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The impact of hyporheic connectivity on the nitrogen metabolism as the groundwater - surface water interface

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This study investigates the impact of physical and redox chemical riverbed conditions on the dynamic exchange fluxes, on transport and metabolism of nitrogen within the hyporheic zone. At the River Leith in Cumbria, UK eighty seven piezometers were installed in nested arrays at several transects and cross sections. Pressure head differences between the piezometers of different depths and the river have been recorded in order to observe the temporal and spatial dynamics of exchange fluxes along the groundwater - surface waters interface. Stream water and pore water sampled in the piezometers have been analysed for nitrogen species at fortnightly time steps corresponding with the hydraulic head observations. The analyses of the hydraulic head gradients between the piezometers and the river detected complex spatial pattern and some significant temporal dynamics of fluxes along the groundwater - surface water interface. Generally the groundwater is contributing to the river with variable intensities but also stream reaches which are gaining and loosing groundwater at opposite sites of a cross section were identified. The pore water nitrate concentrations correlate with physical streambed characteristics such as transmissivities and the resulting intensities of exchange fluxes and flow directions as well with the chemical characteristics of the sediment material. The vertical distribution of nitrate within the analysed profiles is mainly characterised by a decrease of nitrate concentrations with depth. In the riffle section high concentrations of up to 8 mg/l could be found in shallow top gravel layers on top of in-situ sandstone, low concentrations in some anoxic, organic rich and peat layers. Low nitrate concentrations within the sediment strongly corre-

sponds with the amount of organic carbon as a reductive agent and the existence of anoxic conditions which promote denitrification. Within pools generally higher nitrate concentrations than in riffles were detected (up to 50 mg/l). A typical longitudinal pattern of a pool - riffle - pool sequence was characterised by high nitrate concentrations in the pools, low nitrate concentrations in the beginning of a riffle (which we attribute to natural attenuation processes) and a subsequent increase towards the end of the riffle.