AQUAREF

Collaborative trial for groundwater sampling

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LNE
Le progrès, une passion à partager

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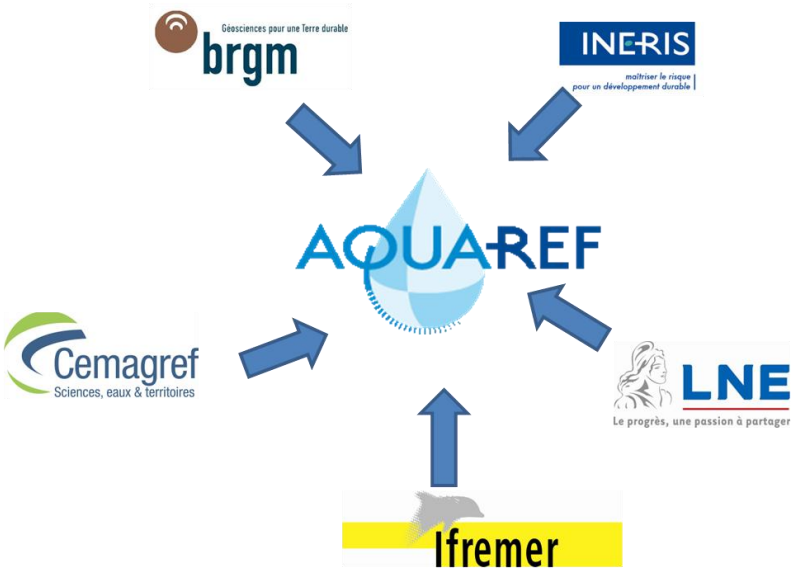
AQUAREF : National reference laboratory for the monitoring of aquatic environment (www.aquaref.fr)

Assistance to public authorities in their policy for aquatic environment monitoring

- **<u>Improvement of sampling and analytical methods and practices</u>**
- **<u>Quality of monitoring data</u>**
- Assistance to public authorities
- Anticipation of future monitoring (emerging substances, new monitoring tools as for ex passive samplers, …)
- …



Support of

ONEMA
Office national de l'eau et des milieux aquatiques

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Framework

Global Improvement of monitoring data quality for WFD

- Taking into account the quality of sampling operation,
- Comparability, reliability of data
- Laboratories : availability of many tools for internal or external quality control
- Sampling teams : no tools, no intercomparison – no information on quality of sampling operations – no information on the part of data dispersion linked to sampling operations

Organisation by BRGM with collaboration of LNE for on site analysis (pH, conductivity, O2, temperature)

Similar trial

- 2007 : collaborative trial for sampling surface water (INERIS)
- JRC Trial (Po, Danube)

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Objectives

- **Observation and qualitative evaluation of ground water sampling practices**
  - Preliminary investigation of participants practices, structure, QAQC system, …(questionnaire)
  - Presence of observers during the trial to register all the participants practices
- Estimation of the effect of sampling operations on the variability of results
  - Quantitative objective
- Accuracy of field measurements (pH, conductivity, dissolved oxygen, temperature).

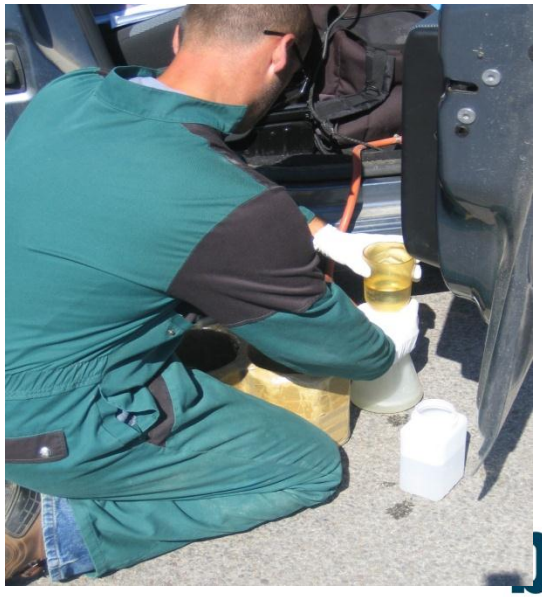
Selection of site, parameters and participants

- Piezometer in La Chapelle Saint Luc (Aube)
  - Good water production with pumping
  - Presence of different parameters
  - Good accessibility, Historical data
- Parameters
  - NO3, Cl, SO4
  - Trichlorethylene et tetrachlorethylene
  - DIA, DEA, Simazine, Atrazine, DesethylTerbuthylazine, Terbuthylazine
  - Ti, V, Cr, Fe, Ni, Co, Cu, Zn, As, Se, B, Al, Mo, Cd, Sn, Sb, Ba, Pb, U
  - Ca, Mg, Na, K
- 9 participants selected mostly by water agency among their usual sampling teams (both sampling teams of big laboratories structure and small sampling companies)

Methodology

Day i			
	Pumping	Sampling	Analysis
8h-9h	BRGM control pumping	1 sampling	2 analysis by sample
9h-10h	Stop pumping		
10h-12h	Participant 1	2 independant sampling	2 analyis by sample
13h-14h	BRGM control pumping	1 sampling	2 analysis by sample
14h-15h	Arrêt pompage		
15h-17h	Participant 2	2 independant sampling	2 analyis by sample

- Free sampling protocol – no imposed protocol
- 5 days of field trial



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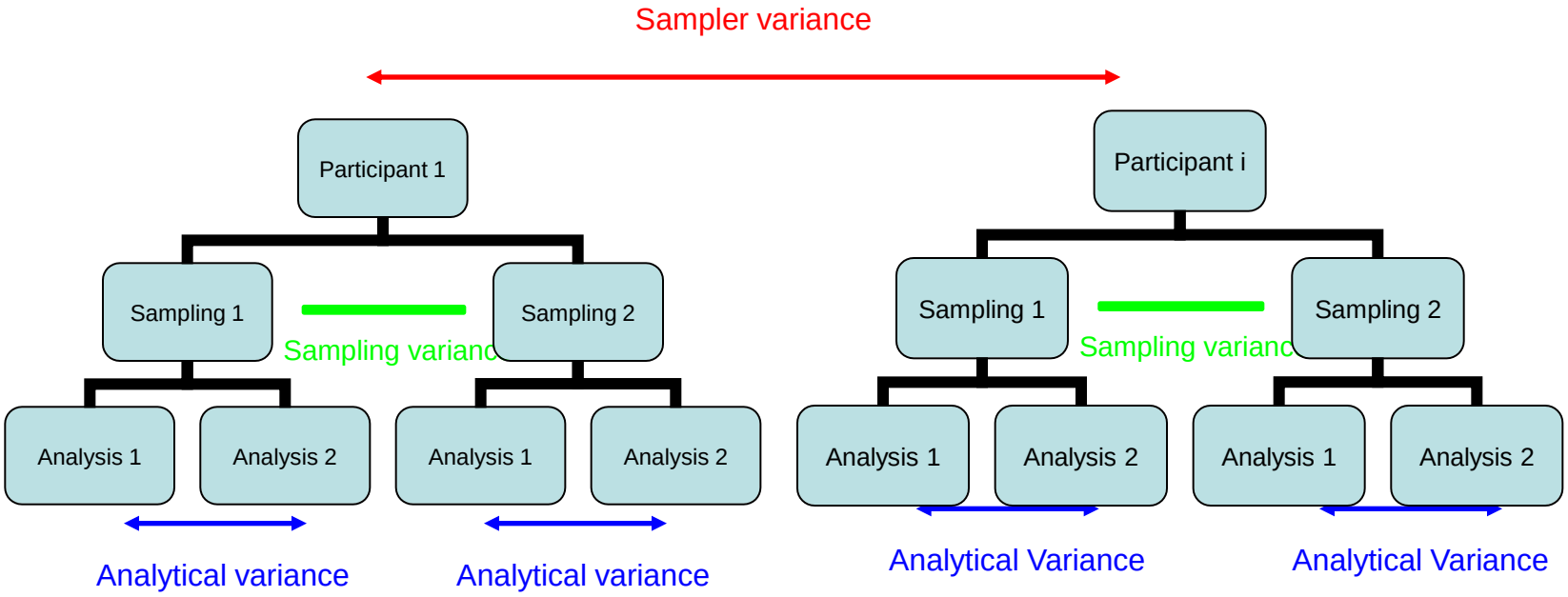
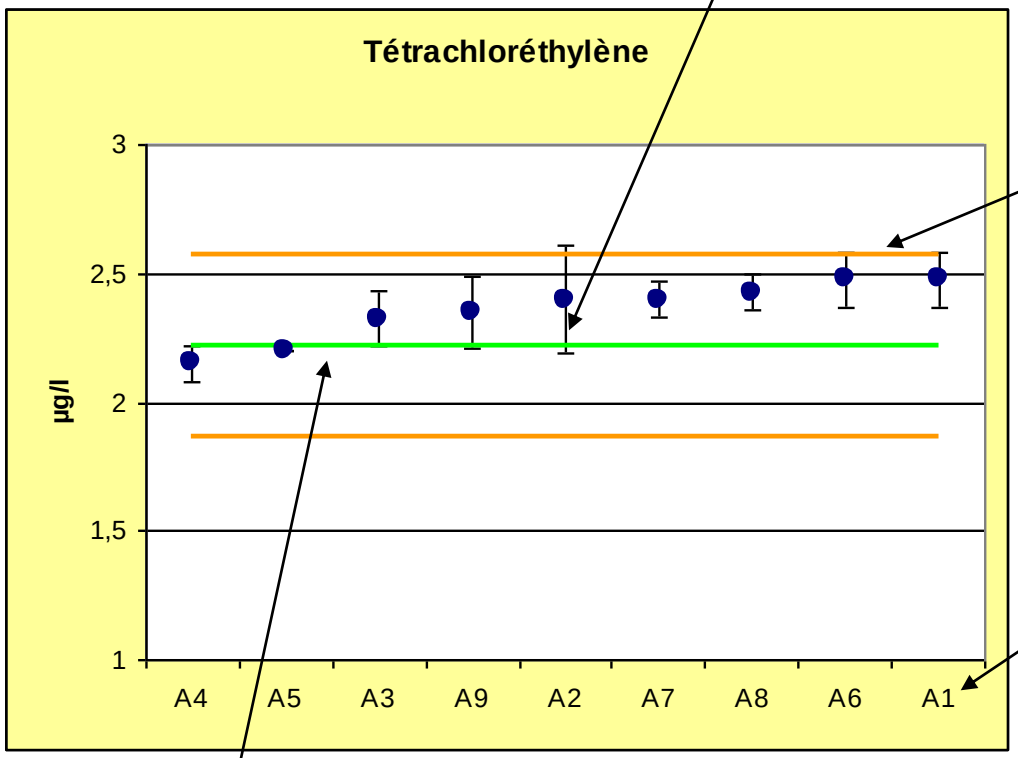
Quantitative data treatment



Analytical variance : repeatability ≠ Uncertainty



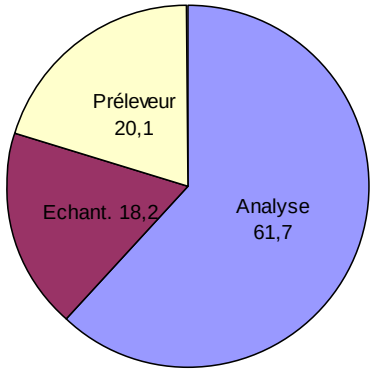
Two sampling range for part. 2

Confidence interval for analytical variability centered to mean brgm control

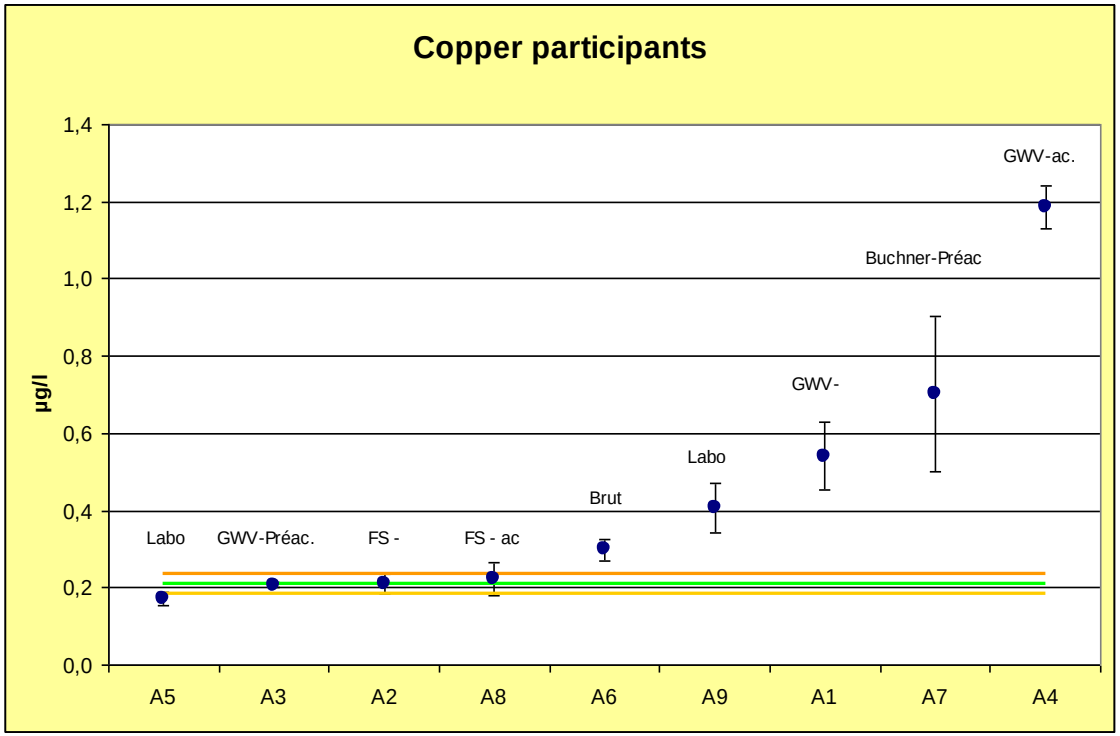
Sampler code

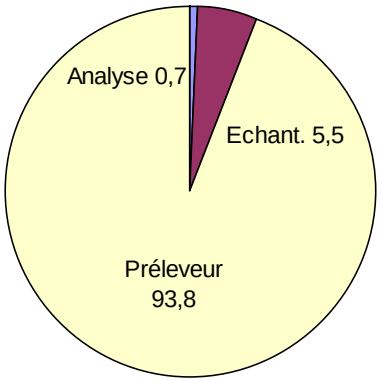
Mean BRGM control

	Estimated SD (%)
Analysis	5,9
Samping repeat.	3,2
Sampler	3,4
TOTAL	7.6

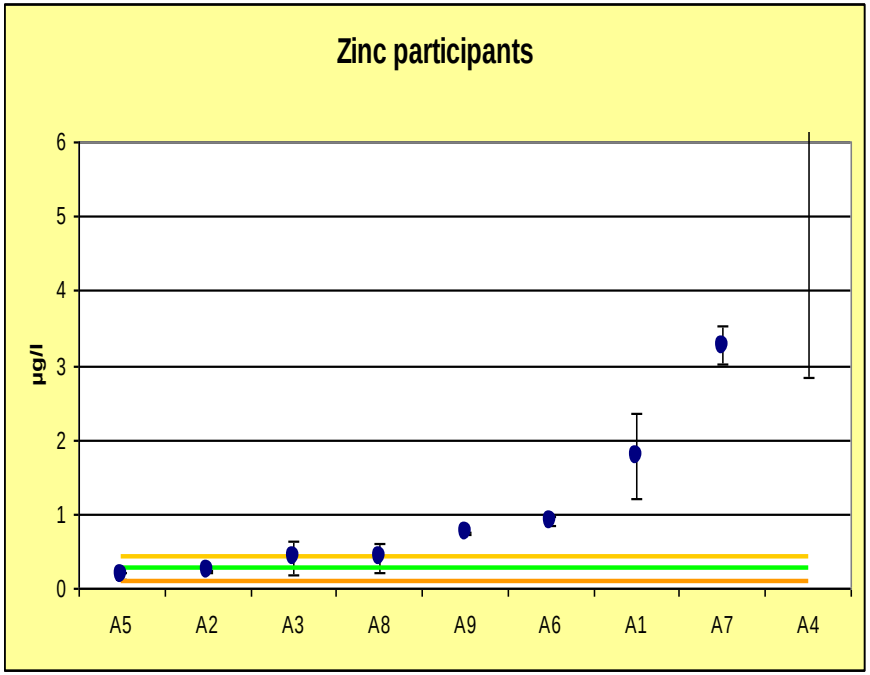


Copper (participants bottles)





	Estimated SD (%)
Analysis	5,0
Samping repeat.	13,7
Sampler	56,6
TOTAL	58,4



	Estimated SD (%)
Analysis	3,7
Samping repeat.	12
Sampler	72,4
TOTAL	73,4

Conclusions

General

- First sampling collaborative trial for underground water
- Good feeling from participants
- Lot of exchanges, discussion : fruitful collaboration
- Not representative of all types of groundwater sites, of all sampling pratices,
- Site/context relativively easy for this first event (in ordrer to get interpretable data)
- Some new information emerged from this trial (quantitative evaluation of sampling effect)
- Statistics to be considered carefully (small number of participants)

Qualitatively

- Various practices globally in good agreement with guidelines and standards
- Some practices not harmonized between participants due to imprecision in standards and guides
- Some prohibited practices

Conclusions

> Quantitatively

- For this trial, in this context and in a non expected way (for example for VOC) : low impact of sampling pratices on variability of results except for some trace elements at low level
  - Rem : tetrachlorethylene is not the more volatile of VOC
- For some trace metal, problems of field contamination (recommandation of the generalisation of field blank practices)
- First information/data on global estimation of measurment uncertainty (sampling + analysis) excepted spatial and temporal variability

> Summary

- **<u>The conclusion should not be that sampling has no impact</u>**
- Such results could only be obtained with good pratices observed in the context of this trial and with the implementation of further recommandations issued from the conclusions of this trial
- In this trial
  - Good practices : very low sampling variability compared to analytical variability
  - Bad practices : huge sampling effect regarding analytical variability

Thank you for your attention

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