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Quantifying Late Miocene fluvial run-off to the Mediterranean and assessing its effect on the Messinian Salinity Crisis

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The Mediterranean's hydrologic fluxes (evaporation, precipitation, exchange with the global ocean) are central to all hypotheses for generating the major lithological changes that represent the Messinian Salinity Crisis (MSC). Moreover, differences in the hydrologic fluxes envisaged are the primary distinction between hypotheses. Discrimination between these hypotheses therefore requires the contrasting hydrologic flux scenarios to be tested. Thirty years of unresolved debate testifies that this has yet to be satisfactorily achieved.

Direct investigation of past hydrologic fluxes is challenging. It requires the extraction of quantitative data on climatic and environmental conditions. MSC research has traditionally been characterised by the prolific production of valuable, but qualitative environmental information. However, recent research in several different fields has started to produce quantified estimates of the climatic conditions during the Late Miocene. These include mean annual precipitation rates from pollen data, Sr-salinity modelling of the Mediterranean's hydrologic budget and the interrogation of Late Miocene Global Climate Model (GCM) runs in the Mediterranean region. Drawing together these independent data should now allow rejection of certain MSC hypotheses through rigorous testing of hydrologic flux scenarios.

Results of new GCM simulations for a Late Miocene scenario indicate that the Mediterranean region was much wetter than today and that most of the additional rain water reached the Mediterranean through North Africa rivers which no longer flow. Mutually consistent results from the GCM simulations and pollen reconstruc-

tions suggest that the previous analysis of the Mediterranean's hydrologic budget during the Late Miocene, which was carried out assuming present day run-off rates, be reassessed. Model output also indicates that Paratethys received significantly more river water than the Black Sea and Caspian today. As a result, its impact on the low salinity Lago-Mare facies in the Mediterranean also requires re-evaluation.