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Influence of water level duration on dike breach triggering in system behaviour

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Reliable hazard analysis is a crucial step in flood risk management, and for large river systems, the effects of breaches on downstream regions should be taken into account. Accounting for these breaches in hazard analyses is often termed 'hydrodynamic system behaviour' analyses, and has become increasingly popular in flood risk assessment.
Methods to perform such analyses usually focus on high water levels as a trigger for dike breaching. However, the duration of high water levels is known to be an important criterion in the mechanisms that cause dike breaching, for example piping. This study aims to demonstrate the effect of the duration on hydraulic system behaviour analyses, using a computational framework in which two dike breach triggering method are compared in a large river system. The Dutch Rhine is used as a case-study. The first method triggers dike breaches based on water levels, and the second method is dependent on both water-level and duration, with the relationship of the two variables inferred via expert opinion. This comparison is made for dike failure probabilities based on the proposed future standards of protection.