Investigation of stochastic similarities among influent and treated effluent variables of spatially distributed wastewater treatment plants in Greece; III Statistical analysis of influent and treated effluent variables in terms of the dependence structure

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The aim of this research is to investigate the second-order dependence structural properties and similarities among several influent and treated effluent variables of spatially distributed wastewater treatment plants over Greece. For this purpose, three different stochastic tools are used, namely the autocovariance function, the climacogram (i.e. variance of the averaged process vs. scale) and the power spectrum. The data is downloaded from the Greek national database of wastewater treatment plants (http://astikalimata.ypeka.gr) uniformly distributed over Greece. For each plant we analyze several entrance and outflow parameters (i.e. BOD5, COD, SS, T-N, NH4-N, NO_3-N, T-P) in terms of their second-order statistics, and we fit a stochastic model that can adequately simulate the observed variability. Finally, we discuss whether the model structure exhibit a white noise, a short-term (Markov) or a long-term (Hurst-Kolmogorov) behaviour, and how can this have a major impact on the spatial variability and uncertainty of the examined variables and therefore, on the design of the treatment plants.