



A novel approach to quantifying resuspension resistance of sediment organic matter against coastal flow

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In order to estimate sediment organic carbon budget in coastal oceans and continental shelves, a first step is to estimate how much of the deposited organic matter is retained within a sediment matrix, for further remineralization and preservation on a geological timescale, rather being physically flushed away by benthic flow¹. This question becomes more challenging for the regions where 'mobile' layers (e.g. fluff layer, fluid mud and nepheloid layer) are formed due to the massive organic matter inputs, and often frequent resuspension and deposition². Organic matter remineralization and preservation in sediments has been mostly investigated but often overlooks the role of flow-induced shear stresses on suspending the organic matter. While such flow influences in sediment organic matter budget may have little influence on sediment organic matter budget in deep oceans, it cannot be neglected in shallow-water coastal seas and continental shelves where cyclic resuspension, deposition and frequent storm events occur^{3,4}. To our knowledge, the resistance strengths of organic matter in sediments against flow resuspension has received little attention.

To investigate this knowledge gap, various organo-clay aggregates and organo-clay-sand aggregates formed under different flow conditions were investigated by a series of laboratory flume⁵ and high resolution X-ray Microcomputed Tomography (micro-CT) experiments⁶. Herein, a novel methodology is proposed, which successfully establishes quantitative relationships between the resuspension resistance strengths of these organic aggregates and a wide range of flow intensities, from moderate to storm conditions. The results provide a basis for computing resuspension under a range of flow conditions and, hence improving estimates of the organic matter budget in the coastal zone.

References

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