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Numerical Dispersion of Bed Load in a 1D Model Mimics Physical Flume Results

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The longitudinal dispersion of bed load particles as they move downstream in a river is relevant both to cases of polluted sediment and pulses of sediment released during reservoir flushing events or dam removals. To quantify the rate of bed-load dispersion, researchers with the U.S. Army Corps of Engineers conducted a series of flume experiments using successive additions of different-colored sediment in a 22m x 0.9m, upstream-fed, tilting flume at the U.S. Engineer Research and Development Center's (ERDC) Coastal and Hydraulics Laboratory. Here we show that longitudinal bed-load dispersion can be accurately modeled in a one-dimensional sediment transport model (HEC-RAS) that does not explicitly simulate dispersion. We accomplished this by adjusting the active layer thickness and the bed-load depositional exchange increment. The bed-load depositional exchange increment sets the ratio of active layer vs. bed-load material that are mixed into the bed during deposition. The optimal parameters varied between the flume experiments, but smaller active layer thicknesses generally performed better.