Geophysical Research Abstracts
Vol. 19, EGU2017-13823, 2017
EGU General Assembly 2017


# Is DOM driver of the microbial carrying capacity in pristine porous groundwater ecosystems? – lab-scale experiments in 2D sediment flow-through microcosms

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Groundwater ecosystems are an essential resource for drinking water and at the same time constitute fascinating habitats subject to increasing (anthropogenic) disturbances. In our research, we look for ways to qualitatively and quantitatively access, and predict the resistance and resilience (potential) of groundwater ecosystems in consequence of selected disturbances. As a central goal we hope to identify and quantify the underlying biological and ecological key drivers of the microbial Carrying Capacity (mCC) – an ecological concept established in macro-ecology - we assume directly connected to the ecosystem's productivity and the resistance and resilience of aquifers. We further hypothesize, that the ecosystems' mCC is a result of available energy and constitutes a promising proxy for the potential of groundwater ecosystems to withstand impacts and recover from it.
In a first approach we studied the dynamics of the microbial standing stock (biomass) and growth (productivity) productivity of a natural groundwater microbial community in parallel 2-D sediment flow-through systems. Selected zones of the model aquifers were disturbed by elevated DOM concentrations. Both the 'mobile' (free floating) and 'sessile' (sediment attached) microbial components were followed over time in terms of biomass, growth, and specific activities (ATP, carbon use efficiency) and taxonomic composition.
Sediment regions supplied with elevated concentrations of natural DOM showed increased biomass, activities and taxonomic richness with the sediment community, while differences in the mobile microbial were marginal. Specifically, the carbon use efficiency was significantly increased in the DOM amended sediment zones. In contrast, the microbial community that received the mainly refractory natural background DOM was able to metabolize polymers more efficiently in substrate use tests (ECOLOG), seen as an adaptation to the energy-poor subsurface. Quasi-stationary conditions were reached in the model aquifers only after several weeks. The quantitative link between microbial productivity and mCC is currently evaluated.