



Biomarker-based salinity reconstruction immediately prior to the Messinian Salinity Crisis (Sorbas Basin, Spain)

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The salinity crisis which occurred in the Mediterranean at the end of the Miocene (5.97 to 5.33 Ma) was a time of large-scale environmental change and thick evaporite deposits formed both in the deep basins and on the surrounding margins. Late Miocene successions in the Sorbas Basin, south east Spain preserve sediments that were deposited immediately prior to the Messinian Salinity Crisis (MSC) and during the initial phase of gypsum precipitation (Sierro et al., 2001). Salinity changes are indicated by evaporite formation and fluctuations in faunal assemblages, but these provide threshold measurements only e.g. gypsum forms at a salinity of 130 psu. By analysing the lipid biomarker composition by GC and HPLC-MS after Soxhlet extraction of pre-MSC sediments we aim to reconstruct granular changes in salinity leading up to initial gypsum precipitation.

The pre-MSC sediments comprise regular alternations of marine marls and terrigenous clays with interspersed diatomites. This lithological cyclicity is climatically forced by orbitally-driven changes in insolation (Krijgsman et al., 1999) such that specific lithologies are thought to accumulate during precession minima (homogeneous marls) and maxima (laminated marls). By targeting these lithologies for salinity reconstruction we can evaluate the orbital control on quantified environmental change.

The reconstruction of the salinity is predominantly based on the ACE proxy introduced by Turich and Freeman (2011). The GDGT-based proxy can show differences over a wide range of salinity, because Archaea can survive over a much larger salinity range than haptophyte algae or other plankton and can therefore also record the salinity signal over a wider range. This makes it suitable for the broad salinity ranges leading up to the MSC e.g. ~35 to 130 psu. Turich et al. (2011) already have published 10 low resolution salinity values for pre-MSC sediments from Torrente Vaccarizzo and Serra Pirciata on Sicily. Our high resolution preliminary data already suggests differences in salinity between insolation maxima's and minima's, which is not expressed in this low resolution signal. In addition we are backing up the ACE proxy data by deuterium values as an independent comparison.

Krijgsman, W., Hilgen, F.J., Raffi, I., Sierro, F.J., Wilson, D.S., 1999. Chronology, causes and progression of the Messinian salinity crisis. *Nature* 400, 652-655.

Sierro, F.J., Hilgen, F.J., Krijgsman, W., Flores, J.A., 2001. The Abad composite (SE Spain): a Messinian reference section for the Mediterranean and the APTS. *Palaeogeography Palaeoclimatology Palaeoecology* 168, 141-169.

Turich, C., Freeman, K.H., 2011. Archaeal lipids record paleosalinity in hypersaline systems. *Organic Geochemistry* 42, 1147-1157.