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Multi-proxy climate and environment reconstruction of the Holocene based on Lake Medina, southern Spain

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The second largest inland salt lake in the province of Andalusia, southern Spain, provides valuable information of the Holocene concerning palaeoclimate and –vegetation. The multi-proxy study applied includes sedimentological, geochemical, mineralogical as well as biological (pollen, ostracods and fungi remains) and charcoal analyses. The analyses reveal the morphology evolution of the lake basin, the changing depositional regime etc. as well as multiple times of rapid climate changes within the last around 9.6 cal. ka BP and the initiation and intensity of agricultural influence. The Early Holocene prior to 8.2 cal. ka BP was a warm and arid period, shown by low lake levels, open land indicators etc., followed by the 8.2 cal. ka BP event and a strong temperature drop. This is followed by times of maximum lake level and humid climate until around 5.8 cal. ka BP and the onset of agriculture within the surroundings. Until 5.3 cal. ka BP, climate conditions are rather dry, postdated by a rapid climate change event at 5.3 cal. ka BP with especially wet climate conditions, reflected by a drop in thermophile taxa, an increase in Botryococcus and other indices. This period also shows a high water salinity, developed by the enhanced catchment dissolution, and shows that there is no direct relation of lake water evaporation and salinity. Between 5.3 and 4.2 cal. ka BP, climate conditions are rather dry but turn to wet at the RCC event at around 4.2 cal. ka BP, nevertheless the climate shows a progressive aridification trend towards the 2nd millennia. Towards 2.2 cal. ka BP, there is a remarkable influence of Northern African winds, shown e.g. by the deposition of tropical African pollen. Until recent times, the temperature increases parallel to a decreasing precipitation volume. This trend is solely interrupted by several colder time intervals and the humid Little Ice Age. The high-resolution sediments of Lake Medina show a clear connection to regional and global changes of the climatological regime, NAO dynamics and reveal important insights into these special endorheic and shallow lake settings.