



An efficient hybrid causative event-based approach for deriving the annual flood frequency distribution

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Flood extremes are driven by highly variable and complex climatic and hydrological processes. Derived flood frequency methods are often used to predict the flood frequency distribution (FFD) because they can provide predictions in ungauged catchments and evaluate the impact of land-use or climate change. This study presents recent work on development of a new derived flood frequency method called the hybrid causative events (HCE) approach. The advantage of the HCE approach is that it combines the accuracy of the continuous simulation approach with the computational efficiency of the event-based approaches.

Derived flood frequency methods, can be divided into two classes. Event-based approaches provide fast estimation, but can also lead to prediction bias due to limitations of inherent assumptions required for obtaining input information (rainfall and catchment wetness) for events that cause large floods. Continuous simulation produces more accurate predictions, however, at the cost of massive computational time. The HCE method uses a short continuous simulation to provide inputs for a rainfall-runoff model running in an event-based fashion. A proof-of-concept pilot study that the HCE produces estimates of the flood frequency distribution with similar accuracy as the continuous simulation, but with dramatically reduced computation time.

Recent work incorporated seasonality into the HCE approach and evaluated with a more realistic set of eight sites from a wide range of climate zones, typical of Australia, using a virtual catchment approach. The seasonal hybrid-CE provided accurate predictions of the FFD for all sites. Comparison with the existing non-seasonal hybrid-CE showed that for some sites the non-seasonal hybrid-CE significantly over-predicted the FFD. Analysis of the underlying cause of whether a site had a high, low or no need to use seasonality found it was based on a combination of reasons, that were difficult to predict apriori. Hence it is recommended that the seasonal hybrid-CE be used as it provided accurate predictions for all sites. The evaluation of the HCE on a wide range of climatology's, including Mediterranean, temperate, sub-tropical/tropical and desert provide greater confidence that it provides an accurate and efficient method for predicting the FFD.