Time Series Analysis and its Applications in Environmental Sciences

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Air quality forecasting is among the most common environmental forecasting applications, and is usually performed by quality agencies or authorities responsible for the monitoring and management of the atmospheric environment in urban agglomerations. Many statistical analyses have been used to study air pollution as a common problem in urban areas [1], [2], [3]. Time series analysis is a useful tool for better understanding of cause and effect in environmental pollution [4]. In this study, the varying trends and the levels of PM_{10} area analysed based on the database monitored at Portuguese Environment Agency for the Porto Metropolitan Area (PMA) and Lisbon Metropolitan area (LMA). Autoregressive Integrated Moving Average (ARIMA) approach, implemented by *Box & Jenkins* is used to forecast the levels of air quality parameters. Statistical indices recommended by the United States Environmental Protection Agency have been used to provide indication of the relationship between the observed and predicted data. The performance evaluations of the models are carried out on the basis of Correlation Coefficient (R^2), Index of Agreement (Id) and Root Mean Square Error (RMSE). The data processing tool is the free *software R*. The results indicate that the ARIMA models provide good predictions for the PM_{10} concentrations in Portuguese Metropolitan Areas. The use of the classical *Box & Jenkins* approach to a data of PM_{10} provides good results concerning the statistical analysis, as proven by its applications to the PM_{10} levels for the urban areas in Portugal.

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