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Deep water circulation in the eastern Mediterranean Sea for the last 95 kyr: new insights from stable isotopes and benthic foraminiferal assemblages

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The response of the Eastern Mediterranean Sea circulation to climate forcing over the last 95 kyr BP was studied using core MD04-2722 collected at 1780m water depth in the Levantine Sea. Foraminiferal stable isotopes and benthic foraminiferal assemblages were combined to reconstruct deep water ventilation and oxygenation in relation to surface water freshening. Over the last deglaciation, benthic foraminiferal δ13C values and benthic foraminiferal oxygen index decreased while δ18O gradient between benthic and planktonic foraminifera increased. These results testify respectively of slower ventilation, bottom water oxygen depletion and stronger stratification prior to S1 sapropel deposition. Similar conditions were deduced for S3 sapropel. Combination of deglacial sea level rise and fresher North Atlantic surface water contribution were evaluated to be a precondition of S1 formation in the Levantine Sea. Local Nile freshwater supply during the African Humid Period further strengthened the water column stratification. For the last glacial period, three events at around 53, 46 and 37 ka BP were marked by benthic δ13C decrease demonstrating deep water circulation reduction at the core location. Bottom water oxygenation was only slightly lowered. Considering the effect of North Atlantic surface water salinity to the Mediterranean Sea circulation, we propose the 46 and 37 ka BP events as responses to the Heinrich Events 4 and 5 that supplied fresher surface water to the Mediterranean Sea. Since the ‘53 ka event’ is characterized by the appearance of an anoxic benthic foraminiferal species observed for S1 and S3 layers, we tentatively attributed it to the ‘missing’ sapropel S2. Our results indicate that intense stagnation in the Eastern Mediterranean Sea could occur when both local freshwater supply and fresher North Atlantic surface water contributed. The influence of North Atlantic condition was significant on the eastern Mediterranean circulation under warm and cold climate conditions.