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# Black Sea ecosystem response to climatic teleconnections

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The Black Sea has been converted from an oligotrophic system prior to the 1970s (the pre-eutrophication phase) to a eutrophic system over the subsequent two decades (the eutrophication phase). The anthropogenic forcing has introduced (i) the bottom-up control by excessive nutrient loading during the 1970s, and their eventual deposition within the bottom layer of shallow coastal regions and the chemocline layer of the deep interior basin following active organic matter remineralization cycle, and (ii) the top-down control by the overfishing of pelagic fishes and population outburst of gelatinous carnivores, which were both most prevailing during the 1980s. The climate also acted as an additional control mechanism on the ecosystem transformations. Our analysis indicated that atmospheric processes over the North Atlantic and Eurasia were responsible from large part of the interannual variation of the pelagic food web, complementing the top-down and bottom-up anthropogenic effects. The hydro-meteorological and biochemical data showed well-defined quasi-periodic climate-induced oscillations superimposed on the sharp trends introduced by anthropogenic and human-induced perturbations. The primary mode of these oscillations had approximately 10 year period and was in phase with those of the hydro-meteorological properties. The first half of each decade was characterized by a transition from warm-to-cold regime, and visa-versa for the next half. They were found to be in phase with the North Atlantic Oscillation (NAO), modulated by the so-called the East Atlantic-West Russia atmospheric pattern formed by high pressure center over the western Europe and a low pressure system over the Caspian region and west Asia.