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An artificial neural network approach for the spatial estimation of urban particulate matter pollution

Chris G. Tzanis, Anastasios Alimissis, Kostas Philippopoulos, Despina Deligiorgi, and Nikolaos Kalamaras

Section of Environmental Physics and Meteorology, Department of Physics, National and Kapodistrian University of Athens, Greece(chtzanis@phys.uoa.gr)

During the last few decades, atmospheric particulate matter (PM) is a subject of extensive research, having an important role in ambient air pollution. PM emissions are generated from various sources, both natural and anthropogenic. These particles, depending on their diameter, concentration and chemical composition, are associated with a variety of adverse effects. The World Health Organization considers PM10 and PM2.5 as the most damaging atmospheric pollutants for human health, recommending compliance with specific exposure limits. PM concentrations need to be adequately monitored, notably in heavily urbanized areas and the data collected should be used to introduce effective countermeasures. However, insufficient data in specific locations require concentration estimations obtained by employing spatial interpolation methods. This study evaluates the use of artificial neural networks for PM10 and PM2.5 spatial forecasting, using data from an urban air quality monitoring network. An extensive comparison of various spatial interpolation methodologies is presented using a set of difference and correlation statistical measures. An accurate scheme can be effectively used to improve the data coverage at monitoring sites and thus creating a more representative air quality network which will provide the appropriate information for future air quality research.