Events control of karst aquifer recharge

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Fissured karst aquifers are vulnerable resources that react very sensitive to the dynamics of recharge events

The description of water and tracer flow in fissured aquifers and recharge event integration are generaly roughly depicted. In fact, there are characterized by multiple water transit velocities ranging from fast flow through fissured network to slow water infiltration in porous media.

An experimental field site located in French Burgundy under a topographic hill with well recognized boundaries has been monitored in-situ (head, temperature, conductivity, discharge flow), continously sampled for stable isotopes and major ion analyses on several sites (springs and boreholes) since two years. This long time monitoring allow us both to define baselines and discuss the impact of recharge events on groundwater dynamics.

The tracers $\delta^{13}C$, ^{14}C, $\delta^{2}H$, $\delta^{18}O$ and major chemical constituents have been used to describe the temporal response of the water flow through the unsaturated zone. The geochemical signals have been monitored at different levels of the system (precipitation, boreholes and springs) during several rainfall events. The preliminary results highlight a wide distribution of transit velocities during a recharge event.

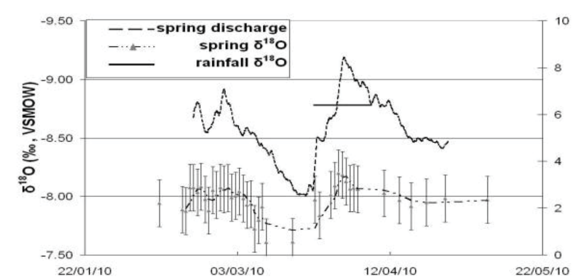

Figure 1: Times series of discharge and $\delta^{18}O$ at R14 spring.

Specific velocities or residence times of the different reservoirs as determined by recharge event characterisation, can be supported by tracers as ^{85}Kr, ^{39}Ar, ^{3}H, ^{3}He, CFCs, SF6 [1]. A recharge event will be monitoring (February 2012) on 2 springs and 1 boreholes. Tracers will allow to realize a geochemical deconvolution and to obtain the water residence times in the fractures and the matrix of this fissured aquifer.

[1] Corcho (2007) *Water Resources Research* **43**, 16pp.

Biogeochemical dynamics related to seasonal changes and biomass-density patterns in rhyzosphere sediments of a *Zostera noltii* meadow

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This study was conducted in the Arcachon bay that shelters the largest *Zostera noltii* meadow in Europe [1]. A severe but non-homogeneous decline of this meadow coverage has been recently observed. In this context, we investigated seasonal changes and short-scale spatial variability of sediment biogeochemistry in a tidal mudflat of this lagoon colonized by a stable eelgrass meadow. Cores were collected at low tide on vegetated and unvegetated sediment over an annual cycle from autumn 2010 to summer 2011. Additional sediment cores were collected along a density-biomass gradient of seagrass in autumn and summer. Concentrations of major redox species were measured in sediment porewaters. In sediment solid-phase, two reactive fractions of Fe and P were extracted. Total oxygen fluxes were determined under light and dark conditions and used to calculate the benthic gross primary productivity (GPP).

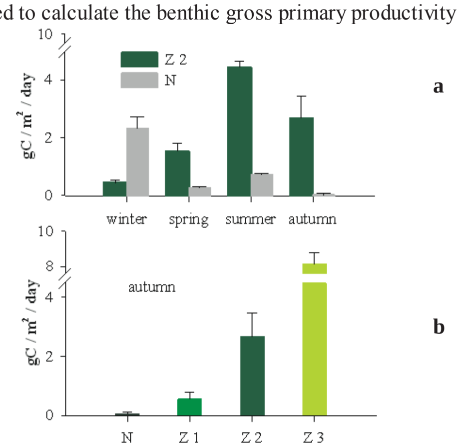

Figure 1: Daily GPP calculated for vegetated (Z) and unvegetated sediments (N) over an annual cycle (**a**), and in autumn 2010 (**b**) along a density-biomass gradient of *Z. noltii* (Z1 to Z3) (*n=4 - 6*).

Some redox species such as dissolved iron did not show significant seasonal changes and along the biomass gradient. For other parameters, e.g. DIP or GPP, the variability observed along the biomass gradient was higher than the one observed between seasons (Fig.1). Results suggest that the effect of seagrass on sediment biogeochemistry can be strongly dependent on the plant biomass, which highly vary with seasons but also on short and large space scales. Hypothesis to explain how this component influences the biogeochemistry of superficial sediments are proposed.

[1] Plus *et al.* (2010) *Estuar. Coast. Shelf Sci.* **87**, *357-366.*