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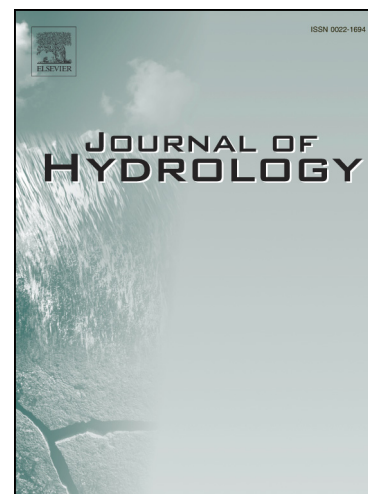
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1 A nonlinear spatio-temporal lumping of radar rainfall for modelling  
2 multi-step-ahead inflow forecasts by data-driven techniques

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**Abstract**

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

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