World Academy of Science, Engineering and Technology
International Journal of Civil and Environmental Engineering
Vol:13, No:05, 2019

# Improving Flash Flood Forecasting with a Bayesian Probabilistic Approach: A Case Study on the Posina Basin in Italy

**Authors :** Zviad Ghadua, Biswa Bhattacharya

**Abstract :** The Flash Flood Guidance (FFG) provides the rainfall amount of a given duration necessary to cause flooding. The approach is based on the development of rainfall-runoff curves, which helps us to find out the rainfall amount that would cause flooding. An alternative approach, mostly experimented with Italian Alpine catchments, is based on determining threshold discharges from past events and on finding whether or not an oncoming flood has its magnitude more than some critical discharge thresholds found beforehand. Both approaches suffer from large uncertainties in forecasting flash floods as, due to the simplistic approach followed, the same rainfall amount may or may not cause flooding. This uncertainty leads to the question whether a probabilistic model is preferable over a deterministic one in forecasting flash floods. We propose the use of a Bayesian probabilistic approach in flash flood forecasting. A prior probability of flooding is derived based on historical data. Additional information, such as antecedent moisture condition (AMC) and rainfall amount over any rainfall thresholds are used in computing the likelihood of observing these conditions given a flash flood has occurred. Finally, the posterior probability of flooding is computed using the prior probability and the likelihood. The variation of the computed posterior probability with rainfall amount and AMC presents the suitability of the approach in decision making in an uncertain environment. The methodology has been applied to the Posina basin in Italy. From the promising results obtained, we can conclude that the Bayesian approach in flash flood forecasting provides more realistic forecasting over the FFG.

**Keywords :** flash flood, Bayesian, flash flood guidance, FFG, forecasting, Posina
**Conference Title :** ICFRMP 2019 : International Conference on Flood Risk Management and Planning
**Conference Location :** Vancouver, Canada
**Conference Dates :** May 20-21, 2019