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# Assessing the interannual climate variability in the Mediterranean Sea during 1901-2010 with a physical-biogeochemical ocean model

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A physical-biogeochemical ocean model MPIOM-HAMOCC is applied in the Mediterranean Sea dedicated to simulate the interannual variability of the physical and biogeochemical processes during the period of 1901-2010. The aim is to identify the natural and anthropogenic control mechanisms driving the variability of the marine environments. The dense Adriatic deep water (AdDW) is formed and transported south into the Ionian Sea in episodic years with cold winters. The North Ionian Gyre (NIG) changes its upper layer circulation from cyclonic/anti-cyclonic to anti-cyclonic/cyclonic on a decadal time scale. The inversion of the circulation leads to the advection of Modified Atlantic Water or of the Levantine/Eastern Mediterranean waters into the Gulf of Taranto. We further focus on the analysis of the biogeochemical and sediment processes in the Gulf of Taranto, where sediment records with high temporal resolution are available for model validation. The primary production in this area is increasing over the simulation period, which can be attributed to nutrient enrichment caused by anthropogenic inputs. Significant decadal and interannual variability, overlaying the general tendency, shows a good coincidence with the variations of the AdDW formation and the reversals of the NIG circulation, suggesting the regional response to large-scale climate dynamics. The organic carbon concentration in the surface sediment shows a similar variability with the local productivity, indicating a dominant influence of the local processes. The flux of the detritus sedimentation shows an irregular interannual variability, which is influenced by a complex interplay between local processes and large-scale dynamics.