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Modelling changes in eastern Mediterranean deep water formation for the early Holocene

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During the early Holocene, abrupt changes in the eastern Mediterranean deep waters properties are reflected in the occurrence of organic-rich marine sediment layers called sapropels. These layers develop in response to reduced oxygen availability in bottom waters and are correlated with the precession cycle. A possible explanation is that a precession-induced increase in the amount of freshwater input leads to a reduction of the deep water ventilation and could allow the formation of those organic layers.

In this study, we investigate the effect of the orbitally-induced changes in freshwater budget on deep water formation for 6000 and 9000 years before present. How is the Mediterranean thermohaline circulation affected?

To answer this question, we set up a regional version of the general ocean circulation model MPIOM for the Mediterranean (26 km horizontal resolution). We forced the model with atmospheric data derived from quasi-equilibrium time slice simulations with the coupled atmosphere-ocean-dynamical vegetation model ECHAM5/MPIOM/LPJ.

A series of long sensitivity experiments (>250 years) is used to analyze the impact of different sources of additional freshwater (like enhanced runoff from the Nile or larger inflow from the Black Sea) on the deep water formation and the ventilation of the eastern Mediterranean basin.

Preliminary results from the ongoing simulations show that the enhanced runoff from the Nile leads to a weakening of the Levantine intermediate water formation. Further results of these simulations will be presented.