

# Accepted Manuscript

A model study on the large-scale effect of macrofauna on the suspended sediment concentration in a shallow shelf sea

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PII: S0272-7714(17)30098-7

DOI: [10.1016/j.ecss.2017.11.002](https://doi.org/10.1016/j.ecss.2017.11.002)

Reference: YECSS 5659

To appear in: *Estuarine, Coastal and Shelf Science*

Received Date: 27 January 2017

Revised Date: 23 October 2017

Accepted Date: 1 November 2017

Please cite this article as: Nasermoaddeli, M.H., Lemmen, C., Kösters, F., Stigge, G., Kerimoglu, O., Burchard, H., Klingbeil, K., Hofmeister, R., Kreuz, M., Wirtz, K.W., A model study on the large-scale effect of macrofauna on the suspended sediment concentration in a shallow shelf sea, *Estuarine, Coastal and Shelf Science* (2017), doi: 10.1016/j.ecss.2017.11.002.

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## 14 Abstract

15 The activity of macrofauna on the sea floor is since long known to mediate deposition and erosion of  
16 sediment, but so far most studies addressed this effect at a local scale. In the present paper, the  
17 contribution of the observed macrofauna distribution (exemplified by a bivalve, the bean-like  
18 *Fabulina fabula*, formerly known as *Tellina fabula*) on large-scale sediment transport in the southern  
19 North Sea is investigated by means of a model study. Macrofauna effects are considered with respect  
20 to the critical bed shear stress and erodibility, which are two important factors that control the  
21 resuspension rate. Simulation results for a typical winter month revealed for the first time that the  
22 suspended sediment concentration (SSC) is increased not only locally but beyond the inhabited  
23 zones. This alteration is not confined to near-bed zones but can be observed throughout the entire  
24 water column, especially during storm events. These effects are most prominent in the fine silt  
25 fraction, coarser and finer fractions are less affected. For a selected storm event in February 2010,  
26 we explain the counter-intuitive decrease in near-bed SSC in some areas with a high macrofauna  
27 abundance compared to a simulation excluding such macrofauna: A high macrofauna-induced  
28 entrainment rate leads to rapid exhaustion of available sediments at the bed in the model and  
29 consequently limits the near-bed SSC.

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