

Title of the project: Modeling the interaction of biology, biogeochemistry, and silt dynamics in marine sediments	
Assignment no.: 34.17	Internal/external: External, NIOZ-Yerseke
Head graduation committee: Dr.ir. Denie Augustijn	Daily advisor: Dr. Karline Soetaert (NIOZ) Ir. Pim Willemsen
Name(s) of participating companies or institutes:	Start of the project: Flexible
Required courses: Mathematical Physics Marine Dynamics	
<p>Short description and objective of the project:</p> <p>In biogeochemistry it is common to distinguish between permeable and non-permeable sediments. In the former the physical exchanges are strongly driven by currents flowing through the sediment pores. In the latter, currents do not penetrate the sediment and the physical transport for solutes is dominated by molecular diffusion and flushing of animal burrows and for particles by bioturbation and sediment accretion. A lot of work has been done on the modelling of biogeochemistry in non-permeable sediments, but very few models deal with the biogeochemistry in permeable sediment. One of the current drawbacks for biogeochemical models of permeable sediments is that the physical framework, the sediment permeability, needs to be imposed and is static. In reality though, permeability is impacted by several processes and may change over time. This is because the water flows in sediments -as induced by tidal currents, wave action, or animal pumping- causes fines to be exchanged between water and sediment. Crawling and feeding activity of sediment-inhabiting organisms may also change the permeability of the sediment.</p> <p>In this master thesis a mechanistic model will be developed that dynamically describes the exchange of fines in coarse sediment and how that affects sediment biogeochemistry. An initial version of this model already exists but it needs to be refined, tested and further explored. A number of lab experiments have been performed that look into the quantification of SPM incorporation in sandy sediments under various conditions of water flow and that may serve to ground truth the model outcome.</p>	