How to dessiccate and reflood the Mediterranean in only 500 ky: Mechanics of the Messinian Salinity Crisis

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During the Messinian Salinity Crisis 6 million years ago, the mixing of Mediterranean waters with the world's oceans became restricted, causing widespread salt precipitation and a ~1.5 km water level drawdown by evaporation. The timing and processes involved in the closure of the Mediterranean remain controversial. Competition between tectonic uplift at the connecting corridors in the Gibraltar Arc and global sea level changes is often regarded as the main control, but the difference in time scale between these processes is difficult to reconcile with the long initial phase of shallow but persistent connection, responsible for the first evaporitic phase.

I will show results from a model combining simple mathematical approaches to water-flow erosion, salt precipitation, and climatic processes, showing that gateway erosion by the incoming water allows a long-term connection of a few tens of meters between Atlantic and Mediterranean by reaching a dynamic equilibrium with tectonic uplift. The same model will be used to estimate the duration of the Zanclean flood that put an end to the Messinian Salinity Crisis.