

Particle size dependence of bedload transport of gravel particles  
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The prediction of particle movement in bedload transport is complicated by the fact that particles tend to segregate by size. Well-known examples in gravel-bed rivers include armouring, where the surface layer is coarser than the subsurface layer, and grain size patchiness, where relatively well-sorted gravel patches form along the river bed. The mechanics that drive these sorting effects have important implications for river restoration efforts and the management of river systems. We study how bedload transport movements vary according to the size of the sediment particles in a simple experimental system. We use a gravel bed sediment-feed flume to perform controlled experiments under conditions similar to the bank-full discharge in natural gravel-bed rivers. We found that even particles very close in size have measurably different streamwise and vertical transport. A simple scaling relationship models the transport distribution function along the bed. A stochastic model that incorporates information about each phase of the bedload transport describes this behavior well. We discuss these results, as well as their implications for size sorting in alluvial systems