Marie Skłodowska-Curie

Innovative Training Network

"HypoTRAIN"

Hyporheic Zone Processes – A training network for enhancing the understanding of complex physical, chemical and biological process interactions

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Deliverable D2.3

Results of coupled assessment of biogeochemical and ecological processes

Dissemination Level of Deliverable:

PU	Public	**X**
CO	Confidential, only for the members of the consortium (including the Commission Services)	

Results of coupled assessment of biogeochemical and ecological processes

1. Assessing biofilm architectural differentiation in porous systems

At micro-scale a novel fluidic device was designed in order to study the architectural differentiation of multispecies biofilms. A purpose-built porous system (20 x 20 x 0.5 mm) which resembles the heterogeneous flow through the sedimentary environment of the hyporheic zone was used to observe long-term growth of biofilm via time-lapse imaging microscopy at high temporal resolution. These novel chambers are gas tight, allowing the use of inline oxygen sensors to evaluate the functional performance of stream biofilm in porous systems. Through particle image velocimetry the flow field was analytically measured and coupled to the biofilm growth rate. This experimental set-up allowed us to understand the mode of life of stream biofilm in the dark of the hyporheic zone (Scheidweiler et al. In review). The findings of this study advance scientific understanding of the specific mechanisms by which micro-habitat conditions can influence the development of biofilms which in turn are the main drivers for many micropollutant transformation processes.

2. Monitoring of coupled biogeochemical and ecological processes

At reach scale a novel method was developed and successfully deployed for the first time during an interdisciplinary joint field experiment in Berlin, Germany in 2015. Dialysis chambers were used in conjunction with Kojak samples to gather biogeochemical and ecological samples, respectively. This data was supplemented by a suite of hydrological and physical data which allowed coupling between biogeochemical and ecological processes (Peralta-Maraver et al. In review). Measurements were taken at several locations along a ~ 6 km stretch of the river Erpe which allowed upscaling of point measurements to a reach scale. Together with the pioneering work by Scheidweiler et al. on micro-scale processes, these results will allow a holistic understanding of biogeochemical processes which occur in hyporheic zones across multiple spatial scales.