

Clay and Silt Flocculation, Petitcodiac River Estuary, New Brunswick, Canada

Alina Shchepetkina, Murray K. Gingras, John-Paul Zonneveld, George S. Pemberton

Clay and silt flocculation is an important process for settling of suspended sediments. Sediment clumping allows for rapid and efficient way for clay to sand-sized sediments removal from suspension.

High concentrations of flocculated clay and silt (10-480 g/L) are defined as fluid mud deposits. Fluid mud within the Petitcodiac River Estuary contains considerable amounts of clay (21-67 %). This contributes to the formation of creeping fluid-mud sheets and streams. Ripple laminated sediments and erosional ripple ridges are closely associated with these fluid mud sheets, and contain larger proportions of silt and sand (85-89 %) with a smaller clay fraction (11-15 %).

It was determined that the naturally occurring clay flocs on the tidal flats contain up to 77 % of the entangled silt- to sand-sized grains. SEM and microscopic imaging of fluid mud revealed a substantial amount of bioclastic material—particularly articulated and detached diatom frustules—within the flocs and dispersed among the sediments. These observations confirm that silt and diatoms are trapped and sieved by flocculating clays from the water column, and then settle on the channel floor. Laboratory experiments, using Petitcodiac sediment, show that the clay flocs have the potential to sweep the water of non-clay suspended debris. Diatoms and their associated extracellular polymeric substance (EPS) sheaths might play a role in mineral aggregation and increased sediment cohesiveness.