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ABSTRACT | Andreas Bohn

Title

"Multi-level modeling of the stochastic growth of phototrophic biofilms"

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Abstract

The present work deals with the development of models for the stochastic growth of mixed cultures of hetero- and autotrophic microorganisms, the so-called phototrophic biofilms. A central objective is to characterize deviations from typical logistic dynamics, consisting in randomly occurring detachment of large proportions of the biofilm biomass, and to pinpoint their dependence on specific environmental conditions and physiological traits of the biofilms. For this purpose, several quantitative approaches are being integrated: i) stochastic models predicting the deterministic development of biofilm biomass as well as the frequency and size of detachment events, ii) flux-balance based models for 1-dimensional distributions of the different biofilm components, iii) individual-based models yielding an explicit representation of the spatiotemporal dynamics of phototrophic biofilms, and iv) data-driven models on biofilm physiology emerging from a database generated in the course of a recent European project on phototrophic biofilms. Besides surveying the different modeling strategies and their outcomes, I will discuss tools from the semantic web serving as the "glue" for the integration of the different modeling approaches.