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Equilibrium time of scour near water engineering structures on river floodplains

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ABSTRACT

The differential equation of the bed sediment movement in clear-water scour conditions was used and a new method for equilibrium time of scour calculation at water engineering structures with flow separation at the structure in clear-water scour conditions was elaborated. The proposed threshold criteria for equilibrium time of scour known from the literature are only depending on the size of the hydraulic structure, and not on hydraulic parameters of the flow. Ratio of the recalculated critical flow velocity to the local one at the head of the water engineering structure was proposed as the hydraulic threshold criterion in equilibrium time of scour calculation. Calculated test data revealed that with an increase in flow contraction rate and with an increase in approach flow Froude number, equilibrium time of scour increases as well. To verify the developed equilibrium time of scour evaluation method, calculated time of scour values were compared to computer modelled ones, the results showed good agreement. This calculation method can be applied to water engineering structures with flow separation at the structure at steady-flow and clear-water conditions.