

Simulating the Behavior and the Environmental Effect of Sediment Plumes from Deepwater Mining

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Abstract

A model for simulating the behavior of sediment plumes from deepwater mining and their resulting environmental effect is presented. This paper contains the complete model formulation and scenario simulations. The sediment transport model includes both the near field (plume dynamics) and the far-field (passive advection-diffusion) phases. The model can handle both upward and downward releases. The model also takes into account the possible separation of sediments from the main plume. The model is three-dimensional and takes ambient current variations and stratification into account. For simulating the behavior of chemicals attached to sediments, three types of chemicals are considered: heavy metal, organic chemical, and mineral. The main difference between the different types is how they partition between being attached to the sediments and dissolved in water. The model simulates the transport of chemicals attached to the sediment as well as the chemicals dissolved in water. The scenario simulations assess the effect on biological life due to entombment by deposited sediments. The light-attenuation and the resulting effect on photosynthesis in the water column due to sediments are also simulated.