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Applicability of rapid and on-site measured enzyme activity for surface water quality monitoring in an agricultural catchment

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For the near real time and on-site detection of microbiological fecal pollution of water, the measurement of beta-D-Glucuronidase (GLUC) enzymatic activity has been suggested as a surrogate parameter and has been already successfully operated for water quality monitoring of ground water resources (Ryzinska-Paier et al. 2014). Due to possible short measure intervals of three hours, this method has high potential as a water quality monitoring tool. While cultivation based standard determination takes more than one working day (Cabral 2010) the potential advantage of detecting the GLUC activity is the high temporal measuring resolution.

Yet, there is still a big gap of knowledge on the fecal indication capacity of GLUC (specificity, sensitivity, persistence, etc.) in relation to potential pollution sources and catchment conditions (Cabral 2010, Ryzinska-Paier et al. 2014). Furthermore surface waters are a big challenge for automated detection devices in a technical point of view due to the high sediment load during event conditions.

This presentation shows results gained form two years of monitoring in an experimental catchment (HOAL) dominated by agricultural land use. Two enzymatic measurement devices are operated parallel at the catchment outlet to test the reproducibility and precision of the method. Data from continuous GLUC monitoring under both base flow and event conditions is compared with reference samples analyzed by standardized laboratory methods for fecal pollution detection (e.g. ISO 16649-1, Colilert18). It is shown that rapid enzymatic on-site GLUC determination can successfully be operated from a technical point of view for surface water quality monitoring under the observed catchment conditions. The comparison of enzyme activity with microbiological standard analytics reveals distinct differences in the dynamic of the signals during event conditions.

Cabral J. P. S. (2010) “Water Microbiology. Bacterial Pathogens and Water” International Journal of Environmental Research and Public Health 7 (10): 3657–3703.

Ryzinska-Paier, G., T. Lendenfeld, K. Correa, P. Stadler, A.P. Blaschke, R. L. Mach, H. Stadler, AKT Kirschner und A.H. Farnleitner (2014) A sensitive and robust method for automated on-line monitoring of enzymatic activities in water and water resources. Water Sci. Technol. in press