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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Data on origin of hyporheic water

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PU	Public	**X**
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Data on origin of hyporheic water

Between 16th May and 16th June 2016 several ERSs conducted a study on hyporheic exchange in the lowland River Erpe in Germany. Six sites were studied along a 3.5 km river stretch (Fig. 1). These locations were selected as potential upwelling (UW) or downwelling (DW) zones based on preliminary analysis of the hydraulic gradient between the river and groundwater table.

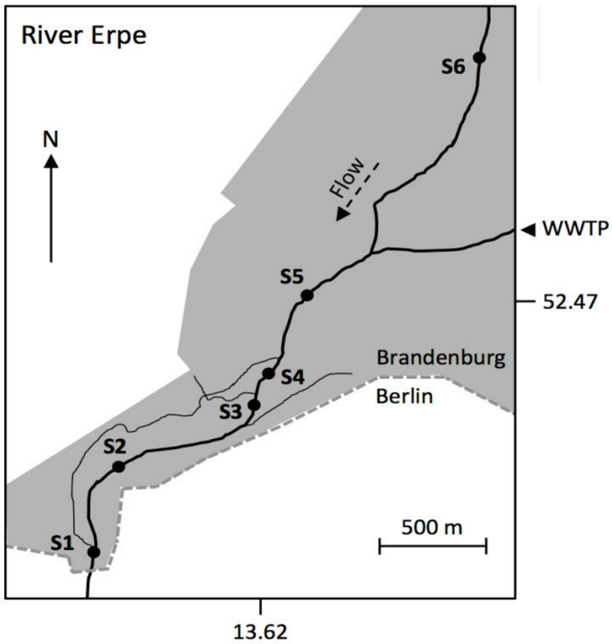

Figure 1. *The study site at the River Erpe with sampling sites (S1 – S6). Effluent input from the municipal wastewater treatment plant (WWTP) Münchehofe is also shown.*

Hydrological conditions at different sites were characterised by measuring vertical streambed fluxes based on sediment temperature. For that purpose, lances with eight temperature sensors (at 2.5, -2.5, -12.5, -17.5, -22.5, -27.5, -37.5 and -57.5 cm sediment depth; resolution 0.04 °C; measurement frequency 10 min; UIT, Dresden, Germany) were installed vertically in the sediment at each study site. Vertical streambed fluxes at each site were calculated by time series analysis of streambed thermal depth profiles during the study period. The measured thermal time series were analyzed with numerical one-dimensional advection–diffusion equations implemented in VFLUX 2 (MATLAB toolbox). Results showed that at sites S1, S3 and S5 the upward flux of water (upwelling conditions) between temperature sensors (negative mean values, Table 1) was dominant throughout the study period. In contrast, at sites S2, S4 and S6 downward flux (downwelling conditions) of water into deeper layers (positive mean values, Table 1) was observed. This pattern was more distinct at sites S4 and S6 as compared to site S2, which showed weak downward or neutral fluxes of water (mean values equal or close to 0) in the first

2.5 cm depth. The large deviation from the mean values observed in upper layers might result from large dial fluctuations in river stage (Table 1).

Table 1. *Mean vertical flux (VF) in m day^{-1} (± standard deviation) between two neighbouring temperature sensors calculated with the 1-D numerical model VFLUX (Matlab). Positive VF values (highlighted in green) indicate downward flux, negative values (highlighted in red) indicate upward flux.*

Depth (cm)	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
0-2.5	+0.250 (0.58)	+0.056 (0.371)	-0.123 (0.361)	+0.646 (0.582)	-0.097 (0.602)	+0.461 (0.651)
2.5-12.5	-0,542 (0.158)	+0.179 (0.034)	-0.462 (0.442)	+0.371 (0.211)	-0.548 (0.368)	+0.444 (0.210)
12.5-17.5	-0.310 (0.102)	+0.057 (0.109)	-1.037 (0.771)	+0.898 (0.108)	-0.087 (0.290)	+0.441 (0.138)
17.5-22.5	+0.124 (0.143)	-0.026 (0.073)	-0.497 (0.357)	+0.270 (0.128)	+0.059 (0.211)	+0.319 (0.169)
22.5-27.5	-0.262 (0.166)	-0.0782 (0.149)	-1.138 (0.370)	-0.370 (0.136)	-0.281 (0.597)	+0.039 (0.213)
27.5-37.5	-0.230 0.134)	-0.452 (0.072)	-0.058 (0.098)	-0.205 (0.129)	-0.142 (0.308)	+0.123 (0.163)
37.5-57.5	-0.031 (0.186)	-0.409 (0.075)	-0.758 (0.516)	-0.006 (0.135)	-0.098 (0.166)	-0.032 (0.356)