evidence for the presence of fresh water input, not only during the final Lago-mare stage but even during times of evaporite formation. Here we present new strontium isotopic data from two well-dated Messinian sections in the Black and Caspian seas, which show remarkably similar Sr-values as the ones recorded in the Mediterranean during the final phase of the salinity crisis. This strongly suggests that a major fresh water pulse in the Mediterranean originated from the Paratethys. It highlights the importance of a Mediterranean-Black Sea connection during the entire MSC, adding an enormous drainage basin to the Mediterranean water balance.
The presence of Paratethyan fauna in the Mediterranean Lago-Mare deposits has fuelled long-lasting controversies over the connectivity between the Mediterranean and Paratethys and contemporary sea level drops in both basins. We furthermore use results of sub-precessional climate simulations to calculate the freshwater budget of the Mediterranean and Paratethys in the Messinian. Using these numerical constraints, we propose a Mediterranean outflow pump as an alternative scenario for the most dramatic hydrological changes in the MSC. This “pump” mechanism significantly enhanced Paratethyan inflow to the Mediterranean, creating 1) suitable conditions for gypsum to form and 2) Lago-mare fauna to migrate and thrive. When the Mediterranean sea level finally reached the height of the Gibraltar sill, Mediterranean outflow restarted there and enhanced exchange with the Atlantic. During this reorganisation of the circulation, brackish and hypersaline waters were pumped out of the Mediterranean, and open marine conditions were re-established without major flooding at the Mio-Pliocene boundary.