Geophysical Research Abstracts
Vol. 14, EGU2012-3730, 2012
EGU General Assembly 2012

Continuous simulation method versus event-based approach for design hydrograph estimation in small and ungauged basins

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The estimation of design hydrograph in small and ungauged basins is a key point of many hydrological applications. In general, two types of methods are available: one approach is based on the statistics of storm events, while the other relies on continuously simulating rainfall-runoff time series. In the first class of methods, the design hydrograph is obtained by applying a rainfall-runoff model to a design hyetograph that synthesises the storm event. In the second approach, the design hydrograph is quantified by analysing long synthetic runoff time series that are obtained by transforming synthetic rainfall sequences through a rainfall-runoff model. These simulation-based procedures overcome some of the unrealistic hypotheses which characterize the event-based approaches. In this work, a simulation experiment is carried out to examine the differences between the two types of methods in terms of the design hydrograph's peak, volume and duration. The results conclude that the continuous simulation methods are preferable because the event-based approaches tend to underestimate the hydrograph's volume and duration.