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Modelling approaches for Quorum sensing in *Pseudomonas putida* and its observation in a biofilm compartment

More and more bacterial species are found to regulate gene expression via extracellular signals called autoinducers. By that mechanism, usually called Quorum sensing (QS), they check for the environmental conditions as population density and diffusion limitation. *Pseudomonas putida*, a rhizosphere bacterium, has one such QS regulation system. Expression of a fluorescence protein (GFP) allows for direct monitoring of induction behaviour on single cell level, but uses as second autoinducer receptor which perturbs the original system to some extent. An ODE model allows to estimate this perturbation and helps to interpret the observed behaviour.

In an experimental approach the dynamics of upregulation was observed under flow and non-flow conditions. A two compartment model was set up and fitted to the experimental data. By that, several hypotheses could be checked, giving a clear hint on a growing layer which is not directly accessible by the flow compartment, probably a biofilm.

A second interesting topic concerns an QS-induced (delayed) production of an autoinducer-degrading enzyme. We introduce a delay differential system, analyse its behaviour and compare it to simpler models. Transferred to a spatial model (as part of a reaction-diffusion equation) it allows to consider the ecological consequences for single bacteria in a biofilm.