Defining Dominant Discharge: A Sediment Yield Perspective

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Abstract. The dominant discharge concept, which is defined as the discharge that if held steady over time would create the same channel geometry, slope, and meander pattern that emerge in rivers with naturally varying flow regimes, has roots and applications in geomorphological science and engineering. Though it has received criticism and qualifications, the concept has nevertheless become embedded in the psyche of river science and management. Here I review the origins of this concept along with its explicit and implicit applications giving consideration to when and where it might apply. A large-scale analysis of the drivers of sediment yield in rivers across the U.S. indicates that in sediment supply-limited rivers with stable flow regimes, a more narrow range of flows near bankfull discharge is responsible for the majority of sediment transport. In fine bed, sediment transport capacity-limited rivers with more variable flow regimes, a much wider range of flows is responsible for sediment transport. These results support the case that the dominant discharge concept is limited to rivers with moderate to low flow regime variability and coarser bed material.