



## **Interannual and interdecadal variability of the physical environment in the Black Sea revisited**

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The Black Sea is the world's most isolated sea - connected to the Oceans via the Mediterranean Sea through the narrow Bosphorus, Dardanelle and Gibraltar straits. Every year, about 350 cubic kilometres of polluted river water pour into the shelf areas of the Black Sea from a huge catchment area including 17 countries covering almost a third of continental Europe. There is compelling evidence of eutrophication and degradation of marine habitats and communities on the Black Sea shelves during recent decades (Mee et al, 2005). There are views that the health of the Black Sea ecosystem is dependent upon pressure from both land based human activity and marine physical processes.

Environmental variations influence the ecosystem in a number of ways (Shapiro et al, 2005, Oguz, 2005). One is the change in nutrient balance on the shelf due to alterations in the water mass structure and strength of horizontal transport between the shelf and deep sea areas, which have very different trophic regimes (eutrophic /oligotrophic), and help remove pollution from the biologically rich shelves. There are indications that environmental conditions in the Black Sea (winds, water temperature, salinity, basin and meso-scale circulation) undergo both interannual and decadal variations (Levitus et al, 2005; Oguz, 2005). However previous studies of climate change were based on a limited data sets and use a very coarse (1 degree) grid, which does not distinguish very different shelf and deep sea regions of the Black sea (Stephens, 2002). Isolation of the Black Sea from the World Ocean means that the climate trends established for the North Atlantic - e.g. warming (Levitus, 2005) or freshening (Curry, 2003) may or may not be valid for the Black Sea.

In this study we use archived and newly obtained data to establish interannual and decadal variations in the environmental parameters of the Black Sea over the last 50

years on a much finer grid. We use all available to us historical raw data on temperature and salinity in the Black Sea, e.g. available from the NODC and the Black Sea Atlas (Suvorov et al, 2004); more recent data sets are available from the UNDP-GEF Black Sea Ecosystem Recovery Programme. We estimate variations of the surface water properties for the open sea and for the shelf sub-domains of the Black Sea during past several decades. Despite data are somewhat sparse for specific decades, it has been possible to estimate interdecadal variations with a relatively small scatter, interannual variations include a greater amount of uncertainty due to smaller number of observations which are included in the statistical analysis for each specific time unit. We estimate the climate trends in physical parameters in relation to the known changes in the state of the ecosystem health. This information should facilitate future predictive modelling.

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