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Time series analysis and forecasting of river pollution using statistical techniques and ARIMA: A case study of the Nistru River at Olanesti

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Abstract. This paper presents a statistical approach to water pollution analysis and forecasting based on time series data collected from a section of the Nistru River near Olănești, Republic of Moldova. The study focuses on three key pollutants: ammonia nitrogen, total phosphorus, and mineral phosphorus, using the values of concentrations recorded in 2019-2023. Descriptive statistics and exploratory visualizations were used to assess the variability, central trends and potential exceedance of maximum allowable concentrations (MACs). The forecasting methodology is based on the AutoRegressive Integrated Moving Average (ARIMA) model, widely recognized for its efficiency in modeling univariate time series with time dependence. The individual ARIMA models have been fitted and validated for each pollutant and the forecasts have been extended to the year 2026. The proposed methodology supports both environmental decision-making and early warning systems by integrating robust statistical models with domain-specific knowledge.

***Keywords*:** time series analysis; ARIMA; statistical methods; pollution forecasting; Nistru River; ammonium nitrogen; phosphorus; water quality.

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