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Black Sea thermo-haline characteristics during the period 2002-2008: State estimates based on modelling and observations

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We present an investigation of the thermo-haline characteristics in the Black Sea during the period 2002-2008 using analysis and intercomparison of data from ocean modelling and observations like satellite altimetry, Argo floats and AVHRR. The ocean model set-up is based on the Nucleus of European Modelling of the Ocean (NEMO) framework. It reproduces reasonably well most important features of the Black Sea processes such as the seasonal variability of the rim current, cold intermediate water formation and evolution of the seasonal pycnocline. The main novelty of the employed model setup is its capability to estimate the transport through the Bosporus Straits from the water conservation equation constrained by altimeter data, which can be understand as an assimilation of the altimetric mean sea level signal (MSL) in the model.

Main attention in the analysis of simulations is been paid to the dominating characteristics of physical fields at seasonal and inter-annual time scales. Therefore we use empirical orthogonal function (EOF) analysis of temperature, salinity and steric heights from ocean model and investigate their consistence with the modelled and observed sea surface anomaly (SLA), the later is an indicator of the propagation of thermo-haline signals. Results from the EOF analysis show that the major part of SLA variability during the examined period can be express through the first two EOF modes which explain approximately 83.5% of total variance and are well know to be connected to the general evolution of MSL (1-st mode) and the seasonal cycle of rim current intensification (2-nd mode). Higher degree EOF modes show more complex processes which are very interesting because these processes could not be found in older versions of altimeter observations and are mainly controlled by the distribution of water fluxes, in particular from rivers and transport through the Bosporus Strait.