SEASONAL AND SPATIAL VARIATIONS IN SURFACE WATER QUALITY AT THE MID-BLACK SEA COAST OF TURKEY

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The Black Sea is an elliptical basin extending over 1200 km in the East-West direction with a surface area of 413,000 km², a volume of 547,000 km³ and a maximum depth of 2212 m. The drainage basin of the Black Sea measures about 2×10⁶ km² and includes six riparian countries (Turkey, Bulgaria, Romania, Ukraine, Russia and Georgia) and 16 other countries in eastern and central Europe [1]. The distinguishing feature of the Black Sea is the shallow (150-200m deep), oxic and biologically active top layer. The remaining 90% of its volume is anoxic [2]. The Black Sea is fed by several large rivers originating in Europe and Asia, which carry substantial loads of organic matter, nutrients and anthropogenic contaminants [3]. The total fresh water input to the Black Sea from rivers is 353 km³ y⁻¹. The five largest rivers are the Danube (203 km³ y⁻¹), Dneiper (54 km³ y⁻¹), Don (28 km³ y⁻¹), Kuban (13 km³ y⁻¹) and Dniesta (9.3 km³ y⁻¹). There are also 28 km³ y⁻¹ of fresh water contributions from a large number of smaller rivers and streams flowing along the Turkish and Bulgarian coasts and 17.7 km³ y⁻¹ of river water discharged by the remaining small rivers and streams located around the basin [4]. The aim of this study was to investigate the seasonal and spatial variations in surface water quality at the Mid-Black Sea coast of Turkey. The samples were collected from 10 monitoring stations including rivers and sea water during the years from 2007 to 2008. The samples were analyzed for 27 parameters: total carbon (TC), total inorganic carbon (TIC), total organic carbon (TOC), chromium, cadmium, copper, lead, iron, nickel, zinc, manganese, phenol, methylene blue active substances (MBAS), ammonium, nitrite and nitrate-nitrogen, phosphorus, adsorbable organic halogen (AOX), sulphate, hardness, dissolved oxygen, pH, temperature, total dissolved solids (TDS), electrical conductivity (EC), salinity and redox potential (ORP). Carbon analyses were performed by Apollo 9000 TOC analyzer, physical parameters were measured on site using a field multi-probe and chemical parameters were analyzed by PG-T70 UV-VIS spectrophotometer with proper kits. The analytical data quality was ensured through blank measurements and duplicate sample analysis. Multivariate statistical techniques, cluster analysis (CA) and factor analysis/principal component analysis (FA/PCA), were applied to analyze the similarities among the sampling sites to identify seasonal and spatial variations in water quality and sources of contamination. Vari-factors obtained from factor analysis indicate that the parameters responsible for water quality variations are mainly related to organic pollution (municipal and industrial effluents), nutrients (agricultural runoff), and dissolved salts (soil leaching and runoff process).

References