Geophysical Research Abstracts
Vol. 15, EGU2013-8086, 2013
EGU General Assembly 2013

Interaction of on-site and near real time measured turbidity and enzyme activity in stream water.

Philipp Stadler (1), Andreas H. Farnleitner (2), and Matthias Zessner (1)

(1) Centre for Water Resource Systems, Vienna University of Technology, Karlsplatz 13/222, A-1040, Vienna, Austria www.waterresources.at, (2) Interuniversity Cooperation Centre Water & Health, Institute of Chemical Engineering and Technical Biosciences, Vienna University of Technology, Gumpendorferstr. 1a/166-2, A- 1060 Vienna, Austria www.waterandhealth.at

On-site and on-line systems that provide an integrated surveillance of physicochemical and microbiological parameters gain significance in water quality monitoring. Particular relating to diffuse pollution from agricultural areas and use-orientated protection of waters the detection of faecal pollution is a fundamental part.

For the near real time and on-site detection of microbiological faecal pollution of water, the beta-D- Glucuronidase (GLUC) enzymatic activity has been suggested as a surrogate parameter. 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 sensitivity and specificity concerning the faecal indication capacity of GLUC in relation to standard assays (Cabral 2010).

Interference effects of physicochemical parameters on the enzymatic activity respectively fluorescence have been discussed (Molina-Munoz et al. 2007; Tryland and Fiksdal 1998, Biswal et al. 2003). Results from a monitoring of a rivulet in an agricultural catchment in Lower Austria (HOAL – Hydrological Open Air Laboratory) are presented here. The HOAL offers technical resources that allow measurements at high temporal and spatial resolution and to apply various hydrological methods in one catchment. Two automated enzymatic measuring devices (Coliguard, mbOnline, Austria) and physicochemical in-stream measurements are used, as well as in-stream spectroscopy (spectrolyser, s::can, Austria). Accuracy of both enzymatic measuring devices is compared through diverse hydrological and seasonal conditions. Reference analyses by cultivation based determination were performed. Data from Coliguard devices is combined with physicochemical and spectroscopy data to gain information about the influence of turbidity on rapid GLUC measurements of stream water. During event run off conditions with high sediment load, accuracy of the GLUC determination was assayed. Various on-site set ups were tested to ascertain the use of sample prefiltration. We would like acknowledge financial support from the Austrian Science Funds (FWF) as part of the Vienna Doctoral Programme on Water Resource Systems (DK-plus W1219-N22).

References:

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

Biswal , N. , S. Gupta, N. Ghosh, and A. Pradhan 2003. "Recovery of turbidity free fluorescence from measured fluorescence: An experimental approach. Optics Express 11, (24): 3320.

Molina-Munoz, M., J. M. Poyatos, R. Vilchez, E. Hontoria, B. Rodelas, and J. Gonzalez-Lopez. 2007. “Effect of the Concentration of Suspended Solids on the Enzymatic Activities and Biodiversity of a Submerged Membrane Bioreactor for Aerobic Treatment of Domestic Wastewater.” Applied Microbiology and Biotechnology 73 (6): 1441–1451.

Tryland, I., and L. Fiksdal. 1998. “Enzyme Characteristics of β-d-Galactosidase-and β-d-Glucuronidase-Positive Bacteria and Their Interference in Rapid Methods for Detection of Waterborne Coliforms andEscherichia Coli.” Applied and Environmental Microbiology 64 (3): 1018–1023.