



The influence of Black Sea Water inflow and its synoptic time-scale variability in the North Aegean Sea hydrodynamics

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The exchange water fluxes between the Black Sea and the North Aegean Sea through the Dardanelles Strait constitute an essential factor for the general circulation of the region. The Black Sea Water inflow in the Aegean plays an important role in the hydrography and circulation of the basin and can affect the deep water formation processes with significant effect in the Eastern Mediterranean thermohaline structure. In order to investigate these issues and evaluate the influence of the synoptic time-scale variability of the inflow and the atmospheric forcing, a series of numerical experiments were performed targeting the dynamics of the North Aegean basin. The experiments were carried out for the period from August 2008 to October 2009, using observed upper- and lower-layer fluxes at the Dardanelles strait and high resolution atmospheric forcing and boundary conditions, derived from an operational system. The results are also compared with available operational products that are using a parameterization of the Dardanelles outflow that has no synoptic time scale variability and presents different seasonality from the observed time series. The large-scale spatial patterns of the circulation and the seasonality of the North Aegean circulation show that the regional dynamics of the basin can effectively absorb most of the Black Sea Water inflow variability. The overall cyclonic circulation of the North Aegean Sea and the predominant cyclonic and anticyclonic features are robust and are very little affected by the different lateral fluxes. However, the area close to the strait and the structure of the Black Sea Water plume are significantly affected by the variability observed in the Black Sea Water inflow, especially at the shorter time scales. The synoptic time-scale atmospheric variability is very important in determining the strength and variability of the regional circulation patterns and the spatial distribution of the inflowing waters in the basin. Differences in the seasonality of the outflow affect the North Aegean water column structure and can play an important role in the deep-water formation processes.