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Development and application of Artificial Neural Networks in forecasting the maximum daily precipitation at Athens, Greece

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Extreme daily precipitation events are involved in significant environmental damages, even in life loss, because of causing adverse impacts, such as flash floods, in urban and sometimes in rural areas. Thus, long-term forecast of such events is of great importance, in order to be prepared the local authorities to confront and mitigate the adverse consequences.

The objective of this study is to estimate the possibility of forecasting the maximum daily precipitation for the next coming year. For this reason, appropriate prognostic models, such as Artificial Neural Networks (ANNs) were developed and applied. The data used for the analysis concern daily precipitation totals, which have been recorded at National Observatory of Athens (NOA), during the period 1891-2009. To evaluate the potential of daily extreme precipitation prognosis by the applied ANNs, a different period was considered than the one used for the ANNs training. Thus, the datasets of the period 1891-1980 were used as training datasets, while the datasets of the period 1981-2009 as validation datasets. Appropriate statistical indices, such as the Coefficient of Determination (R2), the Index of Agreement (IA), the Root Mean Square Error (RMSE), and the Mean Bias Error (MBE) were applied to test the reliability of the models.

The findings of the analysis showed that, a quite satisfactory relationship at the statistically significant level of $p<0.01$ appears between the forecasted maximum daily precipitation totals for the next coming year and the respective observed ones.