Response of the Black Sea coastal ecosystem variability during the last decade to climate change and anthropogenic inputs

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The coastal area of the Black Sea is impacted by many interacting stressors due to extensive human activity (industry, tourism and urbanization) and recent global climatic changes. From 1934 to 2001 the population in the coastal areas increased fourfold. In 2000-2004 the number of hotels along the Varna region almost doubled, however the infrastructure development tailored to meet the direct tourist demands for leisure and entertainment facilities did not meet environmental protection needs. The climate change is likely to further stress both the coastal ecosystem and resource management. The ecosystem related indicators classifying the ecological status of the coastal area between poor-good shown a very high variability. To asses all those changes we will utilize observational data and coupled model simulations and provide an extensive analysis on the response of the ecosystem in the Black Sea coastal regions to nutrient loads and climatic changes. The results from observations and numerical simulations of the inter-annual and seasonal variability of the lower trophic levels are presented. Important climatological features for the Black Sea, such as wind variability, changes of the stratification connected with the upwelling events near the coastal areas, the mixed layer and cold intermediate water variability are discussed. The synergy between the model simulations and observational data is demonstrated. We show that the variability in the biological system is strongly controlled by the variability of the meteorological forcing. A number of indicators were derived from marine ecological data, for assessing ecosystem status and trends for the coastal ecosystem, identifying vulnerability level and setting priorities for recovery measures. The indicators computed based on both observational data and modelling results can be used as a tool for socio-economic evaluation of the ecosystem status of the coastal waters.