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Estimation of Discharge from Breached Earthfill Levee with Elapsed Time

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Lack of the freeboard of levee has been occurred due to abnormally peaked flood events. Thus, the risk from overtopping of earthfill levee has been remarkably increased. When overflow on levee starts to occur, the breaching gap suddenly grows up at initial stage. As the breach width is extended, the discharge from breached section is also nonlinearly increased. Moreover, if the levee is located through multiple cities, the related damage cannot be predictable. However, researches about the breach mechanism have been focused on the breached shape of levee on the equilibrium state and the study on the development of levee breach is not enough to utilize the prediction of damage itself and select its countermeasure. In this study, the formula for breach discharge was presented to be able to predict that based on hydraulic experimental results. All experiments have been conducted with the movable levee which was the crown width of 0.3 m, the height of 0.3 m, the landside slope of 2:1 (H:V). Breach was induced by the lateral overflow for Froude numbers in main channel from 0.15 to 0.35 with the increment of 0.05. Based on the dimensional analysis with significant parameters such as main channel depth, breach width and discharge coefficient, temporal variation of each parameter was estimated with 25 experimental cases. Finally, the formula for prediction of breach flow due to overtopping failure of levee was presented considering the elapsed time for each Froude number after combing all significant parameters. When Froude number was less than 0.3, the breach discharge occurred to increase with Froude number while it became decreased with Froude number exceeding 0.3, which means the maximum breach discharge was occurred at Froude number = 0.3. It would be explained with the flow diversion caused by the collision of breach flow on the breached section downstream, which decreased the breach discharge into landside for higher Froude number of 0.3. As a future works, when the material of levee is properly considered, results from this study would be able to apply to the prediction and prevention of damage due to levee breach.