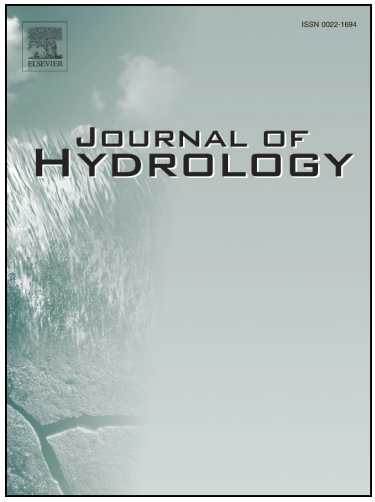

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A nonlinear spatio-temporal lumping of radar rainfall for modelling multi-step-ahead inflow forecasts by data-driven techniques

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Abstract

Accurate multi-step-ahead inflow forecasting during typhoon periods is extremely crucial for real-time reservoir flood control. We propose a spatio-temporal lumping of radar rainfall for modelling inflow forecasts to mitigate time-lag problems and improve forecasting accuracy. Spatial aggregation of radar cells is made based on the sub-catchment partitioning obtained from the Self-Organizing Map (SOM), and then flood forecasting is made by the Adaptive Neuro Fuzzy Inference System (ANFIS) models coupled with a 2-staged Gamma Test (2-GT) procedure that identifies the optimal non-trivial rainfall inputs. The Shihmen Reservoir in northern Taiwan is used as a case study. The results show that the proposed methods can, in general, precisely make 1- to 4-hour-ahead forecasts and the lag time between predicted and observed flood peaks could be mitigated. The constructed ANFIS models with only two fuzzy if-then rules can effectively categorize inputs into two levels (i.e. high and low) and provide an insightful view (perspective) of the rainfall-runoff process, which demonstrate their capability in modelling the complex

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