



Bio-geomorphology of estuaries: the need for understanding the balance between ecosystem engineering, physical forcing and biomechanical species interactions

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The estuarine environment is strongly affected by the hydrodynamic forces from currents and waves, which often form both a resource and a stress to the organisms inhabiting these areas. Organisms that inhabit these areas interact with these physical forces, and may thereby modify their abiotic environment. This is referred to as ecosystem engineering (EE), which may result in locally improved growing conditions for the organisms. By their activities, ecosystem engineers (EE's) can have major influence on sediment dynamics in the coastal ecosystems and may create self-organised bio-geomorphologic landscapes. However, the physical-driven sediment dynamics may also impose control over organism establishment and performance. And on top of that, ecosystem engineering organisms may affect the occurrence of each other via their effect on the environment (i.e. 'biomechanical warfare'). The combination of these 3 types of interactions makes the dynamics of biogeomorphic ecosystems complex to understand and model, and restoration of biogeomorphic ecosystems hard to accomplish. In our presentation we will highlight 3 aspects that we see as crucial to improve our understanding, modelling and restoration of biogeomorphic ecosystems:

- (1) the possibility to generalise EE-effects across species
- (2) identifying to which extent physical forcing may enable vs. restrict EE-effects
- (3) understanding the biological and physical thresholds to the establishment of EE's, and the long-term dynamics of biogeomorphic ecosystems.

Each of these aspects will be discussed based on experimental results.