$$S_t \circ c(h)(a_s)_{ti} c(s) + \mathfrak{S}_e m^i n(a_r)$$

Compound Poisson dams with a general release rule

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An infinite dam with compound Poisson inputs and a state-dependent release rate is considered. For this dam, we solve Kolmogorov's backward differential equation to obtain the Laplace transforms of the first exit times and the distribution of the excess amount at the first exit times in terms of a certain positive kernel. In the second dam, we assume that the release rate is dynamically controlled between two functions, r_1 and r_2; if the level of water exceeds threshold $\beta(>0)$ the release rate function is switched from r_1 to r_2 and if the level of water down-crosses another threshold $\alpha(0 \leq \alpha < \beta)$ the release rate function is changed from r_2 to r_1 instantaneously. By using the level crossing theory and solving the corresponding integral equations, we obtain the explicit expression for the stationary distribution of the level of water in this dam.