



Probabilistic assessment of grass cover failure due to wave overtopping in dikes with roads

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The present study aimed to include the turbulence effects derived from a road located over the crest of a dike, in its probabilistic safety assessment. This was done by building two different computation fluid dynamics models (RANS K-); one of a dike with a road on top and one without it. Both models were validated with experimental data collected from the Wave overtopping simulator experiments performed in the Netherlands. These models were used to produce training data sets which were later used for constructing emulators (computationally cheaper models) which allowed to reduce the computational burden from the required stochastic modelling. These new emulators allowed to calculate bottom shear stress time series in different locations along the dike profile. With these time series, it is possible to estimate the potential scouring depth per wave volume routed. These emulators allowed to model different probabilistic overtopping scenarios without running the CFD models again. The results showed that when assessed under extreme climate scenarios, the presence of a road may reduce the dike safety by almost 50% with respect to the case where no road is present. In addition, it is also concluded that the spatial grass quality distribution is a more important factor for determining dike safety than the spatial grass cover thickness.