

Turbulence-resolving models in sediment-transporting flows

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Abstract. The large eddy simulation (LES) technique of directly calculating the larger scales of turbulent motion was originally proposed for large-scale atmospheric flows and has been extensively utilized in smaller-scale mechanical engineering applications. Use of LES in rivers is growing but remains largely a research tool. Fully three-dimensional models are difficult to implement in rivers because they are long, wide, and thin flows with a free surface and irregular beds. Turbulence-resolving models are worth the extra effort and cost only in situations where depth-integrated models are inadequate, such as in the presence of strong secondary circulation or flow separation. At a smaller-scale LES can be combined with models of particle behavior to develop an understanding of the details of entrainment and motion of bed load and suspended load sediment transport. Examples of river scale turbulence simulations will be shown from work on lateral separation sand bars in Grand Canyon. Smaller scale sediment transport simulations and comparison to laboratory experiments will also be shown.