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Application of Gambler's Ruin Problem to Sediment Transport Modeling

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This study develops a Gambler's ruin model of sediment particle interaction between bed material and water column inflows. Given several transitions between the bed material and the water column, this study calculates the probabilities starting from a given number of sediment particles to the maximum allowable number of sediment particles in the water column and the mean time that the particles remained in the water column. The model is also used to simulate the effective risk of the water treatment plant reaching limits in the water quality standard. The model is also used to quantify variability in the effective risk of exceeding the maximum carry capacity of the Shihmen reservoir basin. The modeling results, including the expected value and variance in sediment concentrations as well as the confidence interval of effective risk, are presented.