



## A model of sediment transport over an intertidal transect, comparing the influences of biological and physical factors

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Limnol. Oceanogr., 47(3), 2002, 848-855 | DOI: 10.4319/lo.2002.47.3.0848

**ABSTRACT:** This paper compares modeled biotic and physical effects on intertidal sediment transport, using parameterizations that are based on laboratory and field experiments. A one-dimensional model of an intertidal transect is constructed. The model is aligned cross shore and includes movement of water and suspended sediment. Within the model, tidal currents cause erosion, and bioturbation by the clam, *Macoma balthica*, alters the erodability of the bed sediment. The concentration of chlorophyll a in the surface sediment (which is an indicator of microphytobenthos density) alters the critical erosion velocity. External sediment supply is specified as an offshore suspended matter concentration. The model is applied within Spurn Bight (Humber Estuary, UK). The effects of various tide heights, biota densities, and external suspended sediment concentrations are investigated. Offshore sediment supply dominates the net deposition below midtide level, but factors affecting intertidal sediment erosion and deposition become important at higher shore levels. Changes in erosion or deposition caused by natural variation in biota densities are as large as those caused by changes in tidal range and currents over a spring-neap cycle, or by doubling external supply. Seasonal variations in densities of stabilizing microphytobenthos can alter the magnitude of net deposition on the upper shore by a factor of two. Interannual variation in numbers of bioturbating clams can change net deposition by a factor of five. These results show that biotic influences on transport of sediment within the intertidal zone are significant and will play a role in determining sediment budgets over tidal to monthly timescales.

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