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Residence time of a buoyant ball in a hydraulic jump RICHARD KEANE, MICHAEL DAMERON, GUSTAVO GIOIA, PINAKI CHAKRABORTY, University of Illinois at Urbana-Champaign — We study experimentally the residence time required for a buoyant ball to cross upstream of a hydraulic jump. The experimental results indicate that the the distribution of residence times is exponential, and therefore history-independent. Based on this insight, we formulate a model in which an attempt at crossing the hydraulic jump is made at regular time intervals τ and with a constant probability of success p, use phenomenological theory of turbulence to obtain an expression for τ, and ascertain that p depends on a single dimensionless variable, which we identify. Last, we show that the predictions of this model are in good accord by the experimental data over a broad range of Froude numbers, ball sizes, and ball densities.

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