Rare earth elements as natural tracers in the Thau basin karst system (Southern France)

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Rare Earth Elements (REE) have been more frequently used as natural tracers in hydrogeology (Smedley, 1991; Johannesson *et al.*, 1996), with the analytical progresses for their determination at very low concentrations(ng/L). These elements cannot be considered as perfect conservative tracers, but REE patterns of groundwaters are mostly inherited from aquifer rocks through which they flow. As a consequence, REEs can be useful to study flow pathways and water mixing processes at different scales.

Because of the few REE studies realized in karst environment, the method was applied to the karst system of the Thau basin (southern France), which is characterized by a high complexity of water mixing processes (Aquilina *et al.*, 2002). Three endmembers waterbodies(hydrothermal, karstic and sea or brackish waters) are present. The Vise submarine spring constitutes one of the main permanent outlet of the aquifers.

Rain, surface and ground waters were sampled from 2005 to 2007 over the Thau basin karst system. Major elements were determined by ionic chromatography. Trace elements and REE, after preconcentration, were analyzed by ICP-MS. Characteristic REE profiles enable to differenciate several types of water and to follow the hydrodynamics of the submarine spring. The study allowed to individuate the different concerned aquifers and to illustrate their possible temporal connections in function of the hydrologic cycle. Further studies are under progress to investigate REE complexation with organic matter.

References

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Diverse active microbial communities in a tidal flat sediment as deciphered by a multidisciplinary approach

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Up to six meter long sediment cores were recovered from a backbarrier tidal flat area of the island of Spiekeroog in the Northwest German Wadden Sea and analyzed by a combination of complementary geochemical, molecular biological and microbiological methods to investigate the activity and composition of microbial communities.

One of our analytical approaches is the analysis of intact polar lipids (IPLs) using HPLC-ESI-MS. These diagnostic membrane lipids are rapidly degraded after cell lysis and thus are considered suitable biomarkers to trace viable microorganisms.

The quantities of the detected IPLs decreased only slightly with depth and correlate well with the total cell counts obtained by DAPI staining.

Furthermore, phospholipids with alkyl diether and mixed alkyl-acyl side-chains become dominant with increasing depth. In accordance with the molecular biological results this may indicate a substantial proportion of sulphate-reducing bacteria (SRB) in the microbial community even in deeper sediment layers because these lipids were detected in mesophilic SRBs (Rütters *et al*., 2001).

Whereas in the uppermost layers phospholipid-type diethers of archaeal origin were absent, archaeol-containing phospholipids were detected throughout the deeper part of the sediment column. In layers with low contents of methane high numbers of ANME-2 and ANME-1 archaea were found using molecular biological methods.

The major IPLs detected in a deep sulphate-methane transition zone were phospholipids with archaeol and hydroxyarchaeol cores which support the identification of ANME-2 consortia. The isotopic composition of these diethers is currently examined to show whether they are constituents of cell membranes from archaea mediating AOM.

References

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