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Hydrodynamic modeling for river delta salt marshes using lidar topography

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Topographic data from lidar and multi-beam sonar create new challenges for hydrodynamic models of estuaries, tidelands, and river deltas. We now can readily obtain detailed elevation data on 1 m scales and finer, but solving hydrodynamics with model grid cells at these small scales remains computationally prohibitive (primarily because of the small time step required for small grid cells). Practical estuarine models for the next decade or so will likely have grid scales in the range of 5 to 15 m. So how should we handle known subgrid-scale features? Simply throwing out known data does not seem like a good idea, but there is no consensus on how best to incorporate knowledge of subgrid topography into either hydrodynamic or turbulence models. This presentation discusses both the theoretical foundations for modeling subgrid-scale features and the challenges in applying these ideas in the salt marshes of a river delta. The subgrid problem highlights some important areas for field and laboratory research to provide calibration parameters for new models that upscale the effects of known subgrid features.