

Causes and consequences of the Messinian salinity crisis

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Abstract

Salt giants are massive salt deposits (hundreds of metres thick) that form during the evaporation of semi-enclosed seas. The drivers of salt giant formation and their feedbacks on global and regional environmental change remain debated. In this Review, we summarize the boundary conditions, causes and consequences of the Mediterranean Messinian salinity crisis (MSC; 5.97–5.33 million years ago). Salt giant formation is more complex than the simple evaporation of an enclosed sea. Instead, the tectonic setting of an evaporative basin largely determines the timing and mode of salt formation, with superimposed impacts of orbital-scale climate and sea-level fluctuations. These drivers triggered precipitation of carbonates, gypsum, halite and bittern salts, with well-defined orbital cyclicities in carbonate and gypsum phases. Removal of Ca^{2+} during salt giant deposition decouples the oceanic Ca^{2+} and HCO_3^- sinks, causing reduced CaCO_3 burial and, consequently, increased ocean pH, lower atmospheric partial pressure of CO_2 , and global cooling. Salt giants,

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The Mediterranean salt giant

Salt giant forcing mechanisms

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