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Modeling of quasi-constant volume gravity currents due to open-water sediment disposal JENN WEI ER, ADRIAN WING-KEUNG LAW, Nanyang Technological University, E ERIC ADAMS, Massachusetts Institute of Technology — The near field transport of a sediment cloud in the water column after open-water disposal generally experiences two sequential phases: (i) convective descent phase, during which the cloud behavior is dominated by gravity, and (ii) bottom collapse phase, which upon impact the momentum and buoyancy of the cloud then drive the propagation along the seabed as a gravity current. The spreading of gravity current determines the zone of influence by the disposal event at the seabed. In this study, a modified Box-Model was proposed to assess the behavior of the gravity current. In particular, for the case of a split-barge, which is commonly used for land reclamation and contaminated sediment disposal, the model took into account the finite time period for the barge to fully discharge. Within this period, the sediments were continuously released from the barge, and supplied into the gravity current (as constant flux current). Beyond that, the gravity current continued to spread as a constant volume current instead. The interplay from constant flux to constant volume, which has significant implications on the engineering outcome, has not been addressed before. In addition, the modified Box-Model also included the geometry of the barge opening with a usual rectangular shape, generating differential spreading in both axes, and leading to the final elliptical zone of deposition. A laboratory study was carried out for model verification. The model predicted well the experimental results, while existing engineering models were inadequate due to their oversimplified representations.

Jenn Wei Er
Nanyang Technological University

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