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Internal variability of the Mediterranean Sea under different climate conditions

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The internal spatial and temporal variability of the Mediterranean Sea is studied under climate conditions characteristic of the current period and the past geological periods of Younger Dryas (cold and well mixed waters) and S1a sapropel deposition (warm and stratified waters). Three long-term numerical experiments were designed and executed, based on the Princeton Ocean Model, producing different thermohaline circulation patterns characteristic of each simulation period. In order to isolate the internal variability of the system, atmospheric forcing was limited to a perpetual year characteristic of each simulation period. Each experiment consisted of a 1000-year long simulation forced by the corresponding perpetual year. EOF analysis was applied to the simulated density fields in order to examine the spatial variability of the Mediterranean Sea. The temporal variability of each mode was examined through the power spectrum of the mode's expansion coefficient. Preliminary results indicate that the seasonality differences and the Black Sea isolation can be considered as crucial factors of the Mediterranean Sea's variability. During Younger Dryas, the Mediterranean Sea's variability is enhanced in the western basin and limited in the eastern basin, in contrast to the current period where interannual oscillations are more intense in the eastern basin. The current variability of the surface and intermediate layers of the Mediterranean Sea is dominated by interannual/ decadal oscillations, while at deeper layers a centennial cycle dominates. The variability of the deep layers during the Younger Dryas and S1 sapropel deposition intervals can be described (by more than 95%) by the first two EOF modes: the first mode expresses inter-centennial variability and the second one decadal (13y) and centennial (83y) cycle for each period respectively. On the other hand, the first two modes of the current period's deep layers express only the $\sim$60% of the basins' oscillations.