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Geochemical and palynological analysis of peatlands of the Bitche military camp (Moselle, France)

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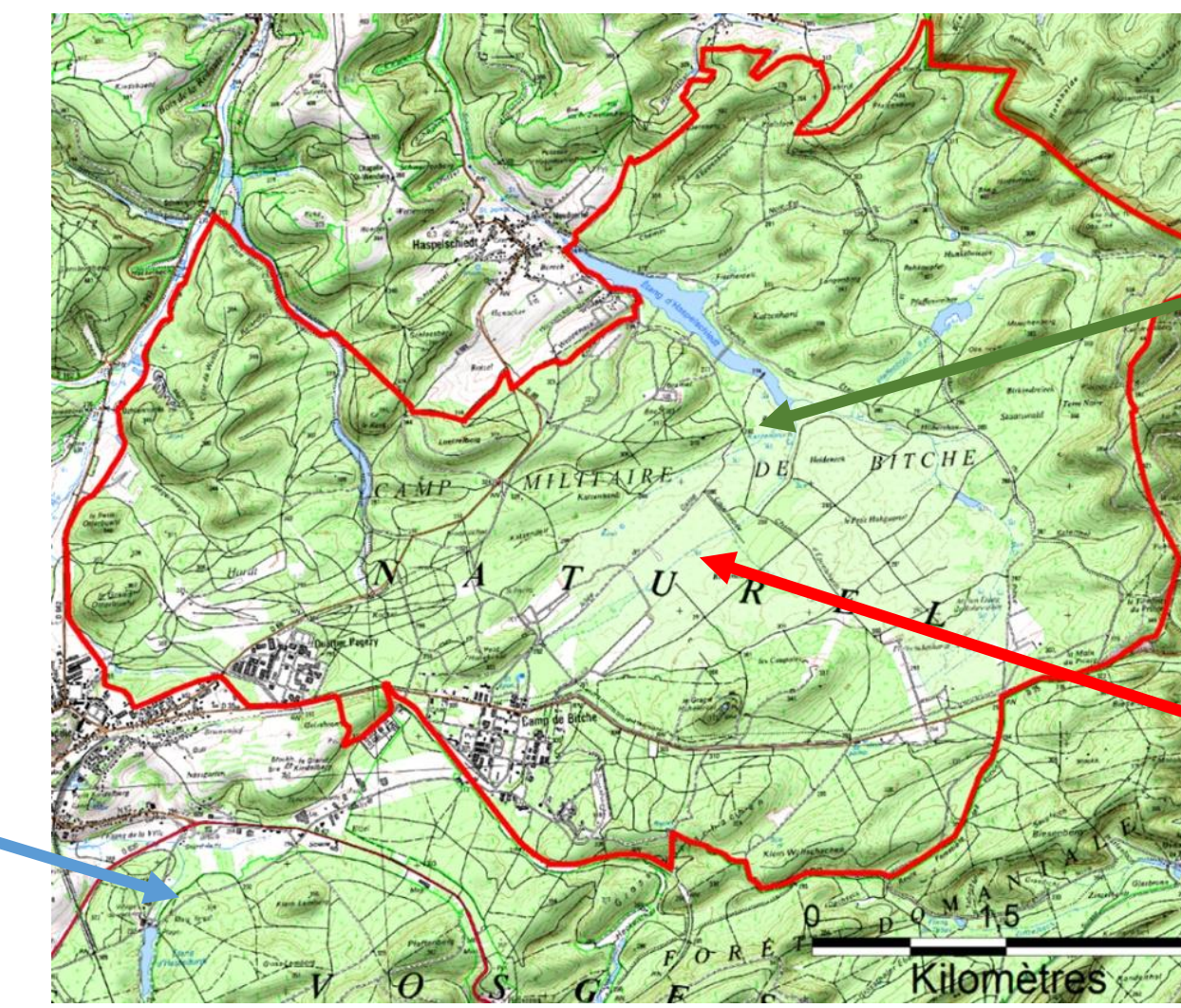
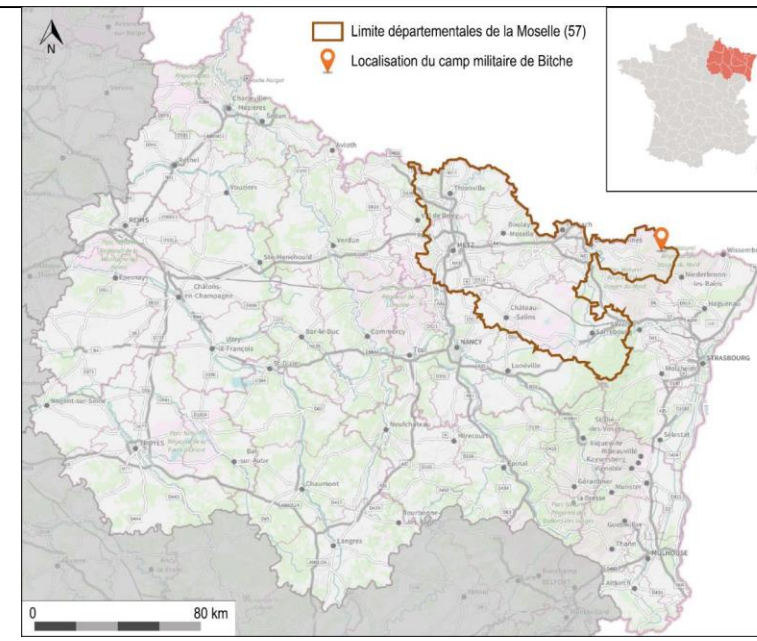
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Study area

Bitche military camp (Moselle, France)

- Area = 3500 ha
- Crossed by several streams
- Over a Triassic sandstones aquifer
- Military activities since 1900

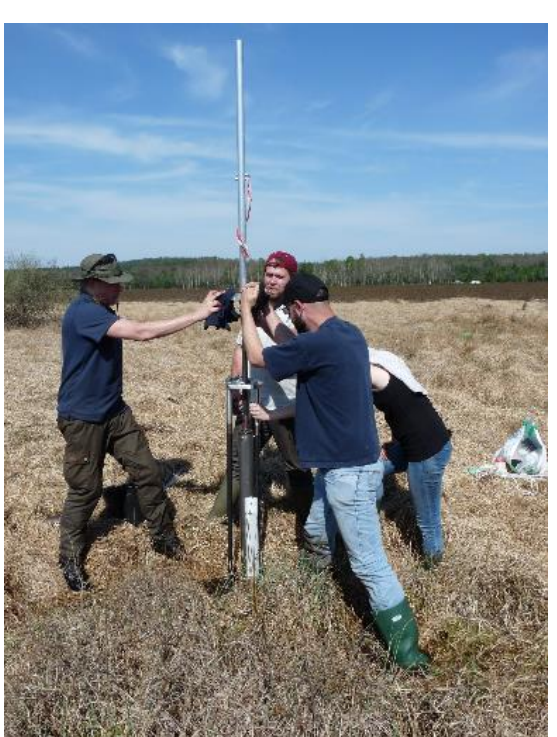


Moors and peatlands of the camp: ten entities (173 ha, 5% of the total area of the camp) classified as Natura 2000 sites

Objectives

- To reconstruct environmental changes in landscapes over time under the influence of natural and/or anthropogenic factors
- To understand the human footprint on these environments (chemical contamination)
- To assess the chemical reactivity of peat towards Pb, Cu and Zn

Methodology



Peat profiles

- 3 peat cores : Katzenbruch « KAT » (168 cm), Allée du Galop « GAL » (184 cm) and Horn (284 cm)
- Major and trace elements concentrations (FPXRF)
- Pb isotopes
- Radiocarbon dating
- Pollen analyses

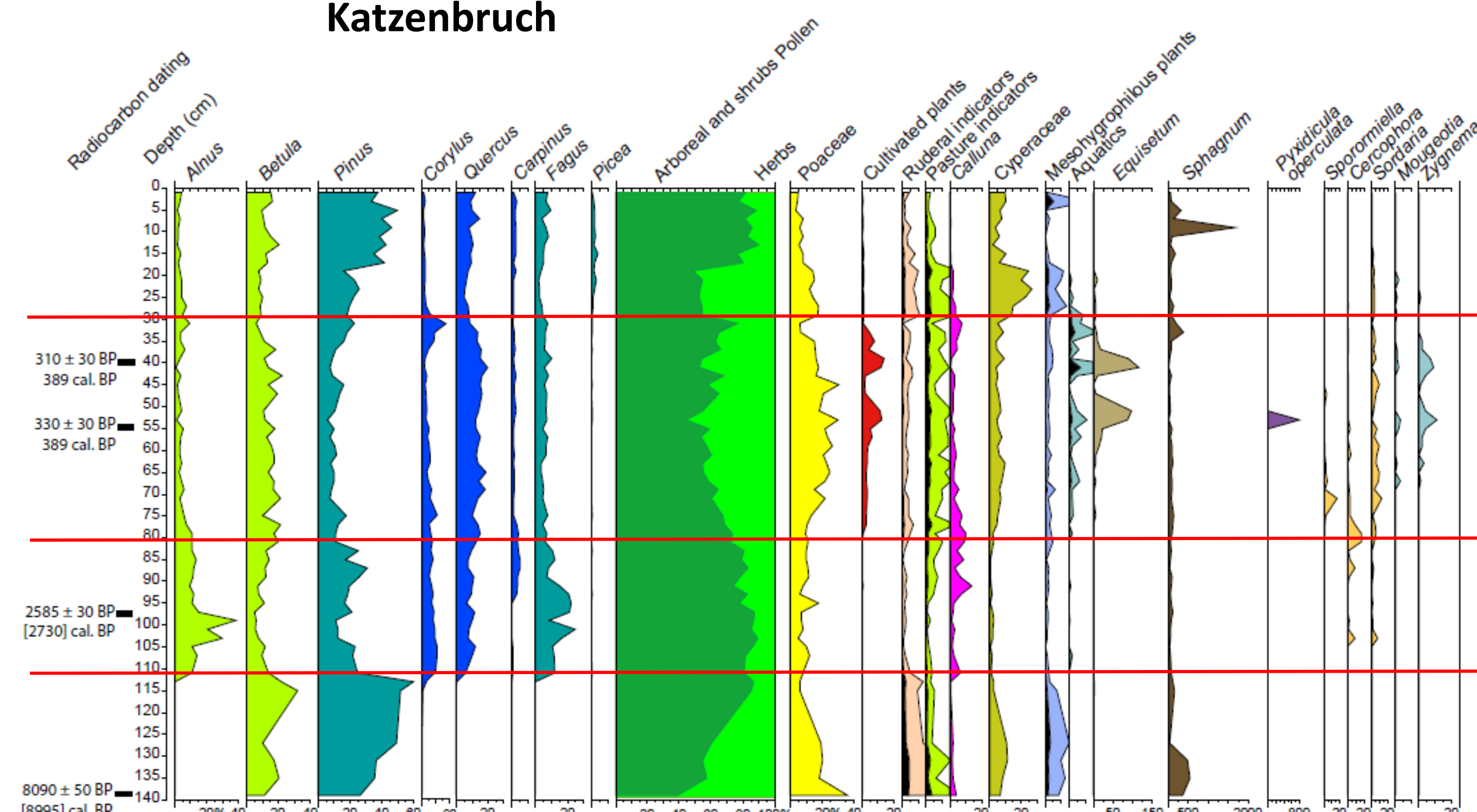
Desorption experiments

- Batch experiments on KAT and GAL surface horizon sampled nearby the peat cores
- Solid/Solution = 2 g.L⁻¹ (IS = KNO₃ 10⁻³ M)
- pH range : 1-6
- Agitation for 24 hours
- ICP-OES analyses of the supernatant



Pollen analyses

Katzenbruch



Simplified pollen diagrams of Katzenbruch. Exaggerated curves are x 5. Spores, thecamibien and and MNP are expressed in number counted.

Contemporary period : Increase in forest cover and significant development of pine. Little contemporary anthropisation detected due to very dense forest cover.

Modern times : Forest regression around the site. Intensification of agricultural activities. Strong presence of coprophiles (*Sporormiella*, *Cercophora* and *Sordaria*), indicators of pastoralism.

Iron Age : Dominant forest cover. Establishment of diversified oak forests and oak-beech forests.

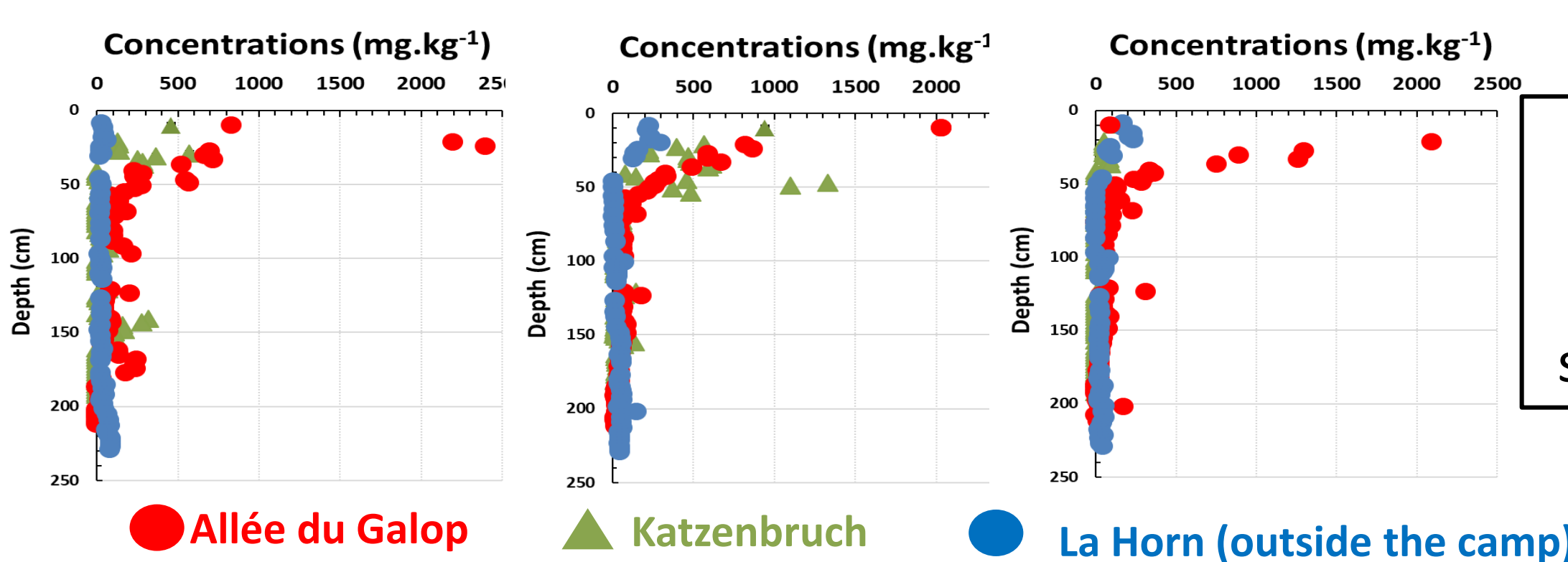
Mesolithic : An open environment that gradually closes. Dominant species: pine and birch forming open, light forests.

Metal contamination

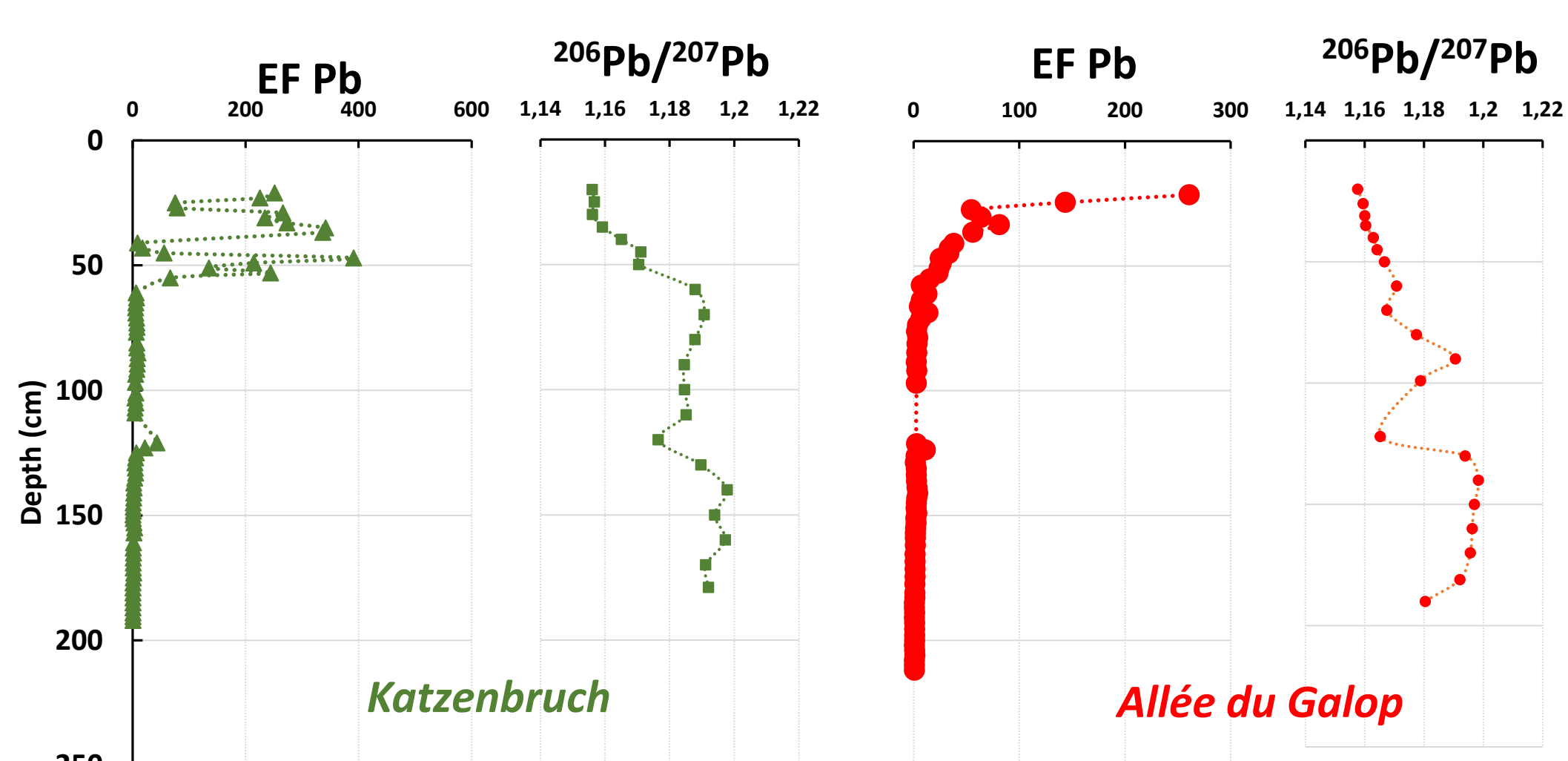
Cu

Pb

Zn



High metal concentrations (Pb, Cu, Zn) at the surface (0-50 cm depth)



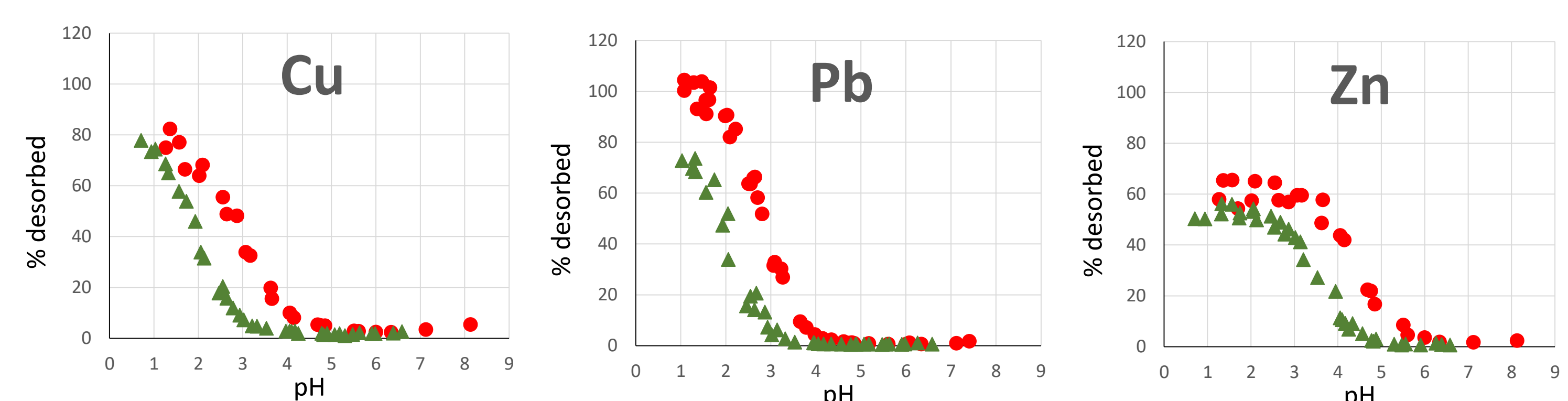
$$\text{Enrichment factor (EF)} = \frac{([\text{metal}]/[\text{Al}])_{\text{sample}}}{([\text{metal}]/[\text{Al}])_{\text{saprolite}}}$$

“Contemporary” military contamination ?

Past contamination sources ?

Desorption experiments

	pH	Organic Matter %	Cu mg.kg ⁻¹	Pb mg.kg ⁻¹	Zn mg.kg ⁻¹
Allée du Galop	5,3	43,3	565	1242	67
Katzenbruch	4,3	84,3	152	465	53



- Highest metal retention on Katzenbruch peat (highest OM content and highest OM reactivity ?)
- Similar behaviour of Cu and Pb : lower mobility than Zn
- Low risk of surface water contamination

Perspectives

- Further radiocarbon dating to refine age-depth model of the peats and improve environmental reconstruction
- Identification of a site closer to former industrial activities (glassworks, mines)
- Modelling of the desorption experiments → reactivity of organic matter and chemical speciation of Cu, Pb and Zn