



Shewhart-type control charts and functional data analysis for water quality analysis based on a global indicator

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ABSTRACT

Water quality is a major concern, particularly when the water is used for human consumption. We study the variability of the Ebro River (Spain) water quality through a global quality index (GQI) using two methods: functional data analysis (FDA) and Shewhart-type control charts for statistical process control (SPC). The aim of this study is to identify abnormal values of this quality indicator. We used the data collected in 2008 at the El Bocal station, which is a strategic location. Temperature, ammonium content, nitrate content, conductivity, dissolved oxygen, pH, and turbidity were measured every 15 min. These physical–chemical parameters were used to calculate the GQI. The results obtained using SPC reflect the causes of specific variation in May, July and October. However, no functional outlier was detected when using FDA. According to our results, we conclude that Shewhart-type control charts could be used to search for and eliminate abnormal values in a water quality analysis based on global indicators. The FDA methodology is not appropriate for this case study because of the type of functions obtained from the available data.

Keywords: Water quality; Outlier; Water quality index; Water quality monitoring

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