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Interpretation of residence time from bed elevation measurements

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Transport rates of individual particles are affected by residence time in the bed. Similarly, virtual velocity of bulk sediment is affected by residence time distribution. Residence time of a particle at level z in a bed is the elapsed time between the movement of the bed surface above z (deposition) and return to z (erosion). Thus, fine-scale LIDAR or sonar transducer tracked bed elevations provide direct measurement of residence time with depth in the bed. We describe observations and models for residence time distributions using continuous bed elevation readings from ten flume experiments conducted under equilibrium conditions: five using well-sorted sediment on plane-bed morphology under low flow regime, and five using poorly-sorted sediment on large-scale bedform morphology under high flow regime.