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Periods of halite deposition/dissolution in the late-glacial to early Holocene Dead Sea as documented in Na/Cl ratios of soluble salts extracted from the DSDDP deep cores

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The modern Dead Sea is a terminal lake that has evolved from a series of ancient lakes since the late Neogene time. Water-rock interactions and the hydrologic regime along the Dead Sea Basin dictated the salinity and composition of the brines that filled these lakes and the sedimentary sequences they deposited. These processes resulted in a brine with a Ca-chloride composition, which has been evolving during the lake's history. Early studies showed that the hydro-chemical evolution of the lakes is documented in the chemical composition of soluble salts trapped within the pores of their sediments. The chemical compositions of soluble salts within the Dead Sea sediments during the transition period from the late glacial to the Holocene were studied, establishing the limnological-geochemical history of the Dead Sea in high temporal resolution, with a particular focus on the time interval between 14-9 kyr. This interval was a dramatic time of global climate changes, including the Bølling-Allerød (BA) and the Younger Dryas (YD). Mud samples were obtained from the DSDDP 5017-1-A and DSDDP 5017-1-H cores, drilled at the deep floor of the Dead Sea. Soluble salts were leached with double distilled water. The leachates were analyzed for Na/Cl ratios and compared to previously collected pore fluids data obtained at a lower temporal resolution. At ~ 14.5 ka, at the beginning of the BA period (88.48 m in core 5017-1-A), massive halite deposition occurred, followed by halite dissolution ~ 12 .5 ka during the YD, indicated by an increase in the Na/Cl ratio (beginning at 78.98 m in the 5017-1-A and 5017-1-H cores). This was followed by another episode of salt deposition and Na/Cl decrease that commenced at ~11 ka (~76 m in the core). The BA was characterized by a decrease in Na/Cl, indicating halite deposition and arid conditions. The YD was characterized by increasing Na/Cl, indicating halite dissolution and wet conditions. The Na/Cl molar ratio from soluble salts was shown to be a useful proxy for halite deposition and dissolution in the late glacial to early Holocene time in a high temporal resolution.