BayCEER Kolloquium

Lectures in Ecology and Environmental Research

WS 2018/19

UNIVERSITÄT BAYREUTH

Thursday
8.11.2018
12:00 in H6, GEO

Dr. Ben Gilfedder

Limnological Research Station, BayCEER, UBT

Groundwater - Surface Water Exchange: From Mountains to the Sea

Groundwater-surface water exchange is often a controlling factor in water resource management, ecosystem health and material cycling in river networks. However it is often overlooked when assessing water allocations, aquatic ecosystem services and stream vulnerability. This is often due to departmental separation between hydrology and hydrogeology, the invisible often diffusive flux of groundwater to surface waters, and the availability of robust methods to quantify water exchange at the catchment scale. It is also due to the difficulty in obtaining representative values in heterogeneous groundwater systems for standard parameters such as the hydraulic conductivity, or chloride concentrations. This is especially due for chloride in Europe, where groundwater chloride concentrations are extremely variable compared to arid and semi-arid countries such as Australia.

In this presentation I will focus on the use of radon-222 (^{222}Rn) as a quantitative tracer for groundwater discharge to streams and lakes from the headwaters to the dynamic coastal regime. ^{222}Rn is produced in the groundwater system through decay of ^{238}U series isotope ^{226}Ra. The ubiquitous presence of ^{238}U in the mineral matrix of aquifer and stream sediments results in a consistently and significantly higher ^{222}Rn concentration in groundwater than surface water. This emanation from the aquifer matrix can be used for two different purposes in groundwater-surface water studies: 1) to quantify groundwater discharge to rivers on km scales using mass-balance, and 2) calculate residence times of young surface water in river and bank sediments (e.g. hyporheic zone) on times scales of up to 20 days. In particular the large contrasting activities between surface water and groundwater means that ^{222}Rn can be used in many different environments to trace water flows at the groundwater surface water interface. New developments in ^{222}Rn methodologies mean that it can be measured in point samples in the field or on-line using continuous measurement devices to trace the dynamic of groundwater-surface water exchange in a diverse array of environments. By combining water fluxes from the ^{222}Rn analysis and chemical measurements it is also possible to estimate turnover of contaminants such as nitrate in the hyporheic zone. This will be the primary focus of this presentation.

Bayreuth Center of Ecology and Environmental Research

Bayceer

The lectures are an inter-disciplinary platform for students, junior and senior scientists. Abstracts and further information: www.bayceer.uni-bayreuth.de/kolloquium/