Geophysical Research Abstracts
Vol. 20, EGU2018-12916, 2018
EGU General Assembly 2018

Trends in sediment characteristics in the German Bight (North Sea)

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The surface sediment in the shallow, coastal North Sea is shaped constantly by deposition of suspended particulate matter, sediment resuspension, and reworking by fauna. Consequently, the specific characteristics of a given sediment reflect the net effect of all these simultaneously active processes. Fine mineral particles (e. g. silt) and particulate organic matter (POM) settle under similar hydrodynamic conditions. Additionally, it has been shown that POM can capture fine mineral particles into flocs (Fettweis et al. 2014), especially when extracellular polymeric substances are present, and that these flocs may settle faster than pure POM or silt (Maerz et al. 2016). Here we speculate that this intimate connection of fine mineral particles and POM enables to deduce estimators for sediment characteristics based on grainsize distributions.

We tested our hypothesis with a collection of 146 samples of German Bight surface sediment from 10 – 45 m water depth, which represents all major sediment types of the study area. The measurements comprise mud content (< 63 μm fraction), porosity, permeability, pigment content and specific respiration rate. Our results support our hypothesis that coupled sedimentation of POM and fine mineral particles enables to deduce biogeochemical sediment characteristics from grain size distributions. We established empirical, grainsize-based estimators for porosity, permeability and specific respiration rate for German Bight sediment. With these, we are able now to employ the high-resolution grainsize data available for the German Bight to map the respective sediment characteristics, for which measurements are still sparse. Our results will help to improve the data basis of ecosystem models of this area.

References:

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