Settling velocity and mass settling flux of flocculated estuarine sediments

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Soulsby, R.L.and Manning, A.J. and Spearman, J. and Whitehouse, R.J.S.
Marine Geology, 339 . pp. 1-12. (2013)

Official URL: http://dx.doi.org/10.1016/j.margeo.2013.04.006

Abstract: New formulations are presented for the settling velocity and mass settling flux (the product of settling velocity and sediment concentration) of flocculated estuarine mud. Physics-based formulae for these are developed based on assumptions of a two-class floc population (microflocs and Macroflocs) in quasi-equilibrium with the flow. The settling velocities of microflocs and Macroflocs are related to floc size and density via the Kolmogorov microscale as a function of turbulent shear-stress and sediment concentration, including height-dependence and floc-density-dependence. Coefficients in the formulae are calibrated against an existing large data-set of in situ observations of floc size and settling velocity from Northern European estuaries. Various measures of performance show that the resulting formulae achieve an improved level of agreement with data compared with other published prediction methods. The new formulae, with the original calibration coefficients, perform well in tests against independent measurements made in two estuaries.

Item Type: Article

Uncontrolled Keywords: cohesive sediment; settling velocity; mass settling flux; flocculation; suspended particulate matter; mud transport models

Subjects: Coasts > Sediment transport and scour
Coasts > General

ID Code: 647