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Flocculation in the Scheldt Estuary: a case study of intertidal mudflats

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The flocculation mechanism dominates the fate of suspended matter in the estuarine environment. As it modifies the texture of suspended matter, flocculation thus affects suspended matter's transport and deposition. In order to understand the complexity of the flocculation mechanism, a case study was performed on two intertidal mudflats in the Scheldt estuary, a freshwater and a brackish water one. A one-year biweekly survey investigated the seasonal variation of flocculation, physical properties of suspended matter, organic matter content and suspended matter deposition in the intertidal area. The flocculation study includes floc's shape, sphericity and microfabric, which properties are believed to be significant in the suspended matter transport processes in the estuary. This study shows that floc size as well as floc sphericity positively correlates with the change of organic matter. Moreover, it reveals that with increasing organic matter floc expands in a three-dimensional way. It is observed that relatively dense, small and elongated flocs appear in winter and spring periods, while loose, large and spherical flocs occur in summer time. The study also reveals that suspended matter transported as dense and fine-to-medium sand-sized flocs have a greater effect on its short-term deposition than loose and medium-to-coarse sand-sized flocs. As the measured suspended matter deposition is much higher in winter-spring than in summer time, it is deducted here that highly concentrated and relatively dense flocs contribute to fast deposition during winter and spring periods resulting in a compact layer, while loosely formed flocs likely lead to an easier erodible layer in summer time. This study concludes that floc density is a more determining parameter in suspended matter's transport processes than floc size.