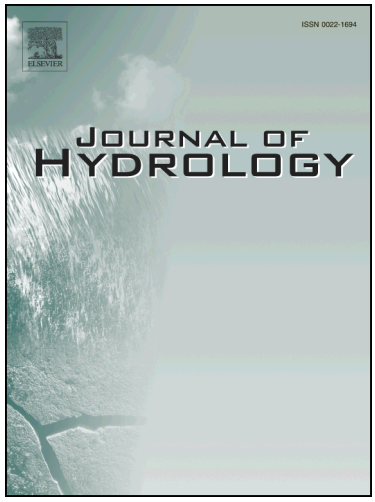


Research papers

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PII: S0022-1694(18)30213-0
DOI: https://doi.org/10.1016/j.jhydrol.2018.03.047
Reference: HYDROL 22680

To appear in: *Journal of Hydrology*

Received Date: 16 January 2018
Revised Date: 13 March 2018
Accepted Date: 17 March 2018

Please cite this article as: Zubaidi, S.L., Dooley, J., Alkhaddar, R.M., Abdellatif, M., Al-Bugharbee, H., Ortega-Martorell, S., A Novel Approach for Predicting Monthly Water Demand by Combining Singular Spectrum Analysis with Neural Networks, *Journal of Hydrology* (2018), doi: https://doi.org/10.1016/j.jhydrol.2018.03.047

# A Novel Approach for Predicting Monthly Water Demand by Combining Singular Spectrum Analysis with Neural Networks

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**Abstract**

Valid and dependable water demand prediction is a major element of the effective and sustainable expansion of municipal water infrastructures. This study provides a novel approach to quantifying water demand through the assessment of climatic factors, using a combination of a pretreatment signal technique, a hybrid particle swarm optimisation algorithm and an artificial neural network (PSO-ANN). The Singular Spectrum Analysis (SSA) technique was adopted to decompose and reconstruct water consumption in relation to six weather variables, to create a seasonal and stochastic time series. The results revealed that SSA is a powerful technique, capable of decomposing the original time series into many independent components including trend, oscillatory behaviours and noise. In addition, the PSO-ANN algorithm was shown to be a reliable prediction model, outperforming the hybrid Backtracking Search Algorithm BSA-ANN in terms of fitness function (RMSE). The findings of this study also support the view that water demand is driven by climatological variables.