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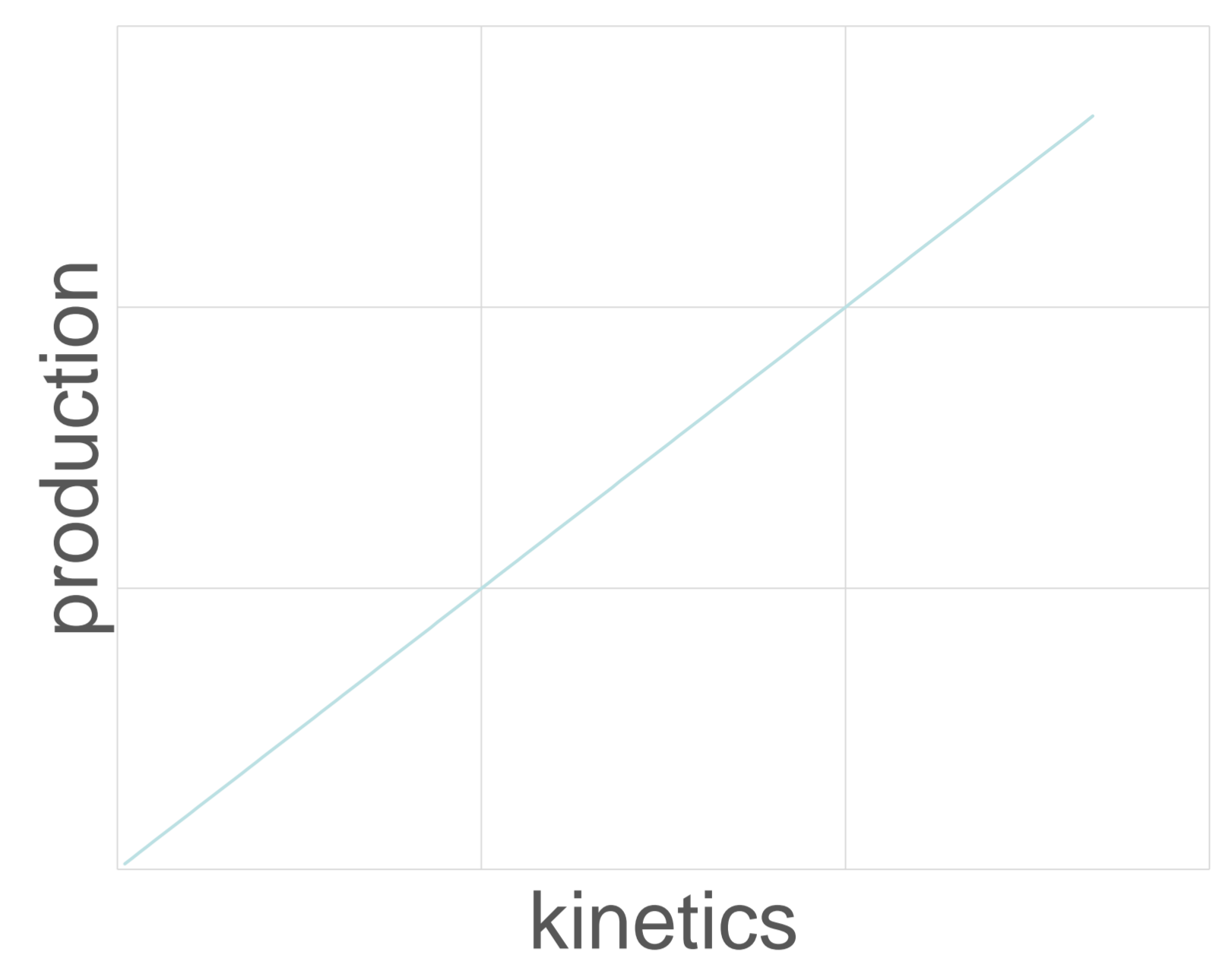
Research Focus in this part of PEPs group

In all industrial applications, **(bio)reactor performance** is related to the **kinetics** of the transformations. **Space and time distributions** of **temperature, concentrations, pH, ...** have a strong effect on these performances due to their impact on reaction kinetics. They are affected by hydrodynamics (phase distributions, mixing, ...) and by mass and heat transfer which depend on (bio)reactor design and operating conditions.

We thus use and develop **experimental** and **modelling tools** to **characterize hydrodynamics, mixing** and **mass transfer** in different types of (bio)reactors :

- Packed bed contactor and fixed bed bioreactors
- Stirred tank bioreactors
- Photobioreactors

In all cases, it is asked to **PhD students** to **collect experimental results** in order to **build and validate a reactor performance model**.



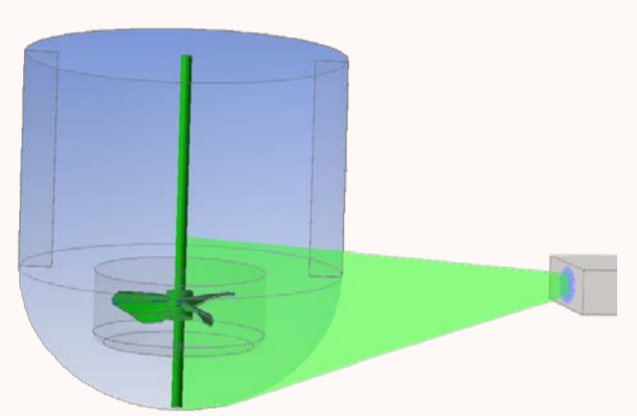
Stirred reactors

Applications : animal cell and stem cell culture, fermentations, pharmaceutical compound formulation, phosphoric acid fabrication...

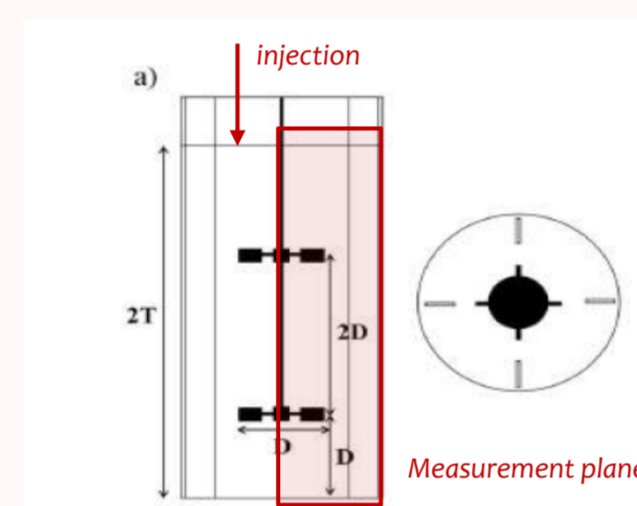
Collaborations : Gblx AgroBioTech, U Lorraine, GSK, Prayon, Pall Lifescience ...

Experimental tools

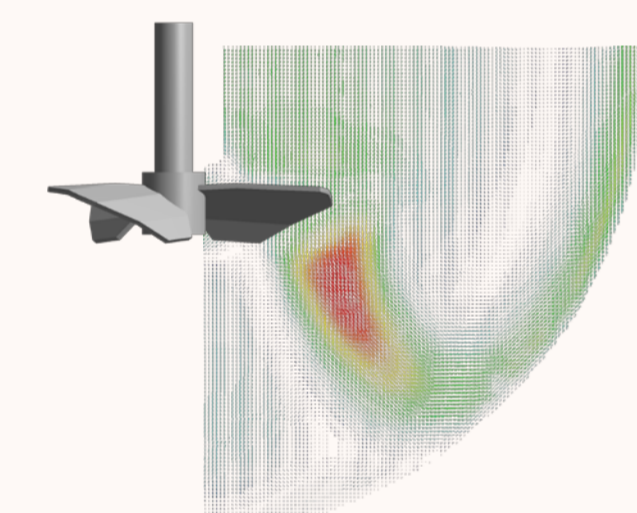
Particle image velocimetry - PIV



Planar laser induced fluorescence - PLIF

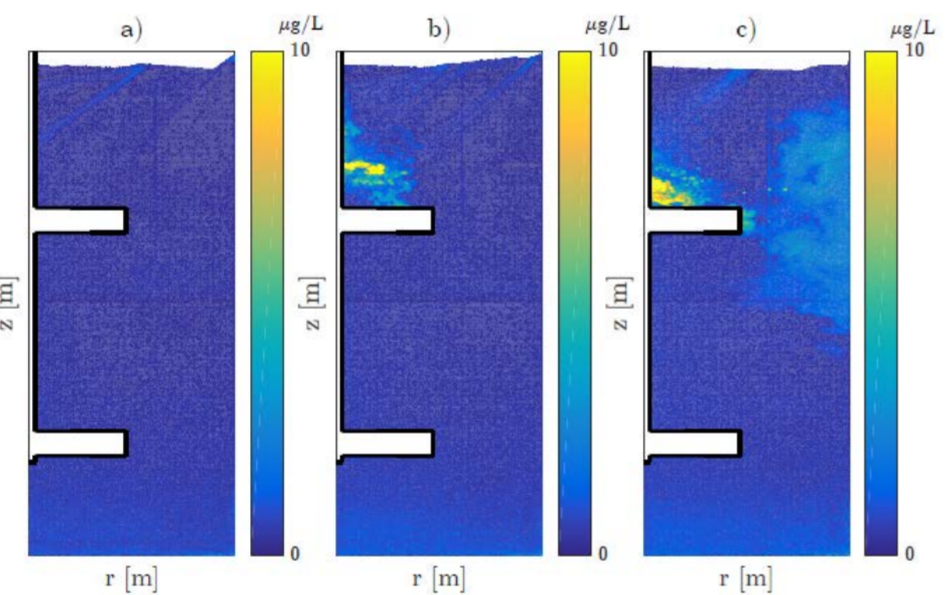


Fluid velocity distribution



Hydrodynamics

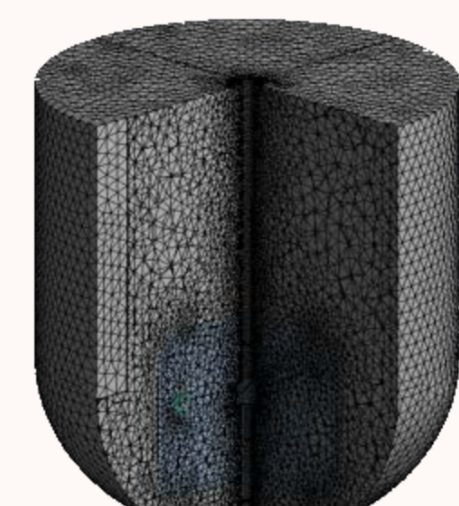
Tracer concentration distribution



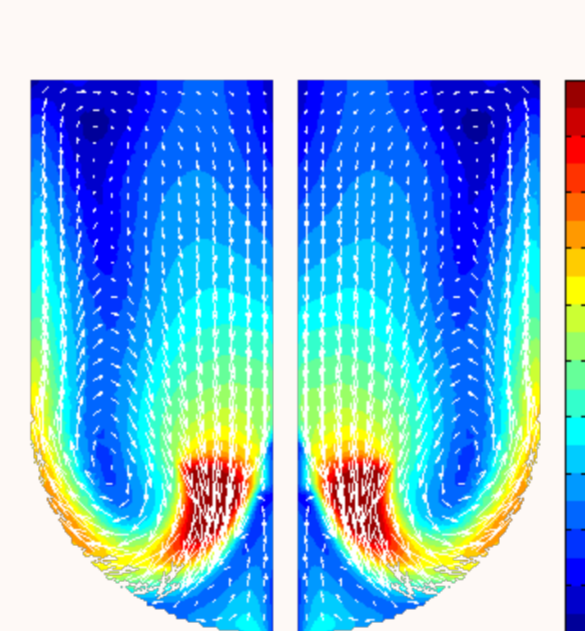
Mixing and mass transfer

Modelling tools

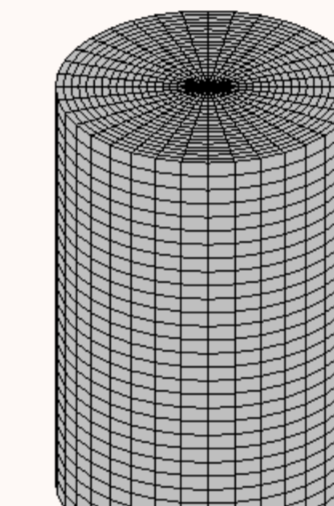
Computational Fluid Dynamics - CFD



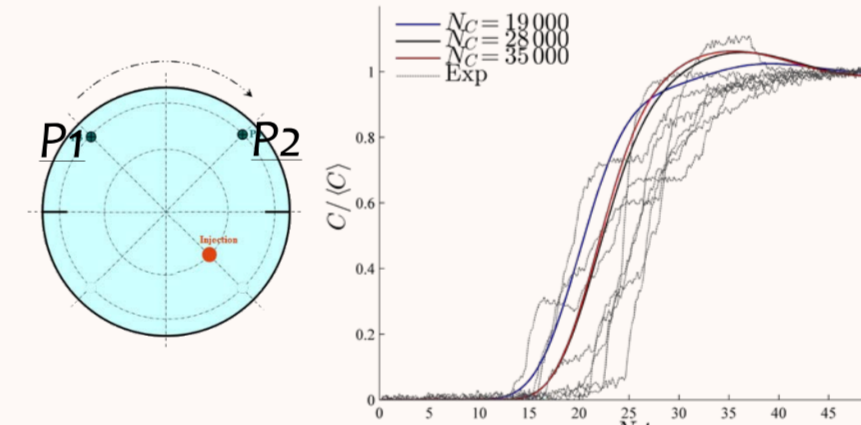
Fluid velocity distribution



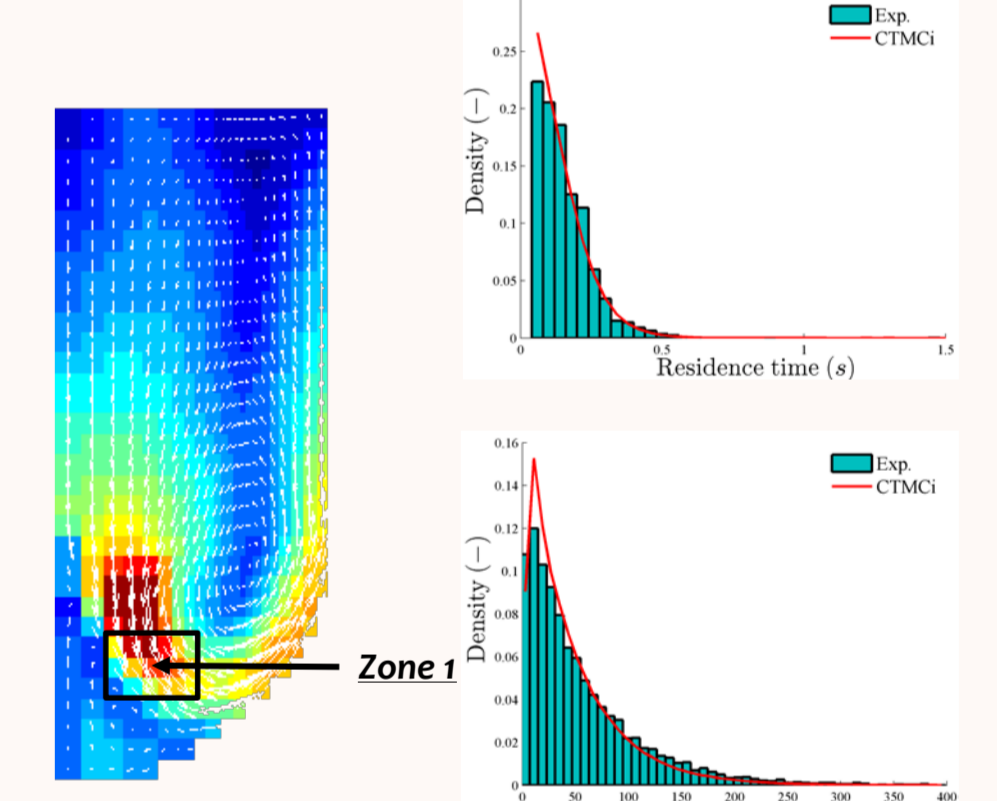
Compartment model



Mixing characterisation



Residence time distribution

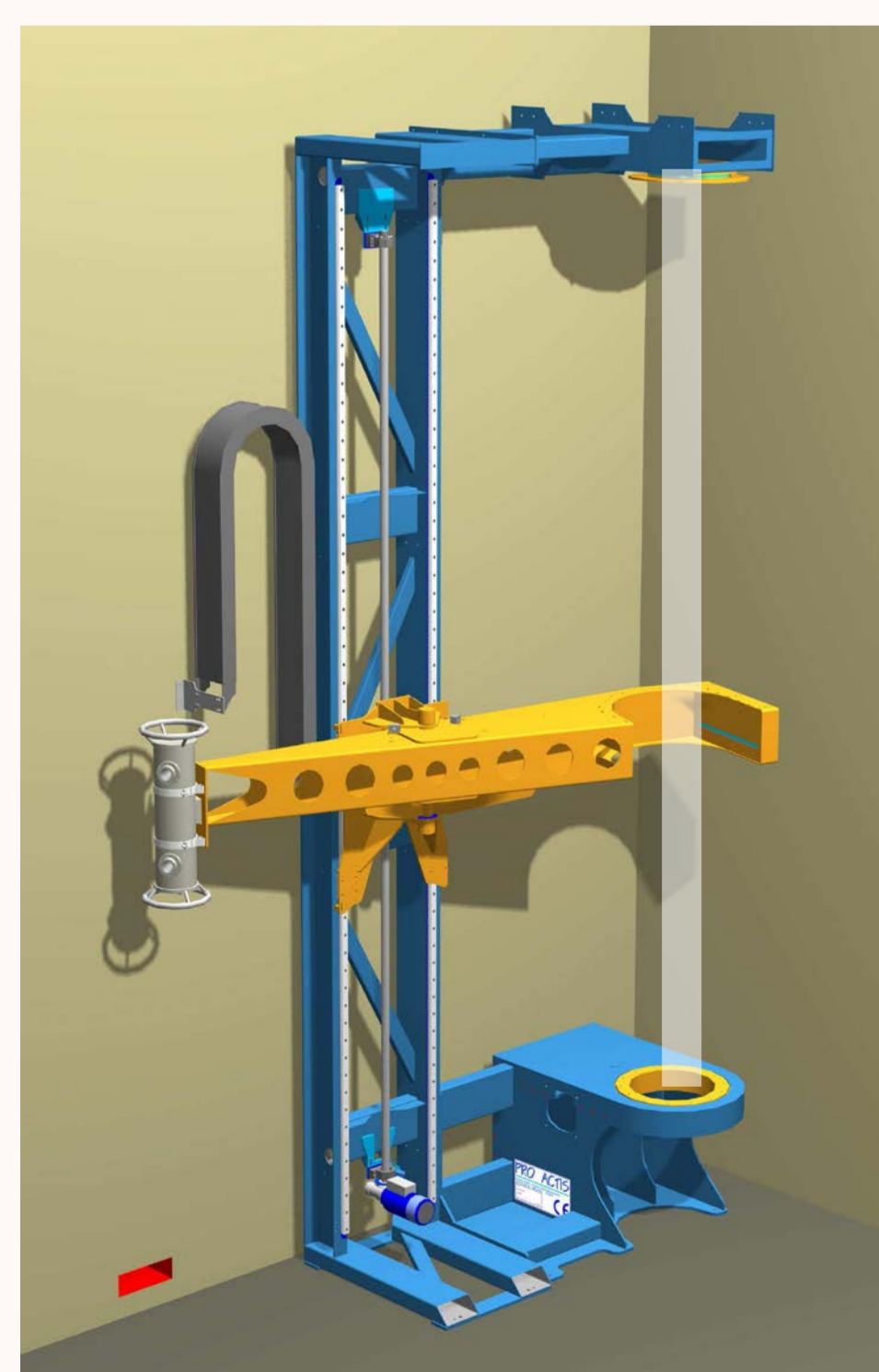


Fixed bed (bio)reactors

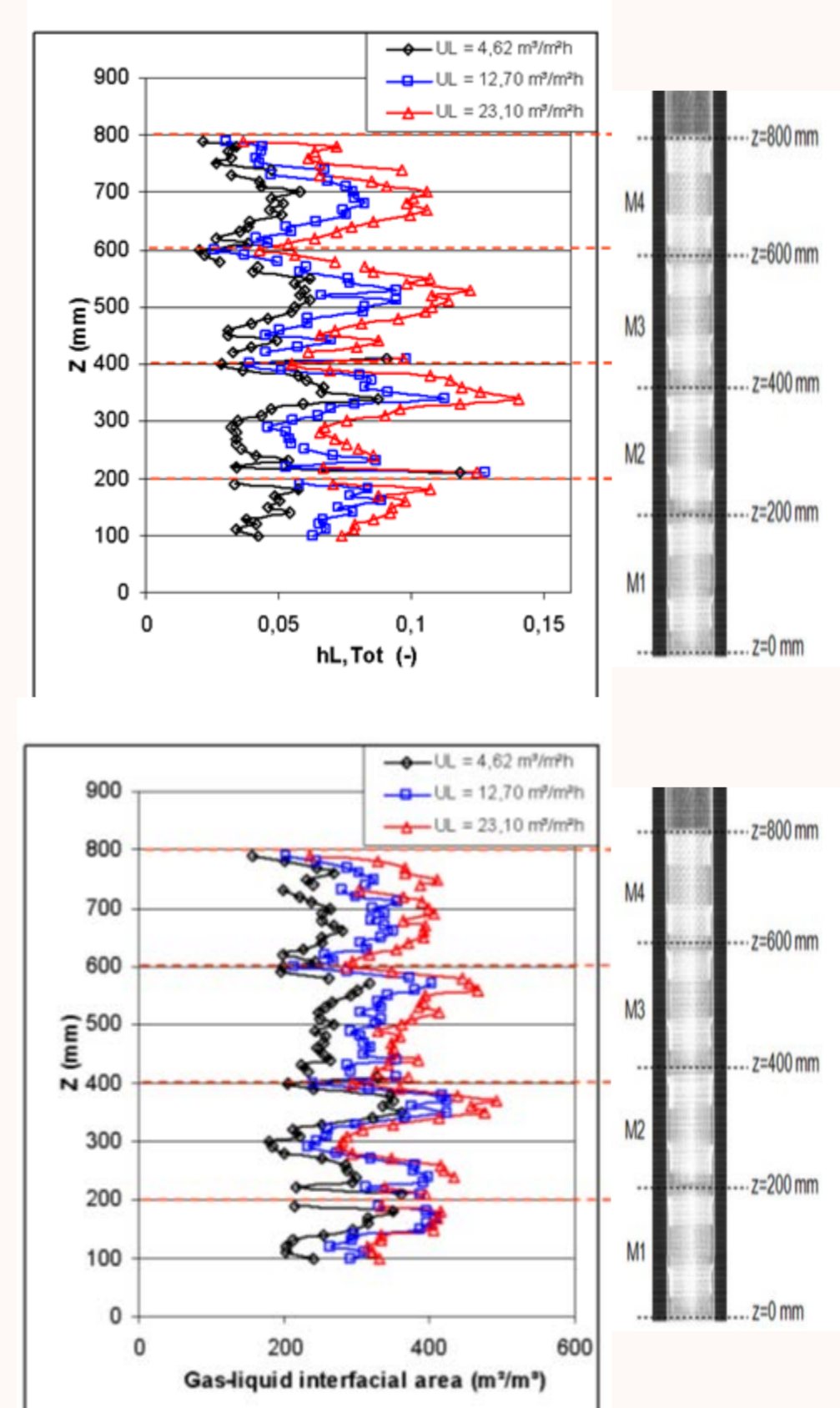
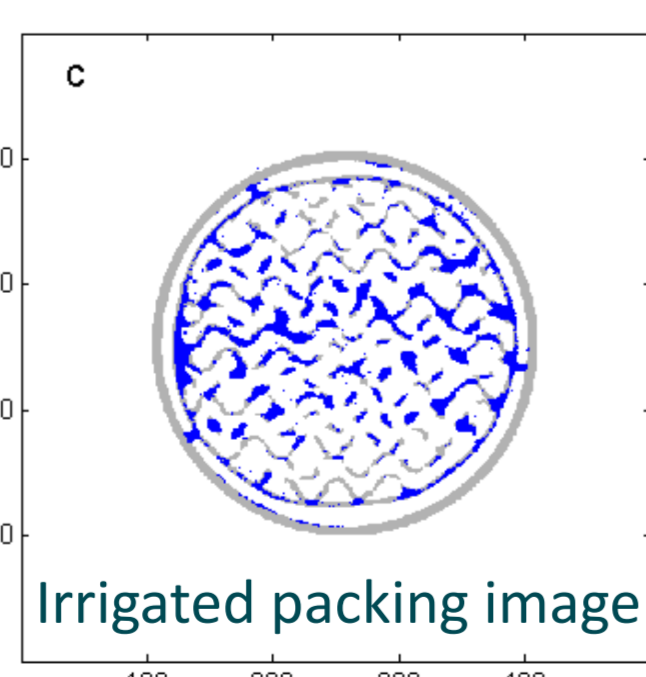
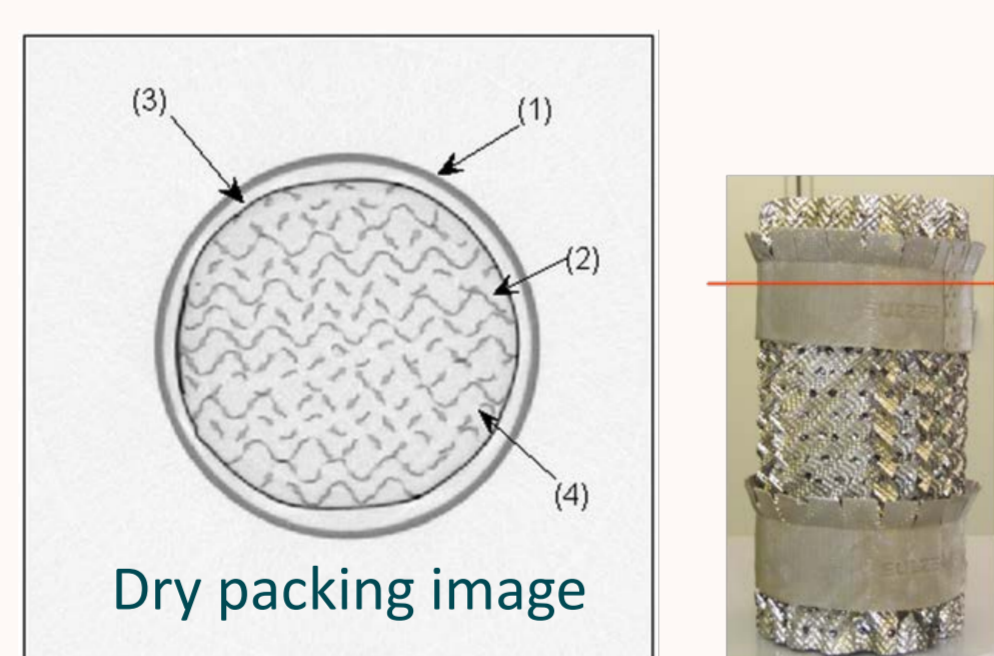
Collaborations : Gblx AgroBioTech, U Paderborn, TU Delft, U Pisa, Eloy Water, Sulzer Chemtech ...

Axial profiles : liquid retention – G/L interfacial area

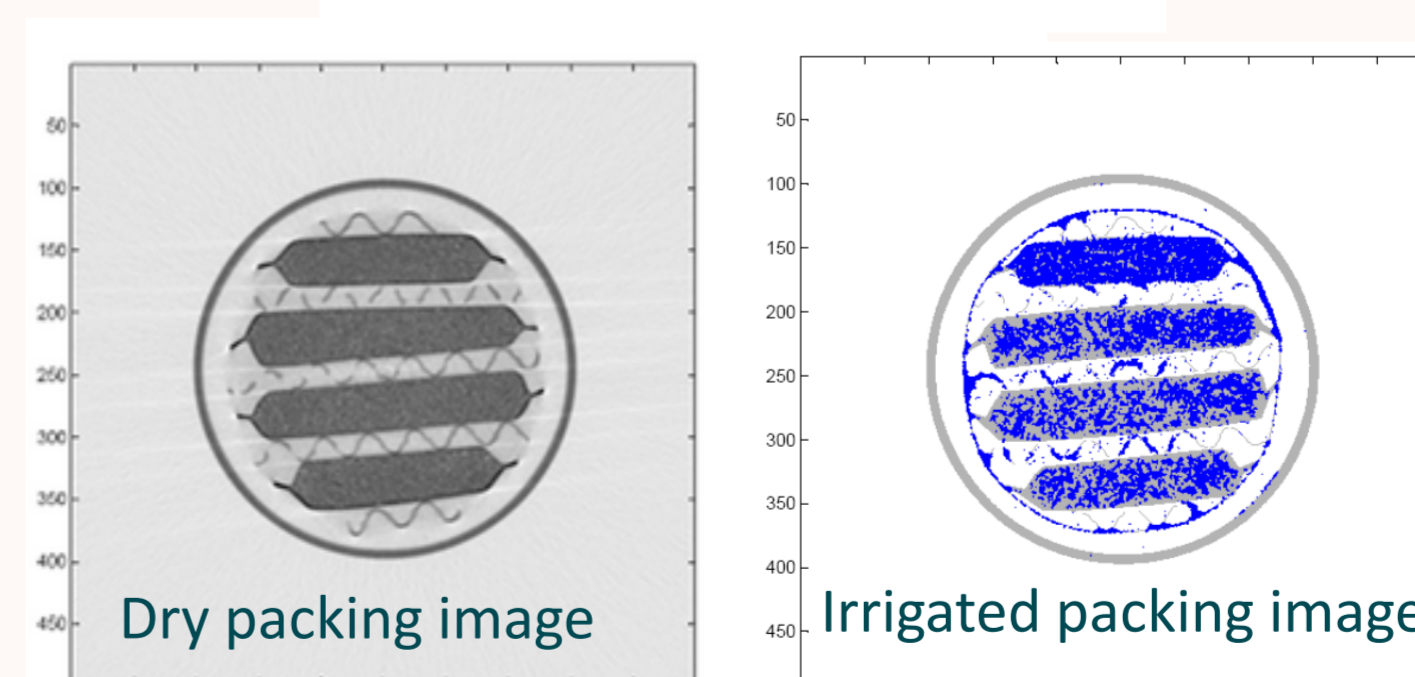
High energy large scale x-ray tomograph



Packed bed absorption column

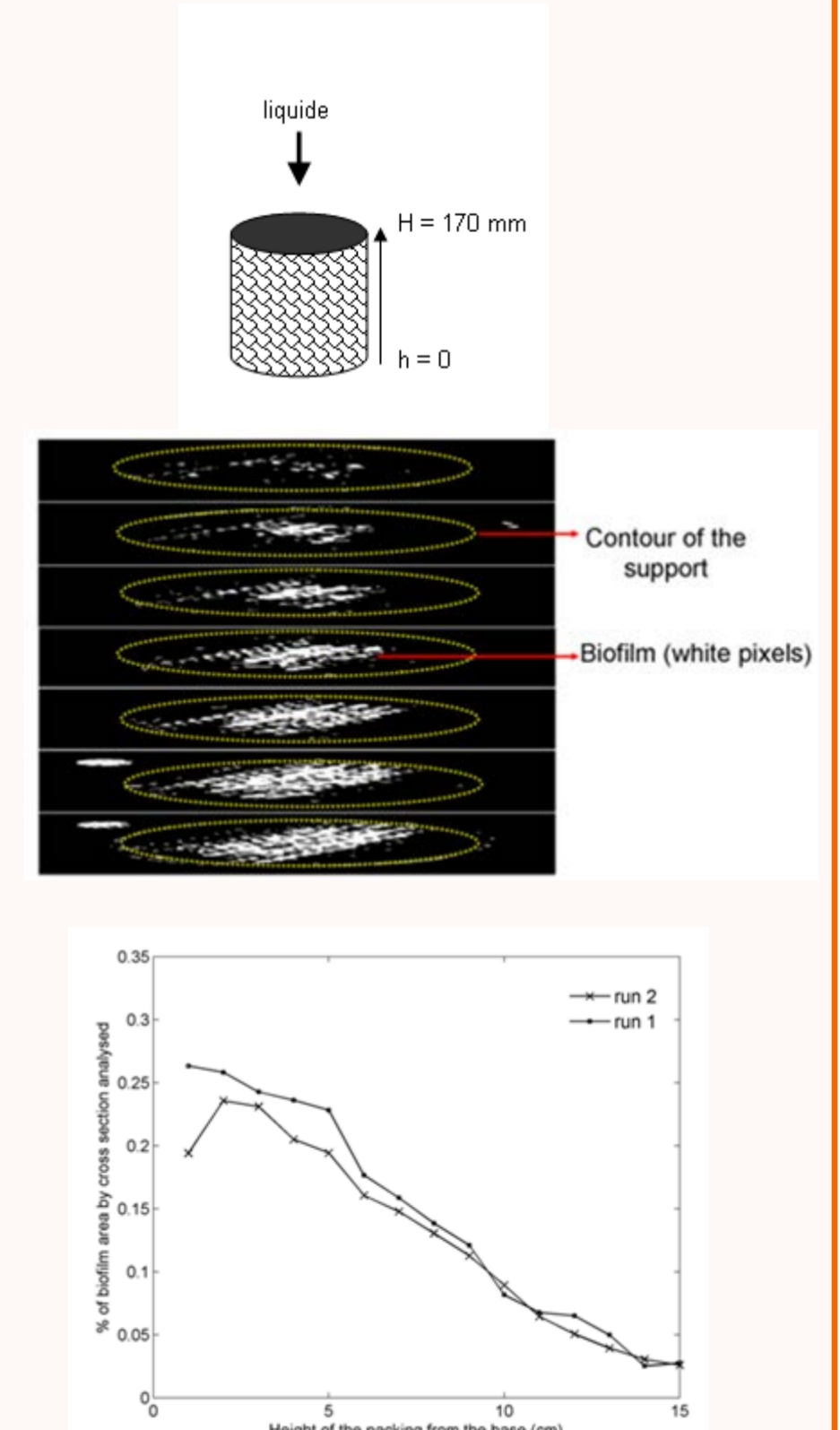


Catalytic distillation column



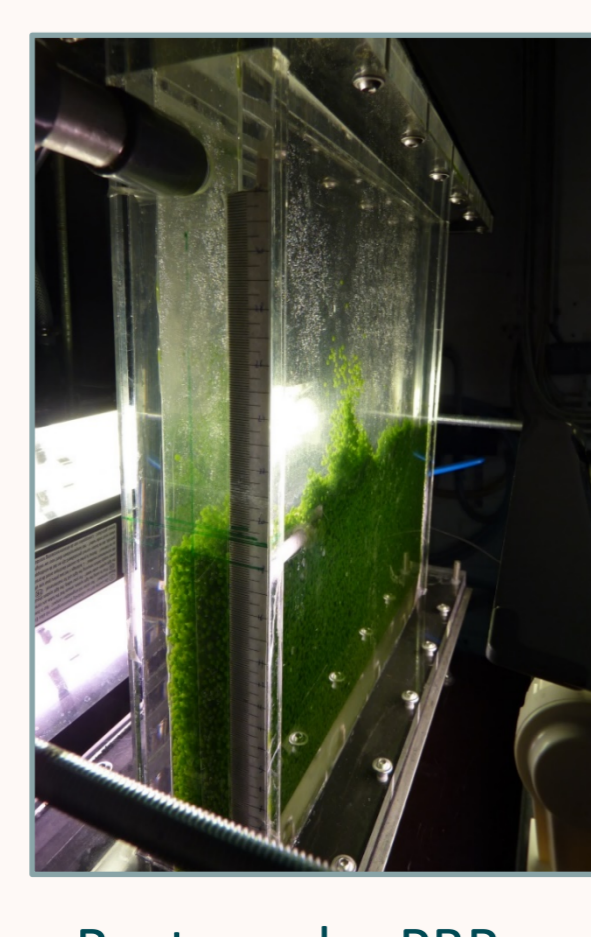
Fixed bed fermenter

Follow up of packing colonization

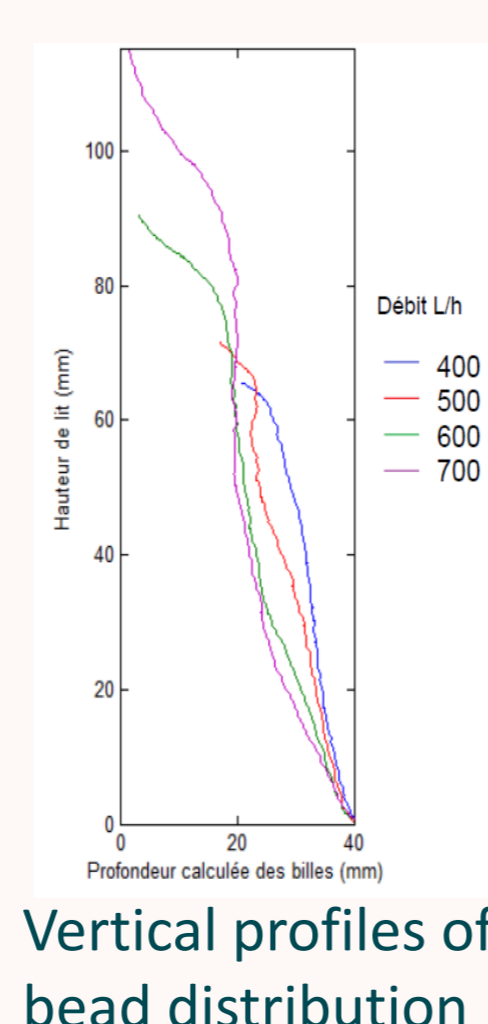


Photobioreactors

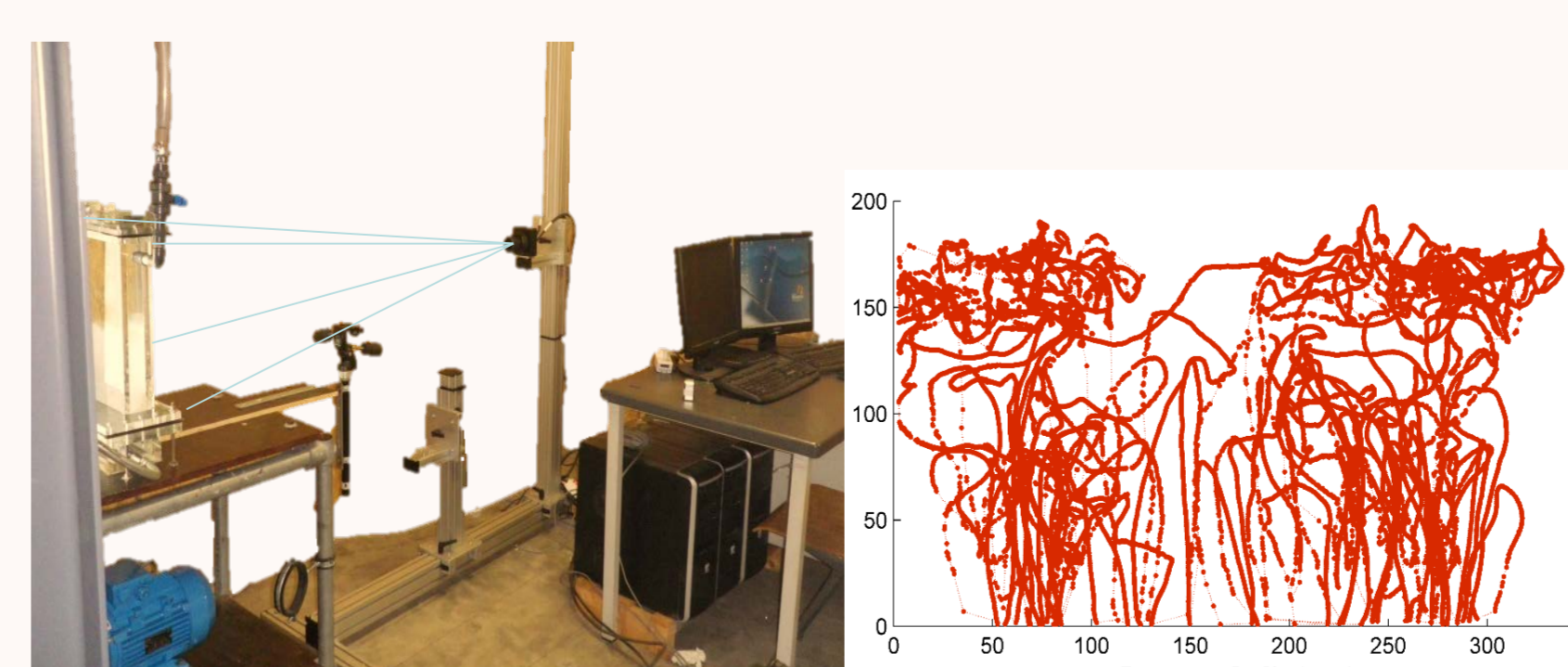
Culture of encapsulated microalgae



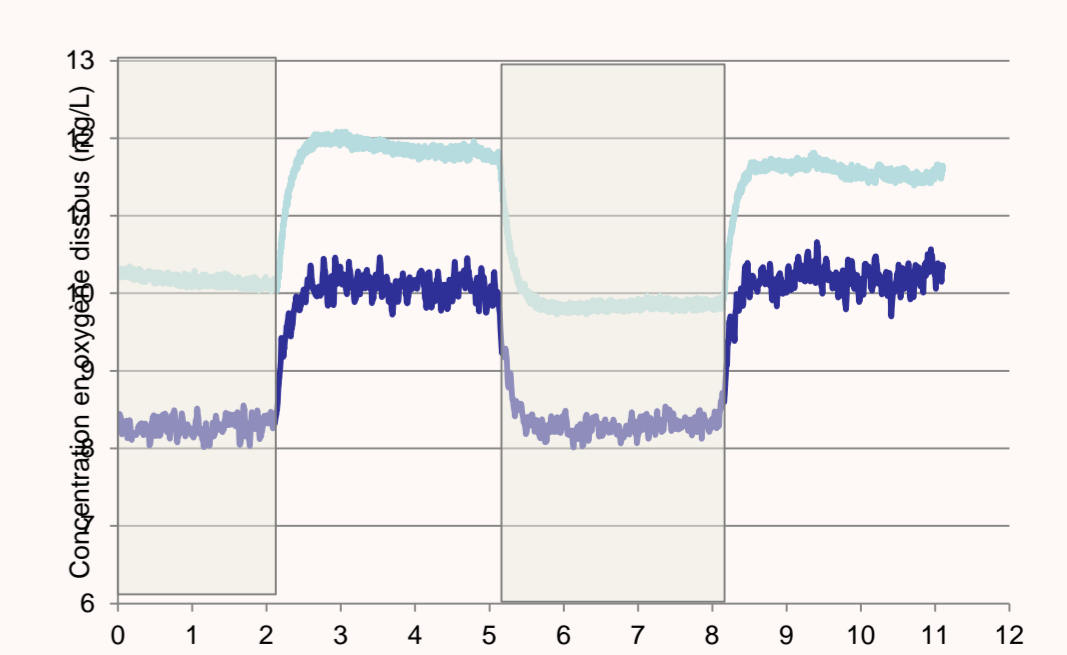
Rectangular PBR



Vertical profiles of bead distribution



Measurement of bead trajectory (optical trajectography)



Follow-up of microalgae activity (dissolved oxygen measurement)