Comparison of tools and protocols for groundwater sampling

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COMPARISON OF TOOLS AND PROTOCOLS FOR GROUNDWATER SAMPLING

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Prevention or management of pollution of groundwater is based on sampling. Sampling leads to determine the water quality and in case of failure, to understand origin and evolution. Data must be reliable, the representativeness of a groundwater sample is essential. But obtain a sample which is "representative" of the water quality in the surrounding geological formation is partly related to the tools and protocols used. Remarkable progress has been done in site characterization, monitoring and field instrumentation over the past 25 years but some issues remain and profession lack of demonstration to clarify certain choices on tools and protocols both best suited to the situation encountered and also to the sampling purpose : use passive or active sampling technique ? use multi-level sampling ? loss of Volatile Organic Compounds ? influence of vertical flows in wells ? influence of purge ? influence of filtration, decantation (site or laboratory) ?... A comparison of existing technology, whether or not conventionally employed by operators, is currently underway by INERIS with academic and private partners - period 2014 to 2017.

Peristaltic pump   PDB   Discrete interval sampler
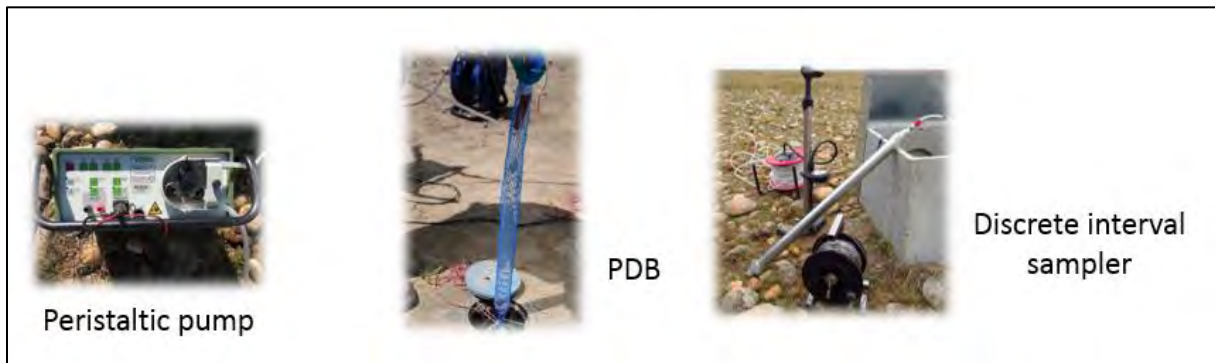
What is the best choice on tool and protocol relevant to the situation and the sampling goal ?

This work aims to give illustrations, trends and recommendations on the influence of a change on concentrations results based on the data obtained on actual polluted sites and on an experimental tank (INERIS, Aix-en-Provence, Fr).
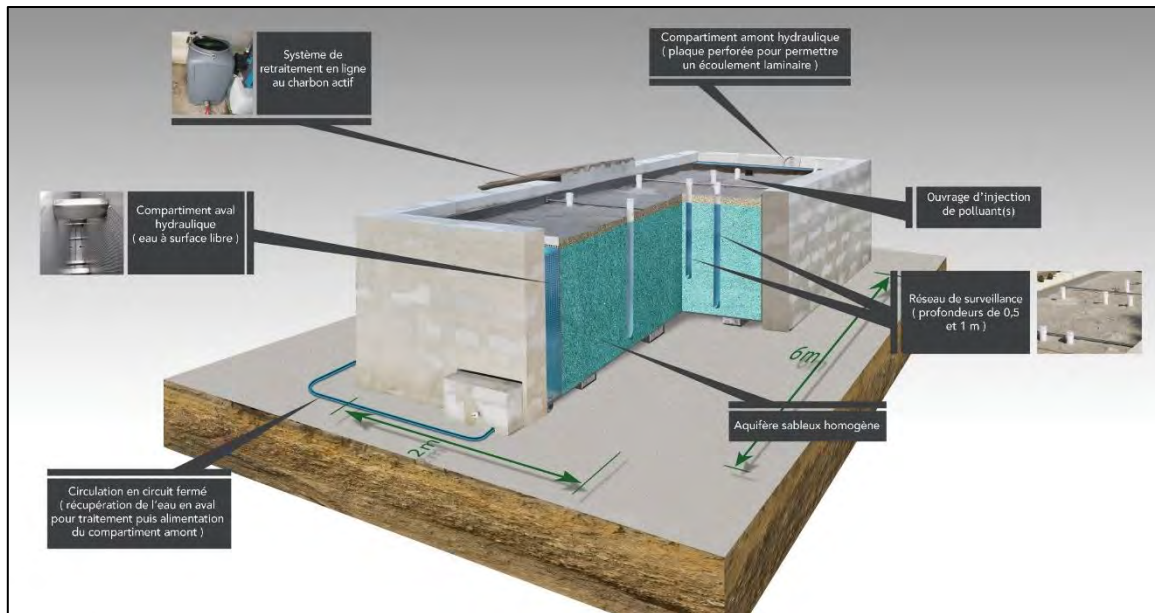
Metric scale: experimental tank (INERIS, Aix-en-Provence)

This comparison process will lead to the acquisition of a large amount of data. Interpretation of the results will allow to answer some questions mentioned above.

Results for BTEX groundwater sampling with different tools

At this stage, for example, the acquired data concerning a surface sampling on three sites and tank show that for BTEX (benzene, toluene, ethylbenzene and xylenes), different sampling tools provide concentrations comparable considering analytical uncertainty (with Low-flow purging, packers coupling with bladder pump, bailer, discrete interval sampler…).
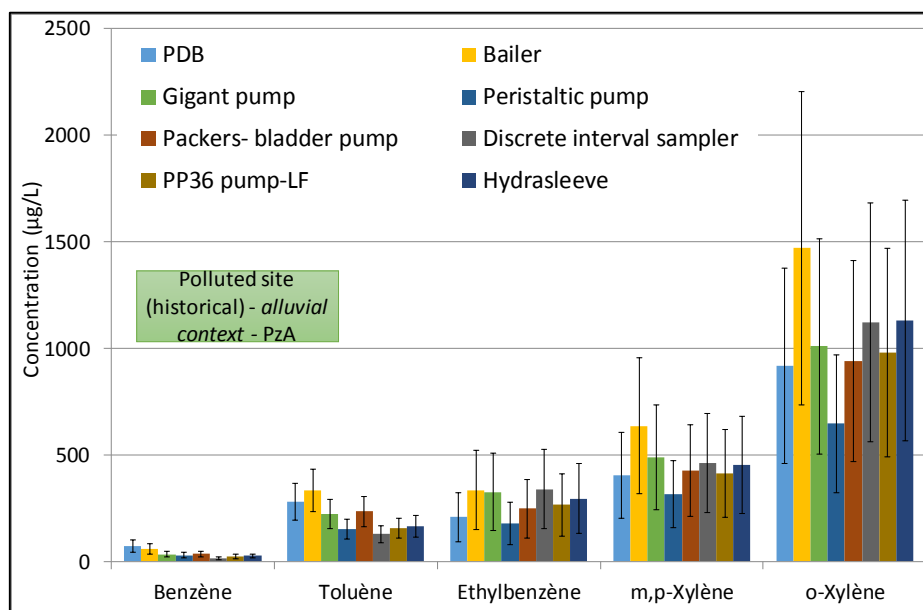

Example – Polluted site (historical)
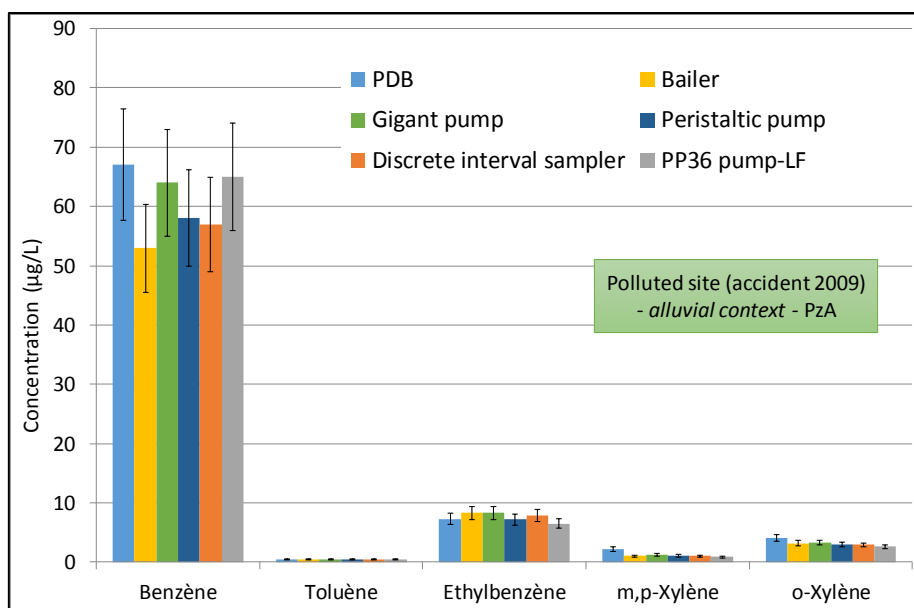
Example – Polluted site (recent)

This trend indicate in this case (dissolved BTEX plume sampling) a small influence of volatilisation in management of groundwater pollution.

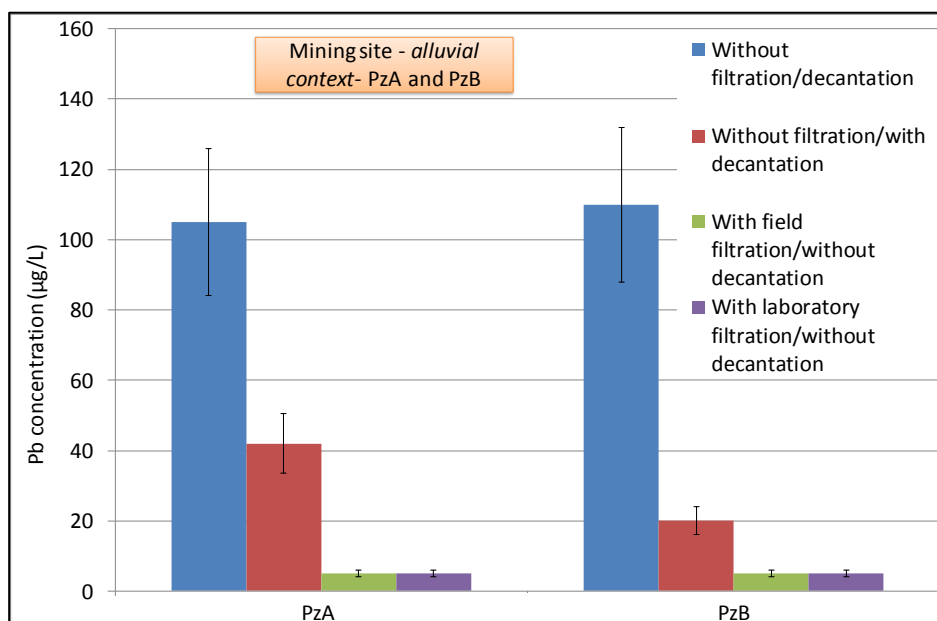Results for groundwater sampling with different protocols

On the other hand, different results illustrate concentrations variations with or without purge and the importance of knowing the preparation carried out by the laboratory.
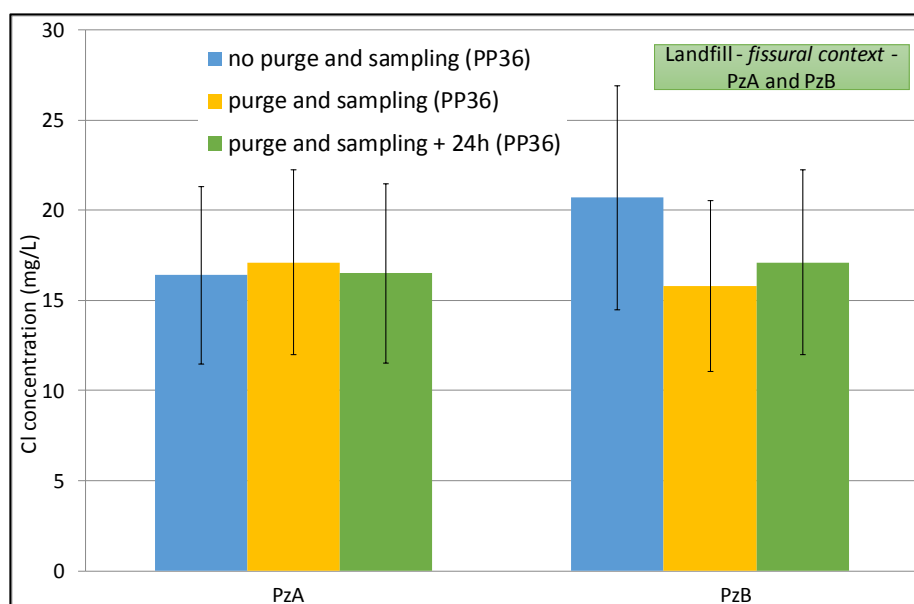
Example – Purge influence
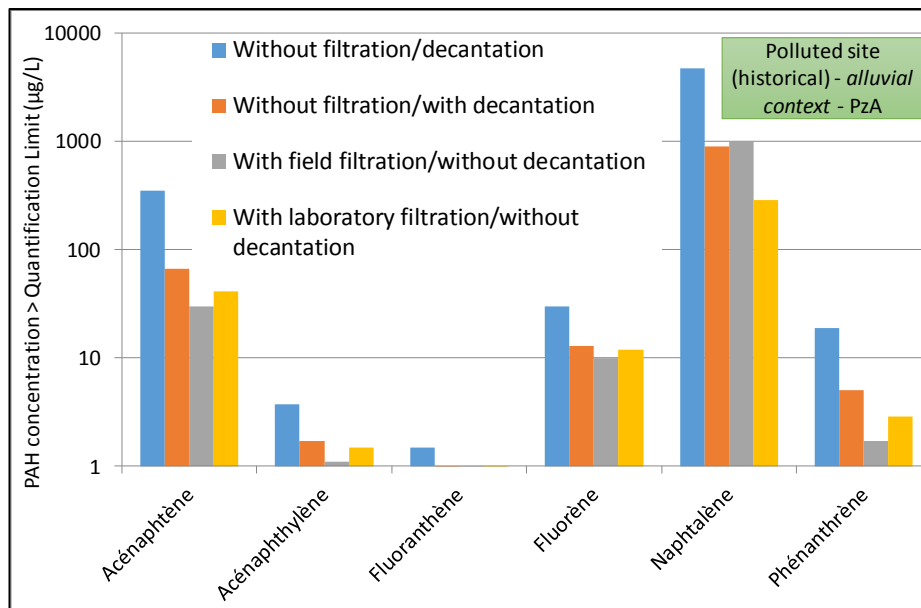
Example – Filtration and decantation influence (PAH)

Example – Filtration and decantation influence (Pb)

Work continues to assess reproducibility of these preliminary results. In some case trends are observed but not always, statistical methods will help us to complete interpretation:

- A lot of campaigns need to be done (objective: 4 on real sites, more in tank…)
- In most cases samples represent a flow-weighted average of the well screen zone…