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Drying up of the Black Sea during the Messinian Salinity Crisis of the Mediterranean

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During the Miocene and Pliocene, the Paratethys represented a large restricted basin extending from central Europe to inner Asia. Because of location and restriction, the Paratethys was very sensitive to fluctuations in the hydrological cycle. However, until now these changes have been assessed mainly through the reconstruction of relative salinity and sea level. Here we present compound specific analyses of hydrogen isotope ratios (δD), measured on both terrestrial and aquatic biomarkers to investigate changes in the hydrological budget of the Paratethys during the Mio-Pliocene transition. Organic geochemistry analyses of the Mio-Pliocene succession in DSPD42B core 380A from the Black Sea, drilled in the mid seventies, revealed both long chain n-alkanes with a distinct odd over even predominance originating from terrestrial plants, and abundant long-chain alkenones originating from haptophyte algae. The δD analyses of these compounds together constrain precipitation and sea surface salinity. The δD of the alkenones from DSPD42B core 380A of the Black Sea shows a δD enrichment of $\sim$70‰ at the end of the Miocene. The amplitude of this change implies a major shift in sea water δD, either caused by a doubling of salinity or a switch in source water δD. This shift in δD coincided with the Messinian Salinity Crisis in the Mediterranean when kilometer thick evaporites were deposited. Although the Paratethys did not reach the saturation level required to generate gypsum precipitation, the recorded deuterium enrichment suggests a negative water budget in the region with evaporation exceeding rainfall and runoff.