

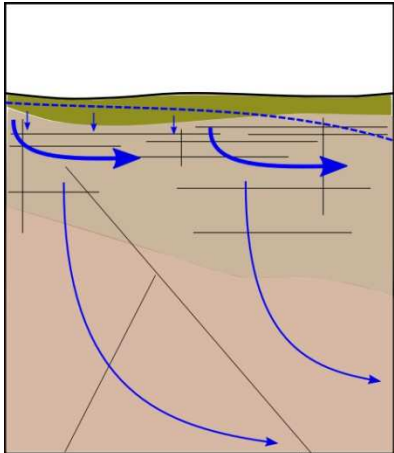
# The role of fault-zones on groundwater flow in crystalline basement

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# Groundwater flow in crystalline media

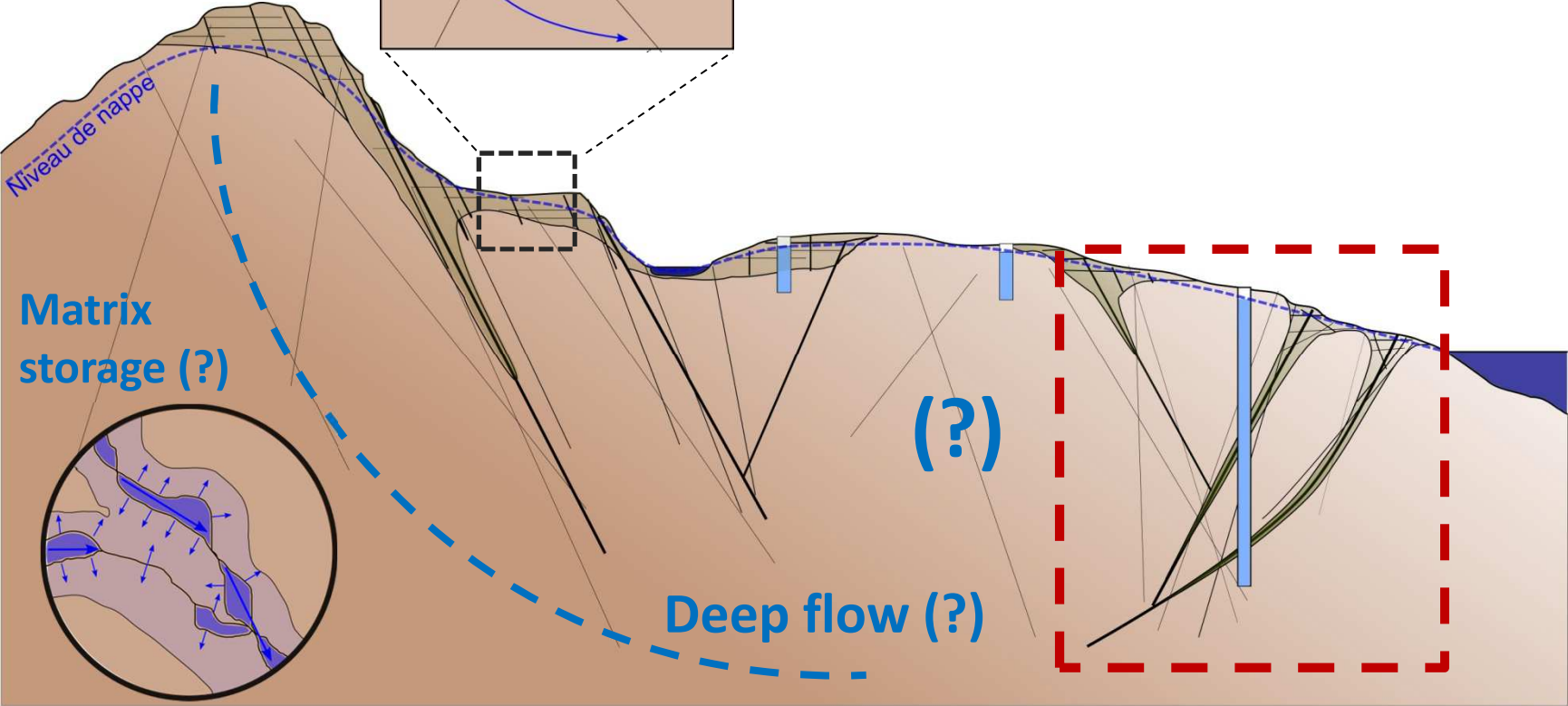
Subsurface flow



Hydrodynamic properties of fault-zones ?

Origin of water?

Sustainability resource ?



# A multidisciplinary approach : Field site (CASPAR Project)

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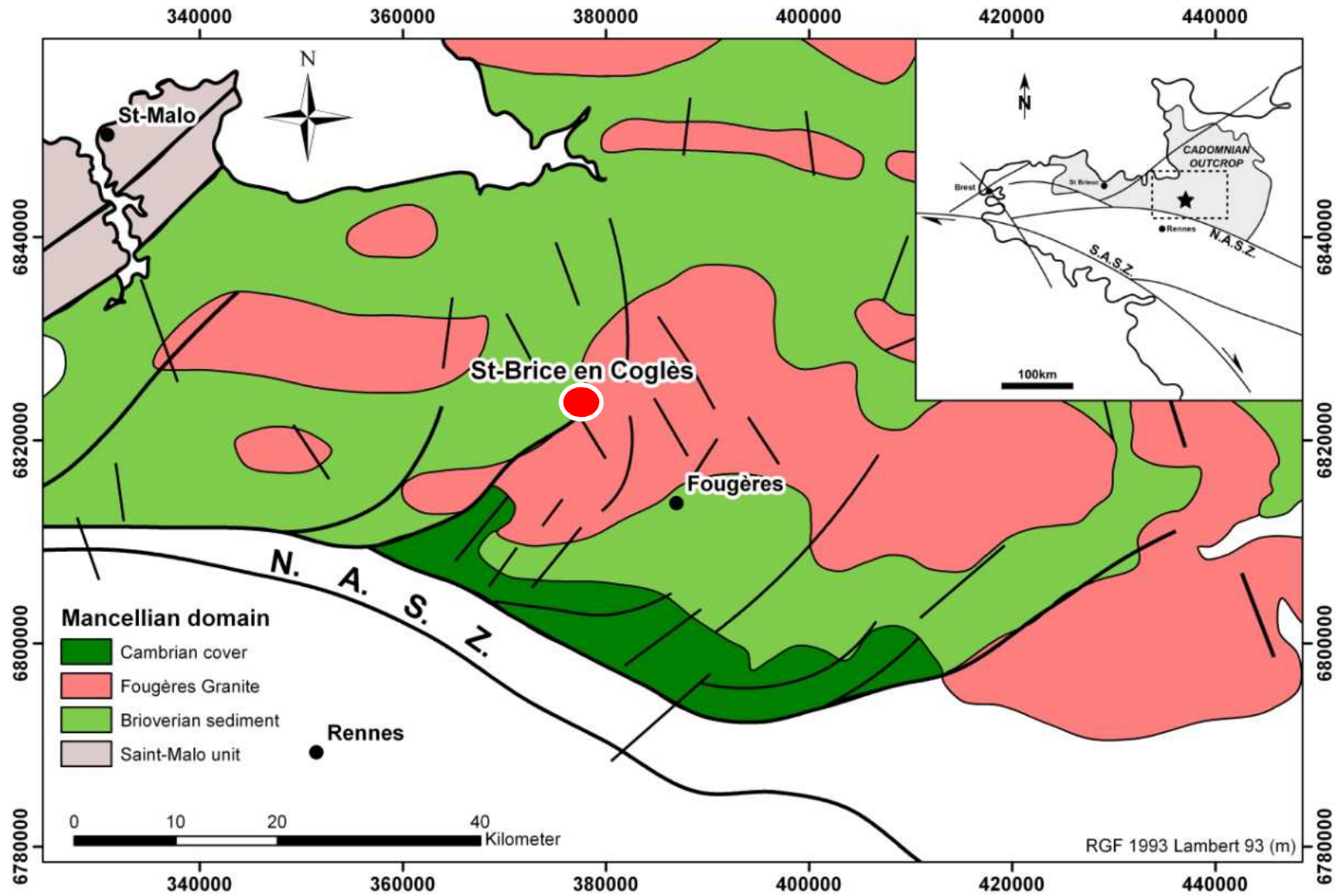
**Structural architecture** => Geology and Geophysics;

**Flow** => Hydrodynamic and flow logging;

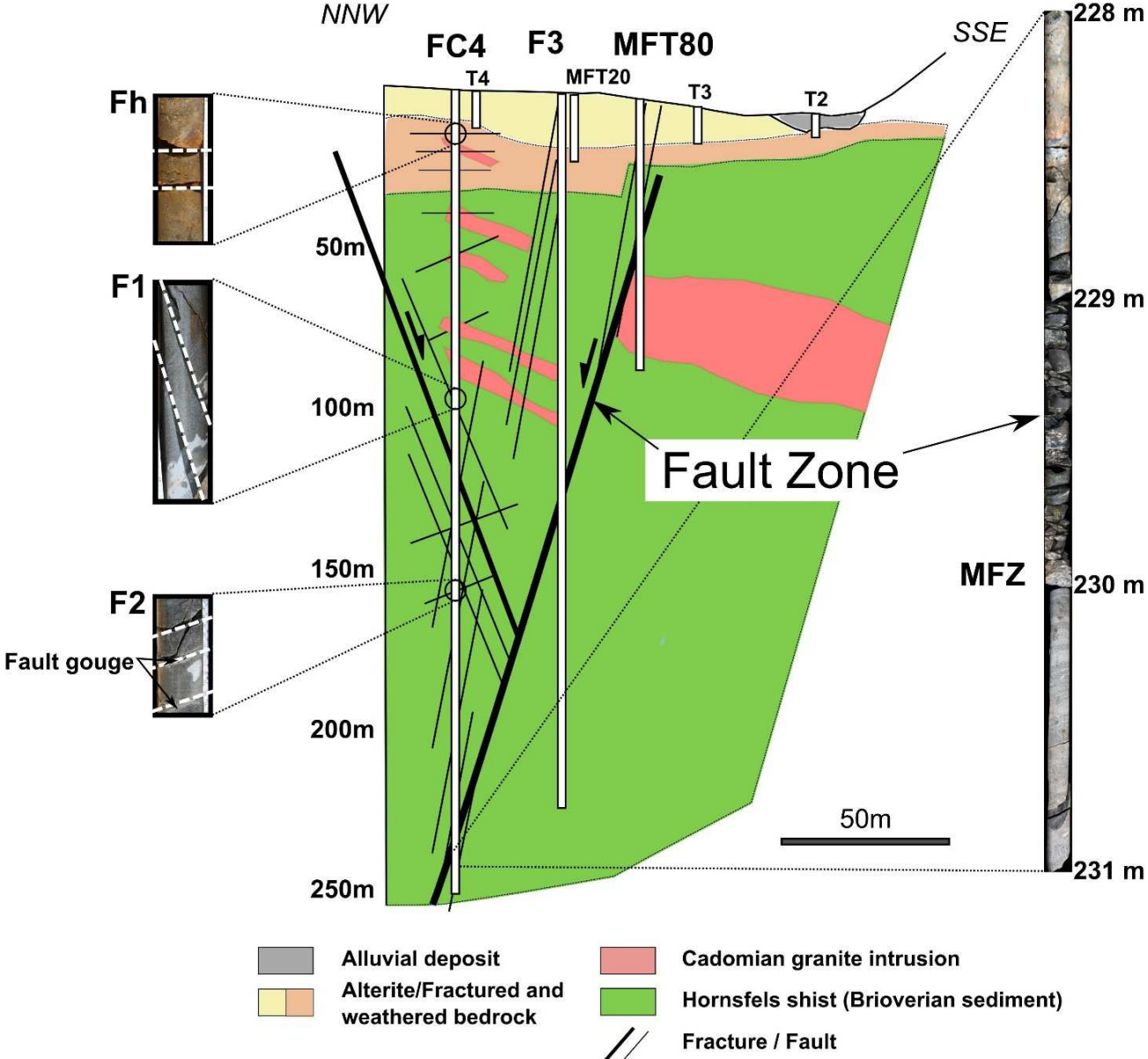
**Groundwater sources** => Hydrogeochemistry and groundwater dating (Anions, Cations, Traces, CFC/SF6, Noble gases).



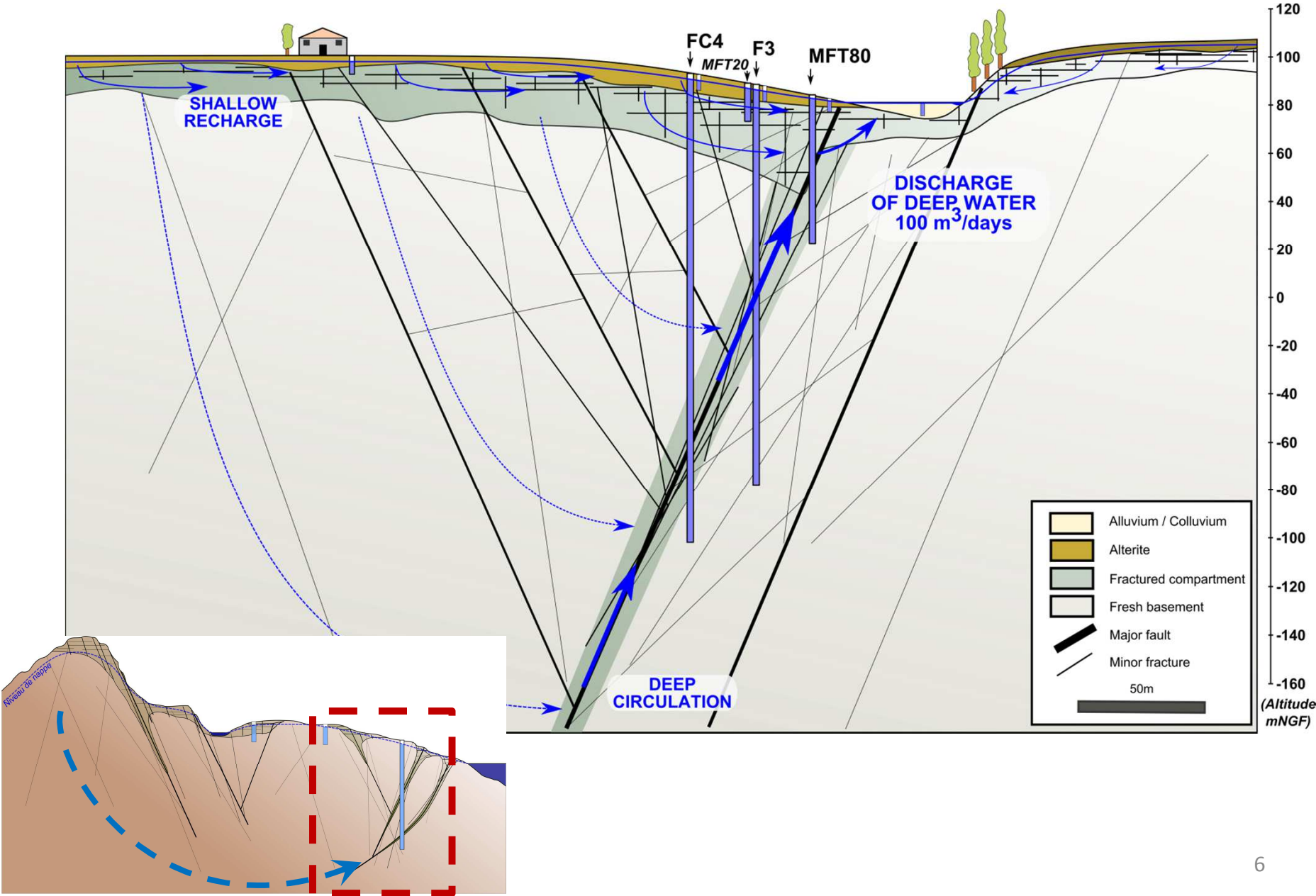
# The field site of Saint-Brice-en-Coglès



# Normal faults in a graben structure

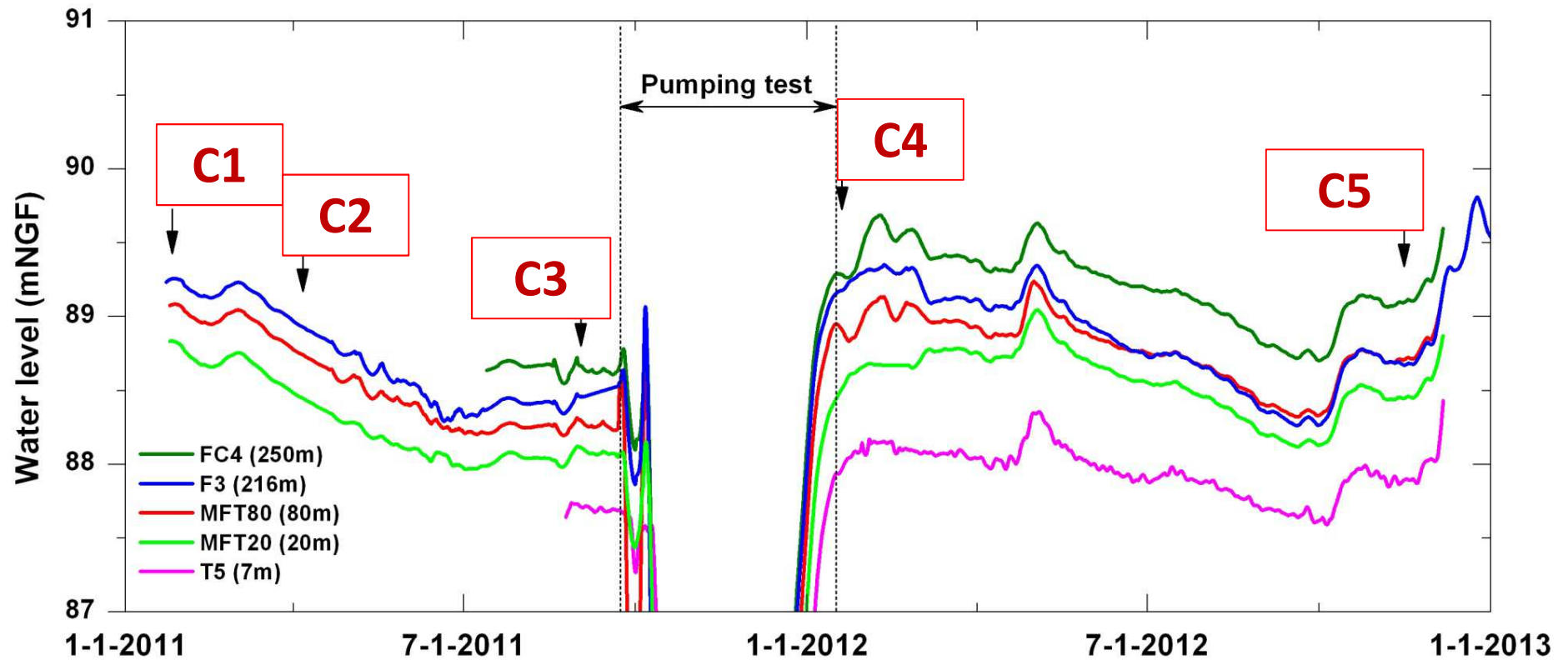


# GW flow controlled by the main tectonic structure

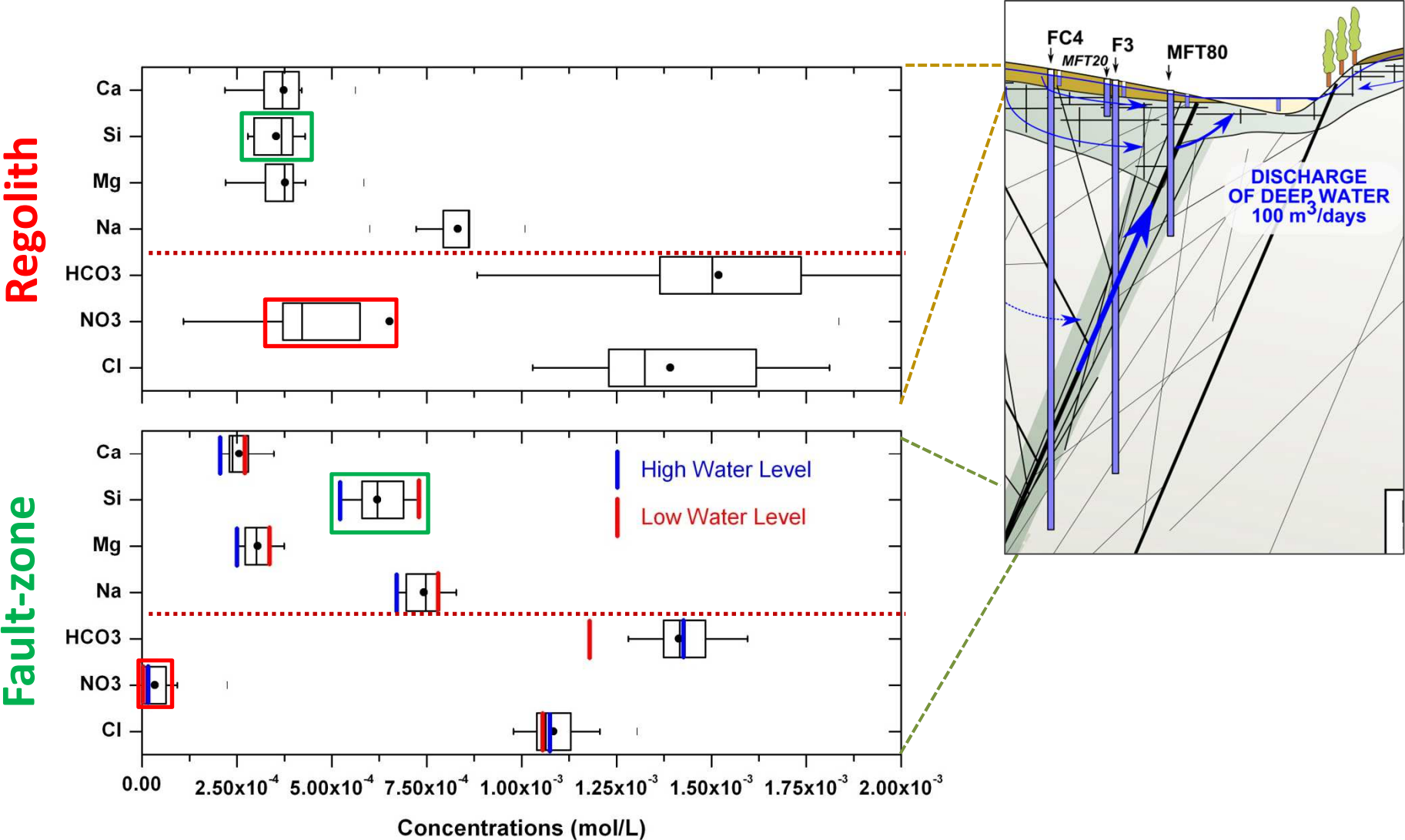


# Origin of water

## 5 sampling campaigns at different hydrological regimes

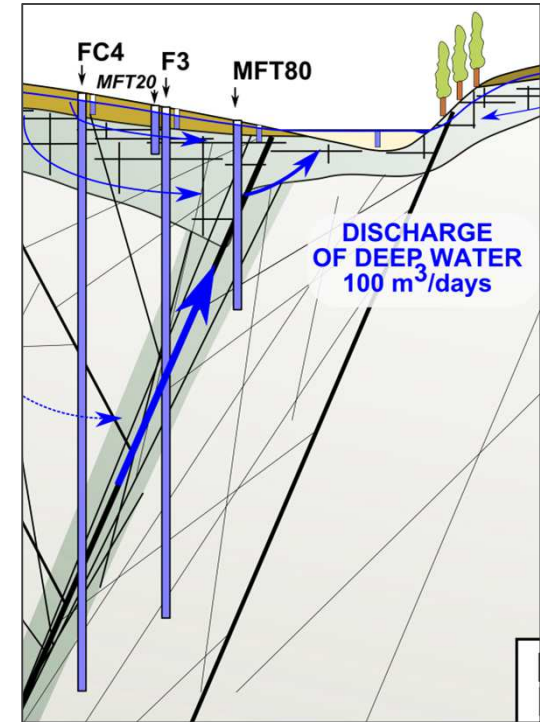
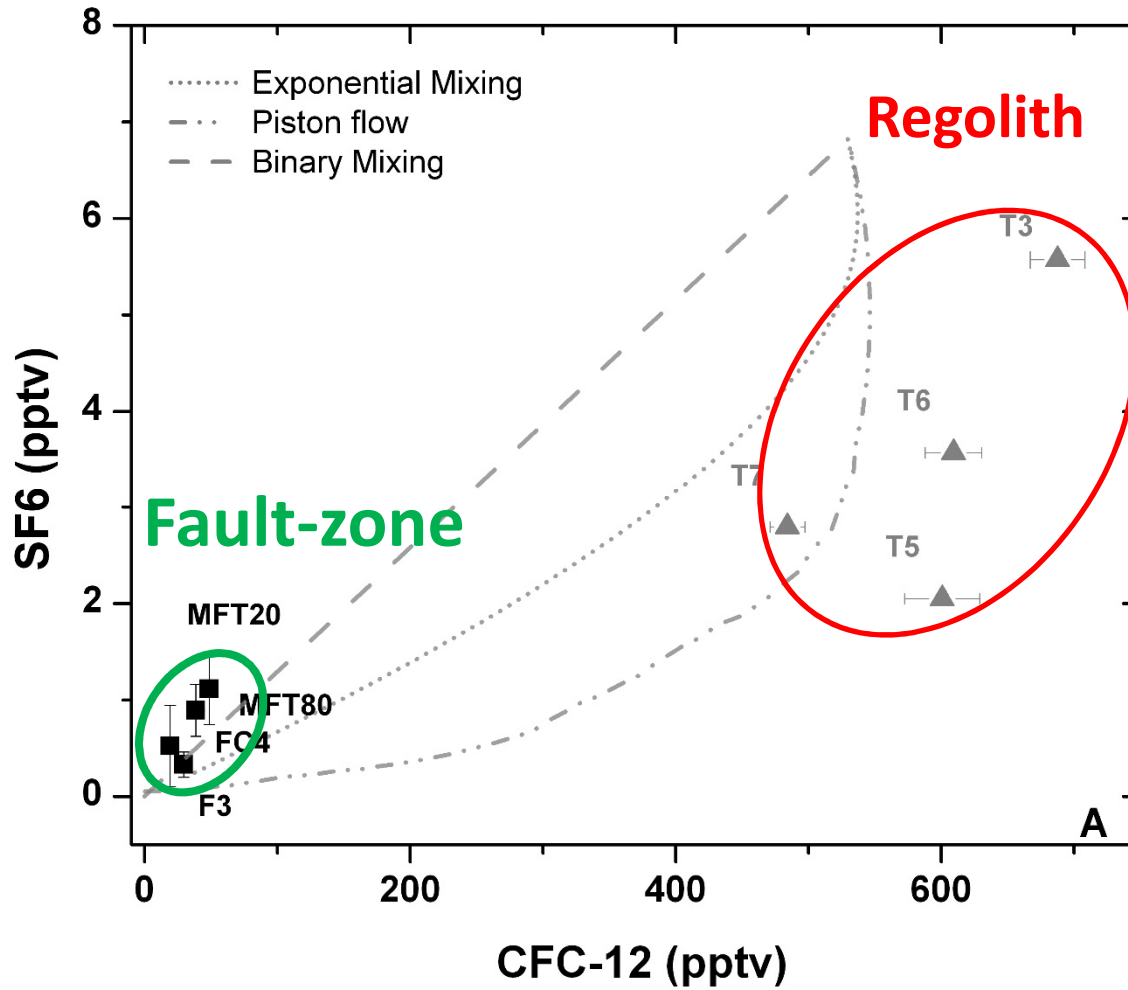


# Hydrogeochemical compartmentalization

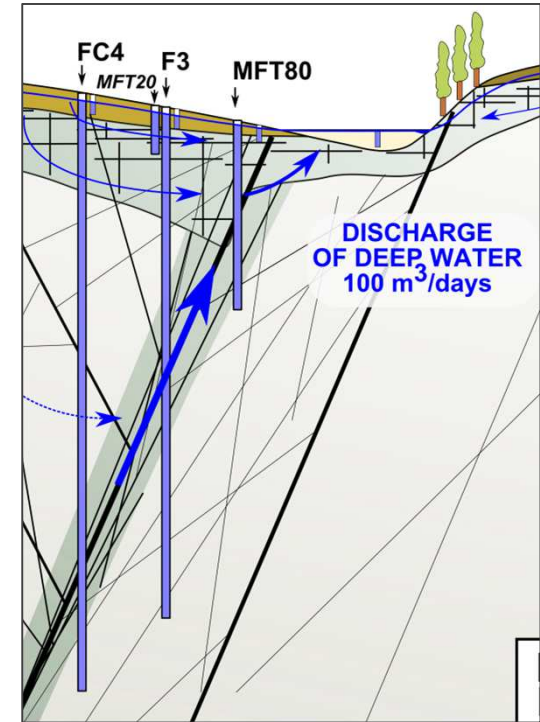
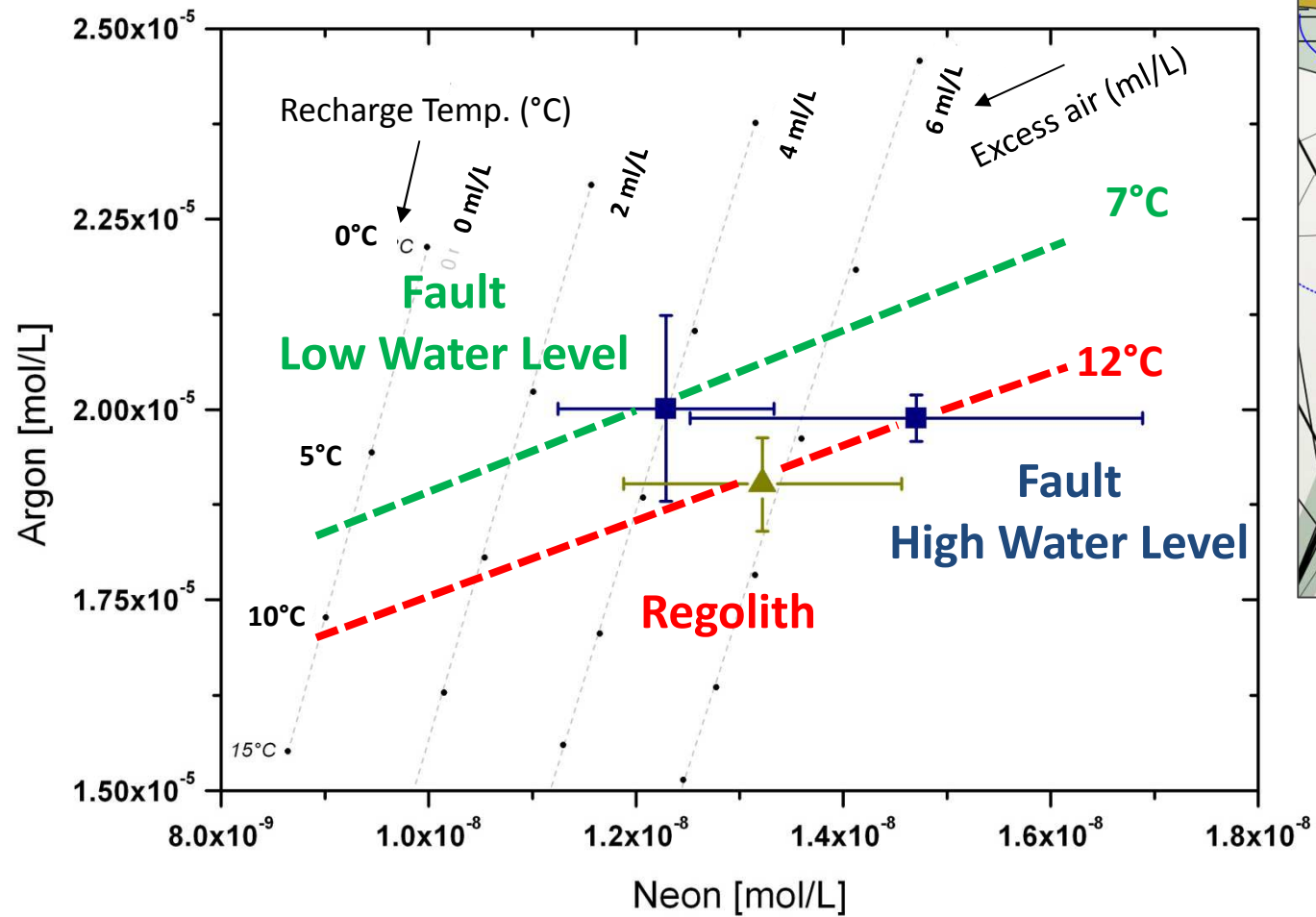




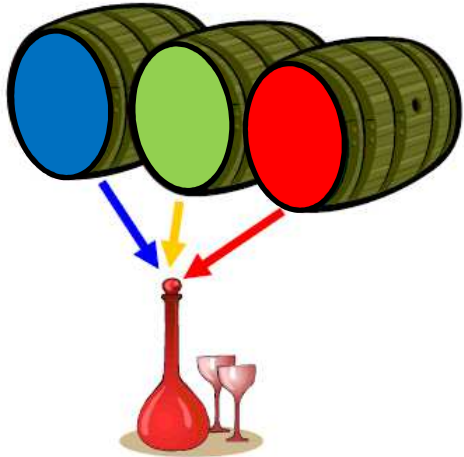
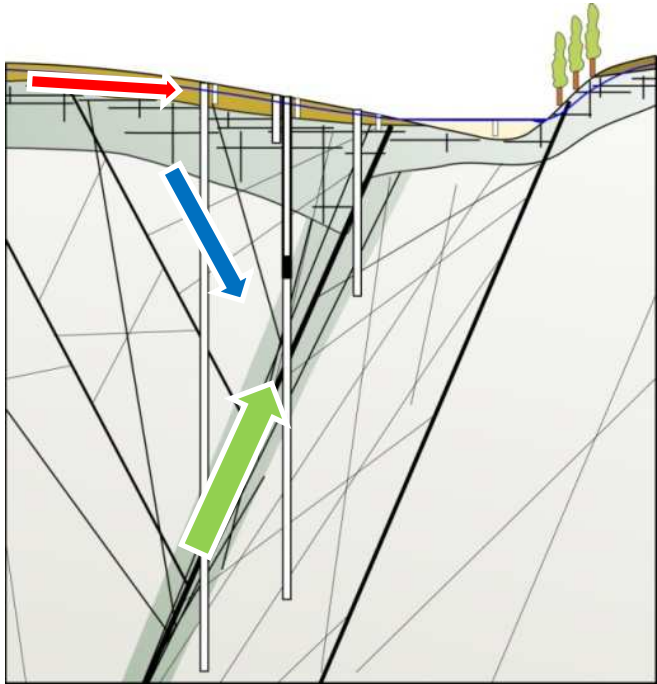
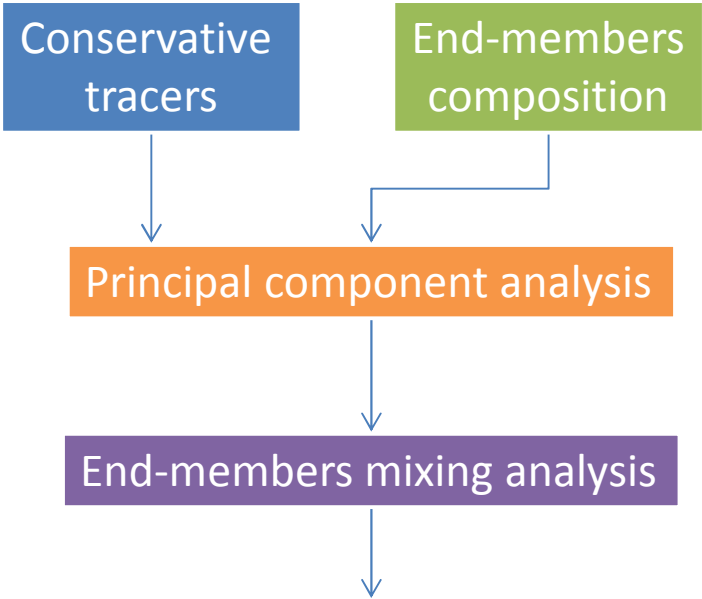
# CFC-12 vs SF6 compartmentalization



# Paleo-water signature from noble gases concentrations



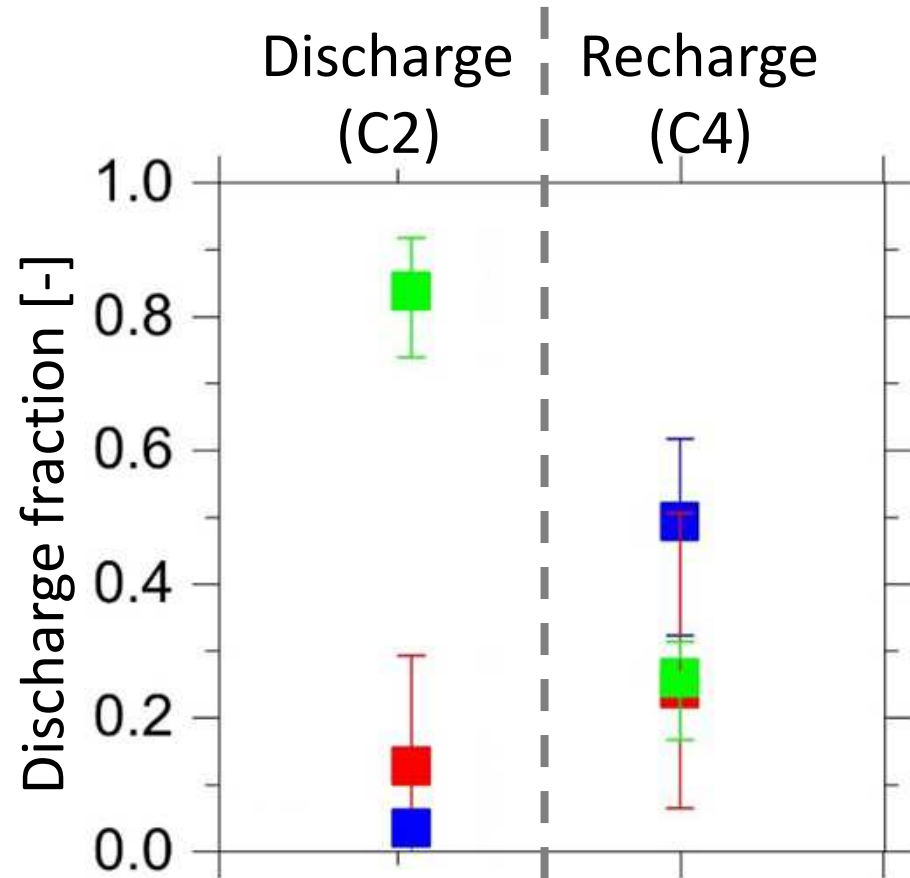
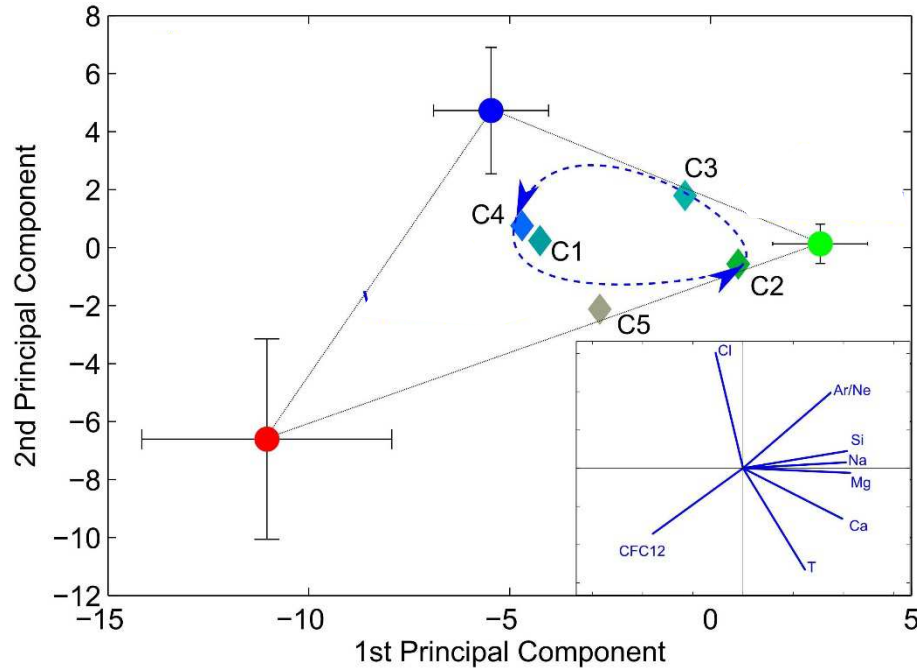
# How do we estimate mixing and origin of water?



**DISCHARGE FRACTIONS from each end-members**

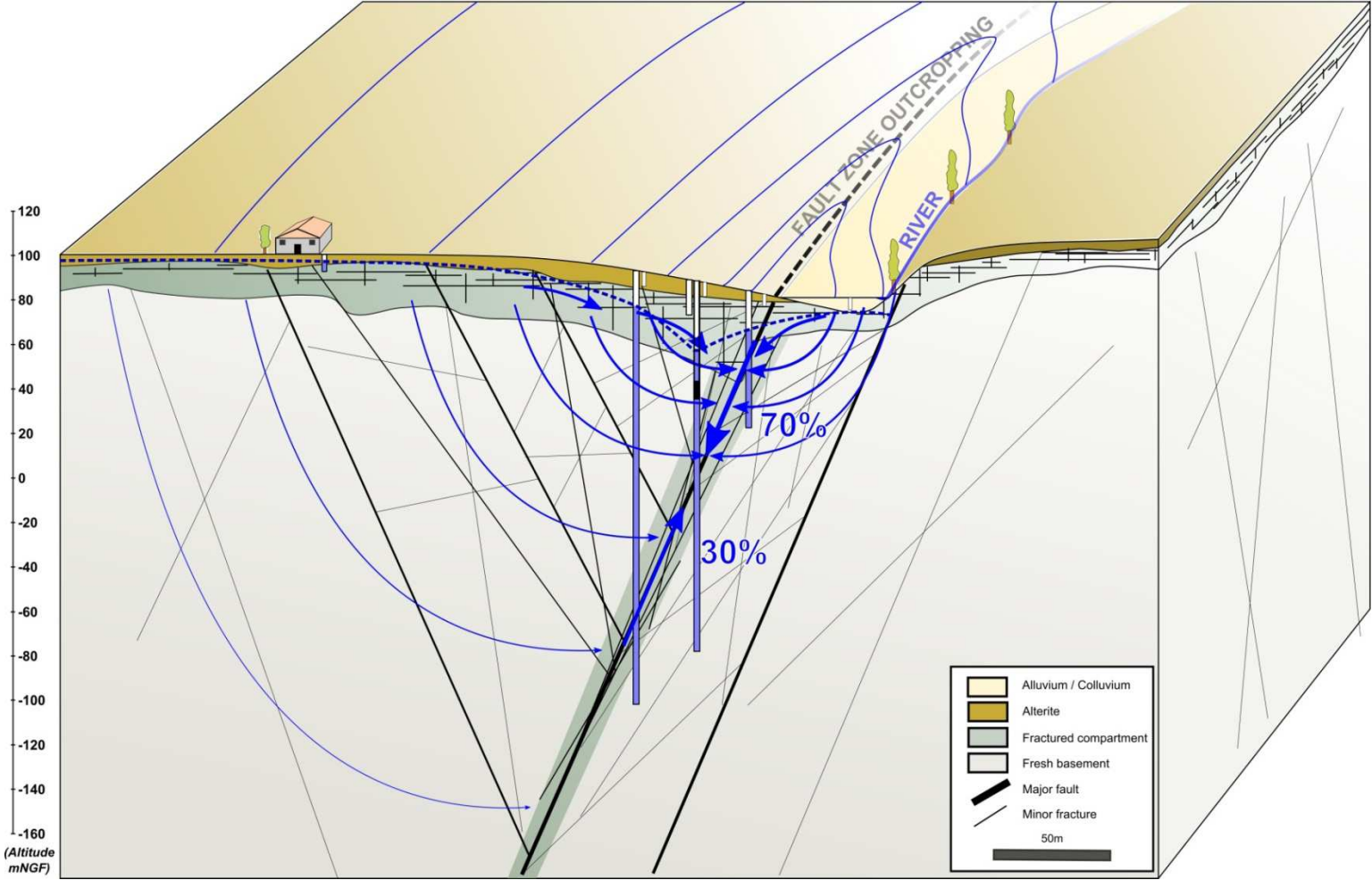
*Laaksoharju et al., 2008*

# Origin of water controlled by regional hydrological regime



- Surface Water
- Modern Water
- PaleoWater

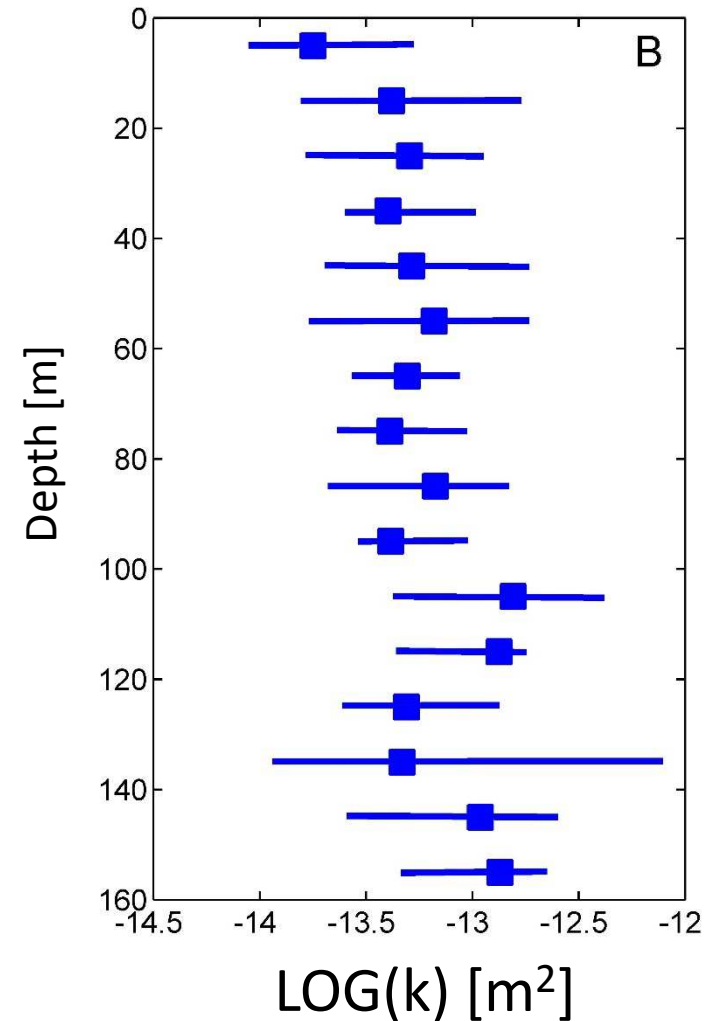
# Pumping dependent on storage reservoirs



9 weeks pumping test at 45 m<sup>3</sup>/h

## Conclusion & Perspective

- ✓ Fault zone can present **high hydraulic properties** to drive GW flow at depth;
- ✓ **Various origins of waters** controlled by regional hydrological regimes;
- ✓ Yields of fault-zones are highly dependent of **storage reservoirs**;
- ✓ It is **NOT a unique case!** => Regional study of high yield fault-zones in the Armorica Massif (21 sites)





Thank you for your  
attention!