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Changes in the thermohaline circulation of the Mediterranean Sea for the end of the XXIst century inferred from a numerical model

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The Mediterranean thermohaline circulation is controlled by the density gradient between the Atlantic Ocean and the Mediterranean Sea. This density gradient is triggered by deep water formation which depends on air sea fluxes.

The purpose of this work is to get further insights in the changes in temperature and salinity in response to a climatic change and consequently in the variability of the thermohaline circulation. We used a 1/8˚ resolution ocean numerical model based on the numerical code OPA developed at LOCEAN (ex LODYC) and forced it by high-resolution atmospheric models. We performed two simulations of 50 years, under present (MED8-P) and future atmospheric forcing (MED8-F). Present atmospheric forcing is inferred from high resolution ECMWF outputs while future atmospheric forcing is constructed using the LMDz atmospheric model with A2 scenario (IPCC). Significant changes are observed for MED8-F. First a net increase in temperature and salinity is obtained after 50 years: the mean temperature of the whole basin increases of about 0.4˚C and the salinity of 0.01 psu, while the temperature of the first 250 meters increases of 1˚C and the salinity of 0.04 psu. Secondly the water mass formation is reduced with a slight shift toward smaller densities. Eventually, a weaker variability of water mass formation is obtained without any transient event in the Aegean Sea as opposed to MED8-P.