



Responses of diatom communities to hydrological processes during rainfall events

Naicheng Wu, Claas Faber, Uta Ulrich, and Nicola Fohrer

Department of Hydrology and Water Resources Management, Institute for Natural Resource Conservation, Kiel University, Kiel, Germany (nwu@hydrology.uni-kiel.de)

The importance of diatoms as a tracer of hydrological processes has been recently recognized (Pfister et al. 2009, Pfister et al. 2011, Tauro et al. 2013). However, diatom variations in a short-term scale (e.g., sub-daily) during rainfall events have not been well documented yet.

In this study, rainfall event-based diatom samples were taken at the outlet of the Kielstau catchment (50 km²), a lowland catchment in northern Germany. A total of nine rainfall events were caught from May 2013 to April 2014. Non-metric multidimensional scaling (NMDS) revealed that diatom communities of different events were well separated along NMDS axis I and II, indicating a remarkable temporal variation. By correlating water level (a proxy of discharge) and different diatom indices, close relationships were found. For example, species richness, biovolume (μm^3), Shannon diversity and moisture index01 (%), classified according to van Dam et al. 1994) were positively related with water level at the beginning phase of the rainfall (i.e. increasing limb of discharge peak). However, in contrast, during the recession limb of the discharge peak, diatom indices showed distinct responses to water level declines in different rainfall events.

These preliminary results indicate that diatom indices are highly related to hydrological processes. The next steps will include finding out the possible mechanisms of the above phenomena, and exploring the contributions of abiotic variables (e.g., hydrologic indices, nutrients) to diatom community patterns. Based on this and ongoing studies (Wu et al. unpublished data), we will incorporate diatom data into End Member Mixing Analysis (EMMA) and select the tracer set that is best suited for separation of different runoff components in our study catchment.

Keywords: Diatoms, Rainfall event, Non-metric multidimensional scaling, Hydrological process, Indices

References:

- Pfister L, McDonnell JJ, Wrede S, Hlúbiková D, Matgen P, Fenicia F, Ector L, Hoffmann L. 2009. The rivers are alive: on the potential for diatoms as a tracer of water source and hydrological connectivity. *Hydrological Processes* **23**: 2841-2845.
- Pfister L, Wetzel CE, Martínez-Carreras N, Frentress J, Ector L, Hoffmann L, McDonnell JJ. 2011. Do diatoms run downhill? Using biodiversity of terrestrial and aquatic diatoms to identify hydrological connectivity between aquatic zones in Luxembourg. AGU Fall Meeting.
- Tauro F, Martínez-Carreras N, Wetzel CE, Hissler C, Barnich F, Frentress J, Ector L, Hoffmann L, McDonnell JJ, Pfister L. 2013. Fluorescent diatoms as hydrological tracers: a proof of concept percolation experiment. EGU abstract, EGU2013-7687-4.
- van Dam H, Mertens A, Sinkeldam J. 1994. A coded checklist and ecological indicator values of freshwater diatoms from the Netherlands. *Netherlands Journal of Aquatic Ecology* **28**:117-133.