Sensitivity of a 1-D Cohesive Sediment Entrainment Model That Incorporates Physical and Biological Effects

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A first step towards creating a realistic model of cohesive sediment transport in nearshore environments (bays, estuaries, river systems) is the development an entrainment rate parameterization that depends on the physical properties of cohesive sediments (e.g. consolidation, geochemistry) as well as the effects of biology (e.g. bioturbation). A better understanding of how the entrainment rate (and thus the suspended sediment profile) depends on these processes is also necessary for the development of a wave bottom boundary model that is coupled to sediment transport. This initial study investigates the relationships between some of the significant physical processes that determine the entrainment of cohesive sediments. This model extends previous theoretical and experimental results for the entrainment rate through additional parameterizations of the underlying physical and biological processes. The sensitivity of the entrainment rate and the mean sediment concentration to consolidation, bioturbation, deposited sediment density, floc settling velocity and mean floc size are examined using a 1-D numerical model for a range of dimensionless shear stresses.