

## USING BIODIVERSITY OF DIATOMS TO IDENTIFY HYDROLOGICAL CONNECTIVITY IN THE HILLSLOPE-RIPARIAN-STREAM SYSTEM

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In recent years, there have been calls for new eco-hydrological approaches to answer questions on water source and connectivity in the landscape. In this study, hydrologists and ecologists jointly assess the potential for diatoms to infer runoff generation processes. Diatoms from various terrestrial and subaerial substrates (bryophytes, litter and leaves), as well as from aquatic habitats (epilithon, epipelon and drift samples) were collected at seasonal and event scales in two headwater catchments in Luxembourg. Spatial ordination (non-metric multi-dimensional scaling, NMDS) of samples revealed distinct spatial patterns in the organization of diatom communities along three landscape units: hillslope (mosses), riparian zone (mosses, soil, leaves) and streambed (epilithon, epipelon, drift at baseflow, drift during storm events). We also noted a high dissimilarity among diatom communities sampled in the riparian zone and on hillslopes in the Weierbach (schists) and Huewelerbach (sandstone) catchments. Amongst the ca. 400 diatom species identified, very few were common to both geological regions, indicating highly contrasting communities between catchments. This suggests the potential for diatoms to determine the spatial origin of water (i.e. contrasting geological sub-areas) at larger scales. Comparison of diatoms in stream water samples taken during baseflow and storm conditions have shown a systematic flushing of terrestrial diatoms to the stream in response to incident precipitation and increasing discharge. Mixing diagrams (SiO<sub>2</sub> and specific absorbance – 254 nm) suggest a substantial contribution of the soil water component to total runoff. Diatom abundance proportions appeared to be very sensitive to incident precipitation, suggesting rapid onset of connectivity between the soil surface and the stream network. Almost simultaneously to incoming precipitation, the abundance of diatoms from soil habitats summed with those from terrestrial epiphytic habitats increases up to 20-30% of the total number of drift diatoms inside the stream during summer rain events. Species from terrestrial habitats include poorly known taxa such as *Navicula obsoleta* Hustedt, *N. parsura* Hustedt, and *Nitzschia harderi* Hustedt. The diatom community from riparian and hillslope areas was dominated by species belonging to the genera *Eunotia* Ehrenberg, *Diadesmis* Kützing, *Hantzschia* Grunow, *Luticola* D.G. Mann, *Navicula* Bory and *Pinnularia* Ehrenberg.