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Experimental assessment of the motion patterns of Large Woody Debris in rivers in presence of complex geometry

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An experimental framework is developed to describe the motion of Large Woody Debris (LWD) in streams, when complex motion pattern is induced by the presence of obstacles. Non rooted, defoliated LWD is modeled using wood dowels featuring different length and placed in running water into a flume with known bed roughness. Obstacles are represented by sticks placed into the flume and featuring known spatial density. The motion patterns of the dowels are observed and qualitatively described. The stopping fashion of the dowels is described and quantitatively assessed, including leaning against single obstacles, or bridging more obstacles, as it is strongly related to the formation of in channel obstructions and wood jams. The probability for the dowels to travel a given distance, eventually moving out of the flume, is assessed. The distance traveled by the dowels is then evaluated quantitatively and interpreted statistically. This shows to depend on the water depth and velocity, on the dowels' length as related to the average density of the obstacles and on the interaction between the dowels and the channel bed. Using regression analysis on dimensionless variables, simple first-guess rules are given to assess the expected traveled distance, the lodging probability and the deposition fashion of LWD in streams.