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Wenyan Wu
*The University of Melbourne*, wenyan.wu@unimelb.edu.au

Seth Westra
*University of Adelaide*, seth.westra@adelaide.edu.au

Michael Leonard
*Univesity of Adelaide*, michael.leonard@adelaide.edu.au

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# Censored continuous simulation for flood estimation

**W Wu[a,b], S Westra[b], M leonard[b]**
[a]*Department of Infrastructure Engineering, Melbourne School of Engineering, University of Melbourne, Melbourne, VIC, Australia*
*(wenyan.wu@unimelb.edu.au)*
[b]*School of Civil, Environmental and Mining Engineering, University of Adelaide, Adelaide, SA, Australia*
*(seth.westra@adelaide.edu.au; michael.leonard@adelaide.edu.au)*

**Abstract:** The understanding of flood risk relies on accurate estimation of flood exceedance probability. This is often a challenging task in estuarine regions, as estuarine floods are often caused by multiple processes, such as storm surge and riverine floods. Failure to consider the dependence between multiple flood drivers can significantly under-estimate flood risk. Multiple methods exist for estimating probability of floods in estuarine regions, including traditional flood frequency analysis, continuous simulation, and recently proposed event-based design variable method. Each method has its own advantages and limitations. Flood frequency analysis is the simplest method; however, it requires long term, good quality of flood data at locations of interest, which often do not exist. Continuous simulation can fully account for the dynamic interaction between different flood drivers; however, the large computational effort required often makes it infeasible for real-world applications. Finally, the event-based design variable method, although being efficient, assumes static tail-water and therefore cannot fully account for the dynamic interaction between flood drivers. Consequently, this method will always lead to conservative estimation of flood levels. This study proposes a censored continuous simulation approach for flood estimation, which is based on the fact that floods are relatively rare events and flood data from most of the time series record are often not used for flood probability estimation. Therefore, these “no-flood” periods can be “censored out” in the simulation process. This censored continuous simulation approach has the advantages of continuous simulation, which considers the dynamic interaction between flood drivers. It also reduces the simulation time significantly compared to full continuous simulation by simulating mainly the “flood events” of interest. The application of this approach is demonstrated through a case study in Western Australia.

***Keywords****:* Flood modelling, flood probability, continuous simulation, censoring, censored continuous simulation