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HYDROLOGIC CONTROLS OVER THE SEASONAL NITRATE EXPORT MECHANISMS IN A FORESTED WATERSHED

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It is well accepted that hydrologic data alone are rarely sufficient to test hydrologic process assumptions. Furthermore, to be able to relate a specific hydrologic situation with ecohydrological and biogeochemical processes, both, hydrologic and water chemistry time-series data are needed. The tracing and identification of hydrologic and biogeochemical processes in the scope of a hydrologic event requires high frequency measurements of hydrologic processes which are supported by simultaneous high frequency measurements of stream water chemistry. From the hydrologic and biogeochemical points of view, the benefits of such data-sets are mutual. On one hand hydrologic data enable us to trace fluxes of dissolved chemical constituents, and on the other hand, the stream chemistry tracing enables us to uncover the fundamental mechanisms of functioning of hydrological processes. High frequency chemical measurements are also valuable for testing various hydrological models.

During the last two years we have established a hydrologic monitoring system on the Padez stream forested watershed in the south-west part of Slovenia. The precipitation area of the Padez stream comprises 43 km^2 and reaches deeply into the Brkini hilly area. The stream network is well developed as the flysch rock structure has very low permeability. The forested Padez stream watershed has been equipped with a meteorological station, five rain gauges and four limnigraphs which continuously measure water level and water velocity. Additionally, the hydrological monitoring of the Padez watershed has been supplemented with high-frequency measurements of the stream water chemistry, which include measurements of water temperature, nitrate, ammonium, conductivity, depth, dissolved oxygen, total dissolved solids (TDS), oxidation

reduction potential (ORP) and pH.

The water chemistry variability and especially behaviour of nitrate export from the watershed during different hydrologic conditions in different seasons has been analyzed. Continuous measurements during five floodwaves for the period October 2005 to December 2006 have been assembled. Seasonal patterns of the nitrate concentration during baseflow conditions show only small variability when compared to hydrologically induced oscillations. Influence of hydrologic conditions over the nitrate export was disclosed by continuous measurements of nitrate concentration during high discharges. Interactions and prevalence of biogeochemical controls over the hydrologic controls of nitrate export, and vice versa, has been observed during different seasons. In the growth season the concentrations of the nitrate express a positive correlation with the increased discharge whereas in the dormant season (late winter and early spring), the diurnal biogeochemical patterns of nitrate fluxes have prevailed over the changeable hydrologic conditions.