Poster No: 2

KATHOLIEKE UNIVERSITEIT LEUVEN

HYDRAULICS LABORATORY

# Heterogeneous Flocculation Combining the Biological and Mineralogical Populations in a Marine and Coastal Environment

*B. Joon Lee[1], Michael Fettweis[2], and Erik A. Toorman[1]*

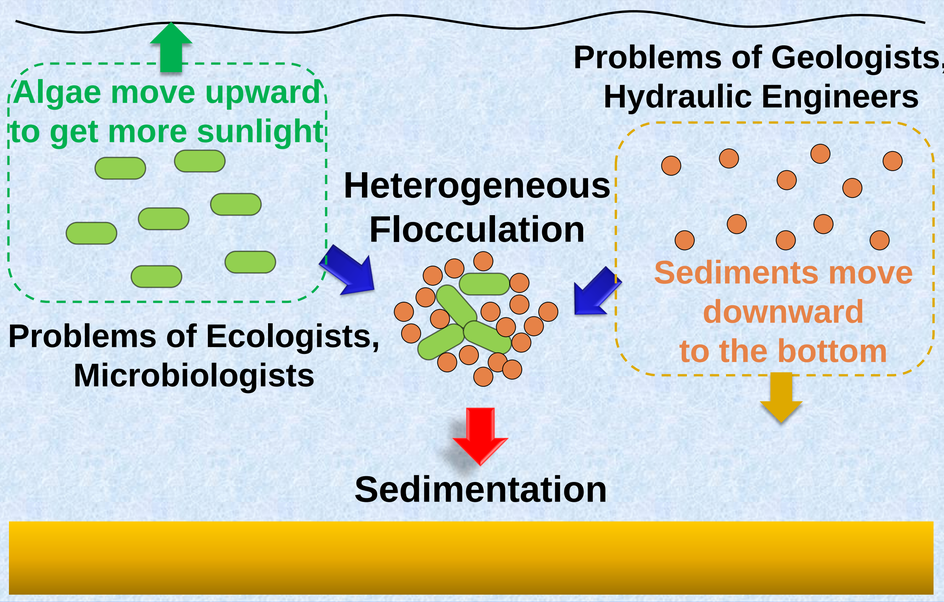
1 Hydraulics Laboratory, Department of Civil Engineering, Katholieke Universiteit Leuven (Info: joon.lee@bwk.kuleuven.be)

2 Royal Belgian Institute of Natural Science Science, Management Unit of the North Sea Mathematical Models

## 1 Heterogeneous Flocculation

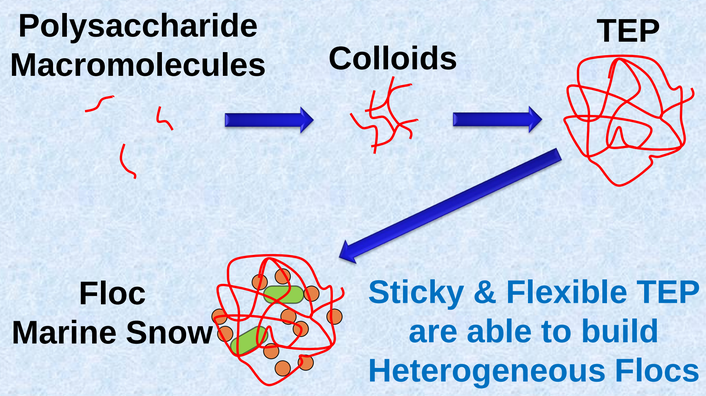
**Flocculation**:
is a reversible floc-size growth and decay process, due to particle aggregation and breakage.

**Heterogeneous Flocculation:**
is flocculation combining heterogeneous fractions of the biological and mineralogical populations into a bio-mineral floc, thereby bridging the biological and mineralogical worlds.



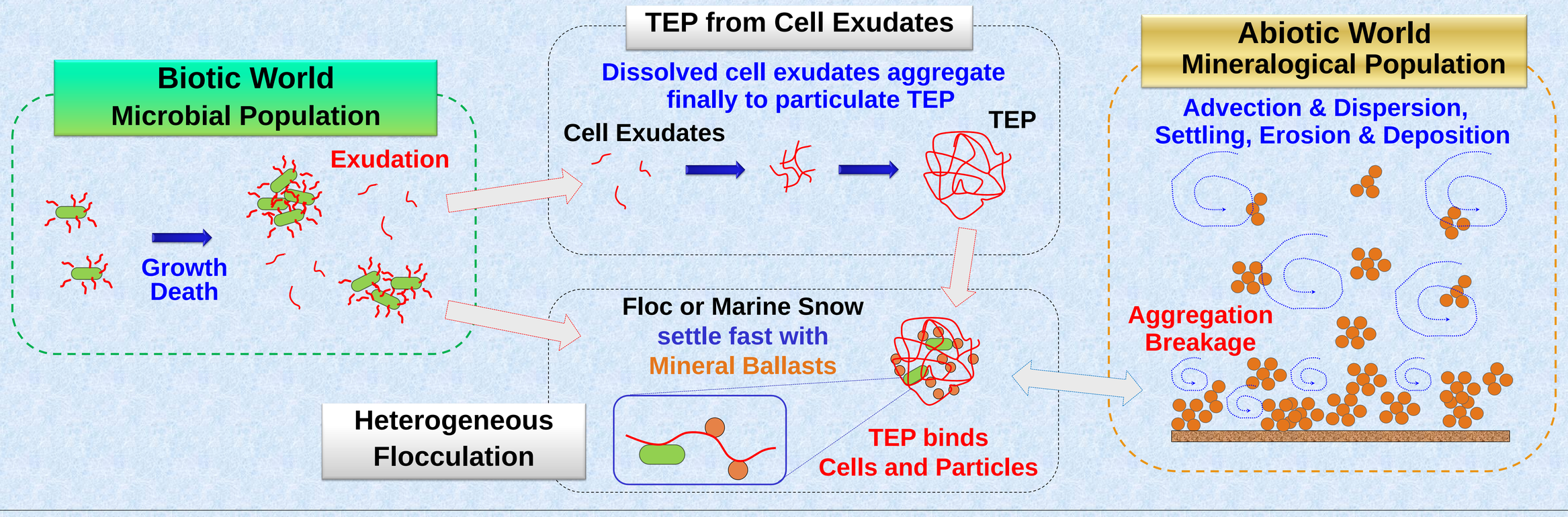

## 2 Transparent Exopolymer Particles (TEP)

**TEP** is an organic particles formed by aggregation of polysaccharides excreted by microorganisms (Alldredge et al., 1993).




## 3 Conceptual Model: TEP-Mediated Heterogeneous Flocculation

**TEP combines the Biological and Mineralogical Populations into a Heterogeneous Floc.**




## 4 Mathematical Model: Initiative Strategy

**Ecological Modeling**

**Microbial Growth and Death:** Phytoplankton, Zooplankton, Heterotrophic Bacteria, etc.
**Nutrient Flux:** N, P, Si, Fe, etc.
**Carbon Flux:** $CO_2$, Dissolved and Particulate Organic s, etc.

**e.g. SWAMCO (Lancelot, 2000)**

**TEP Formation**

**Polymerization & Aggregation**: Self-Assembling Polymerization, Cluster-Cluster Aggregation
**e.g. Engel et al. (2004)**

**Combining Three Model Compartments**

**Cohesive Sediment Transport & Flocculation**

**Transport**: Advection, Dispersion, Sedimentation, Erosion, Deposition, Fluid-Sediment Interaction, etc.
**e.g. FENST, COHERENS (Toorman, 2002)**

**Flocculation**: Floc-Size Growth and Decay by Aggregation and Breakage
**e.g. TCPBE (Lee et al., 2011)**

## 5 Multi-disciplinary Collaboration Required

| Ecological Engineer | Microbiologists | Hydraulic Engineer | Process Engineer | Marine Geologist |
|---|---|---|---|---|
| Developing Ecological Models of Microbial Population Dynamics | Physiology of Microbial Species, e.g. Finding EPS-Producing Species | Large-scale Simulation of Sediment Transport and Ecological Models | Developing Biological and Physicochemical Process Models | Mineralogical and Geomorphological Investigation |
| | | | **This is me …** | **and more …** |

**References**

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