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LONG-TERM RECORDS OF TRACE METAL ELEMENTS IN CORE SEDIMENTS: ANTHROPOGENIC IMPACTS IN THE EURE RIVER WATERSHED

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INTRODUCTION

General context

The Seine River watershed is historically known for important Trace Metal Elements (T.M.E) anthropogenic contaminations, from various human pressures except mining activities. The Eure River watershed was poorly studied in the past, although there is one of main tributary of the Seine River. Recently, it was highlighted that lead contamination recorded in Seine River partially came from the Eure River.

The OSS 276 Project: Observatory of the Seine Sediments in the Eure River and the Seine River

The main aim of the OSS 276 project is to fill the gap of knowledge concerning the Eure River watershed.

This part of the study is focused on the potential anthropogenic impacts suffered by the Eure River.



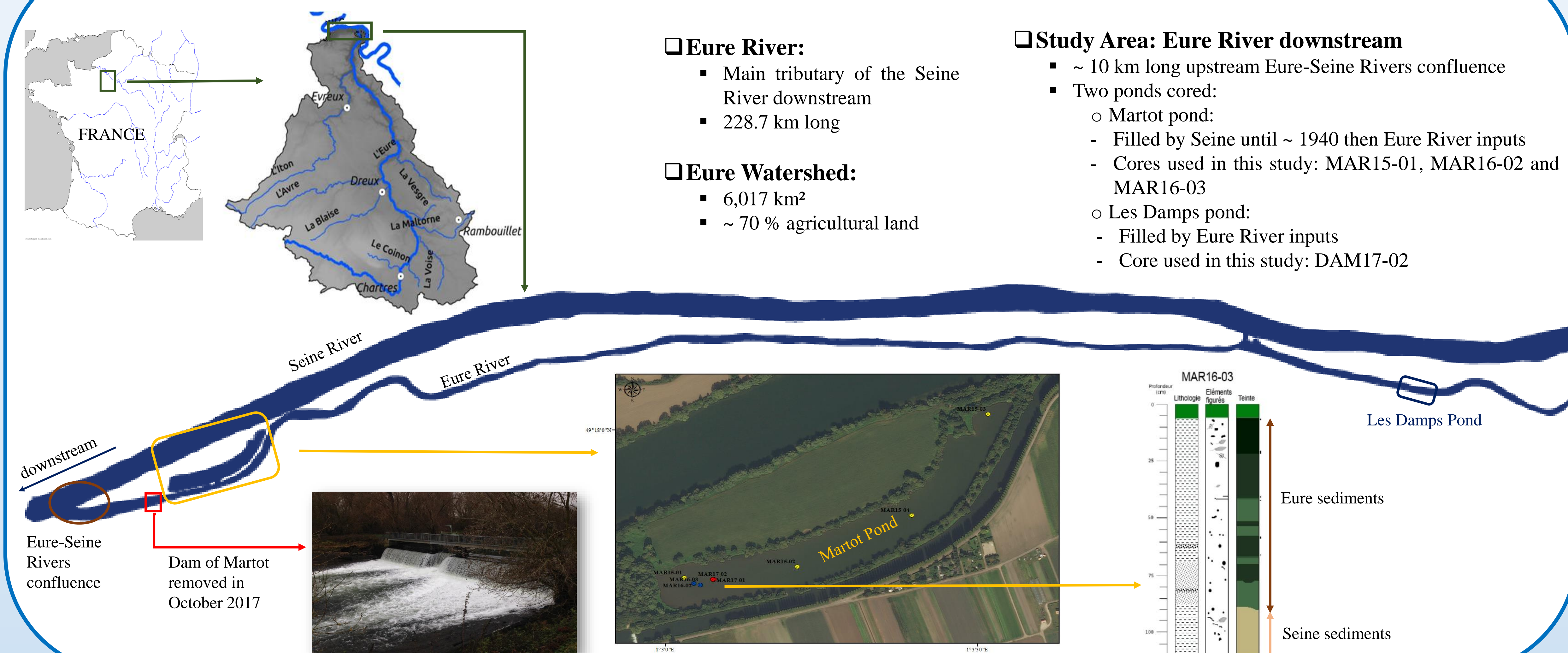
Uniqueness of the OSS 276 Project

The hydro-sedimentary inputs from the Eure River watershed were blocked ~ 300 m upstream of the confluence with the Seine River by a small obstacle called the Dam of Martot. Built during the last century, this dam was removed recently. Observing and understanding the impact of the dam removal on hydro-sedimentary transfers, re-suspension and transfers of contaminated sediments is one of the aim part of this project.

Trace Metal Elements (T.M.E)

In fluvial systems, T.M.E are majority linked to the Suspended Particulate Matter (S.P.M), especially the < 63 μm fraction. Their potential toxicity is well established and for this project it was decided in this project to work with metals (Cadmium : Cd, Chrome: Cr, Copper: Cu, Mercury: Hg, Nickel: Ni, Lead: Pb), and metalloid (Arsenic: As) elements listed "priority substances" by the European Water Framework Directive.

STUDY AREA: THE EURE RIVER WATERSHED



Eure River:

- Main tributary of the Seine River downstream
- 228.7 km long

Eure Watershed:

- 6,017 km²
- ~ 70 % agricultural land

Study Area: Eure River downstream

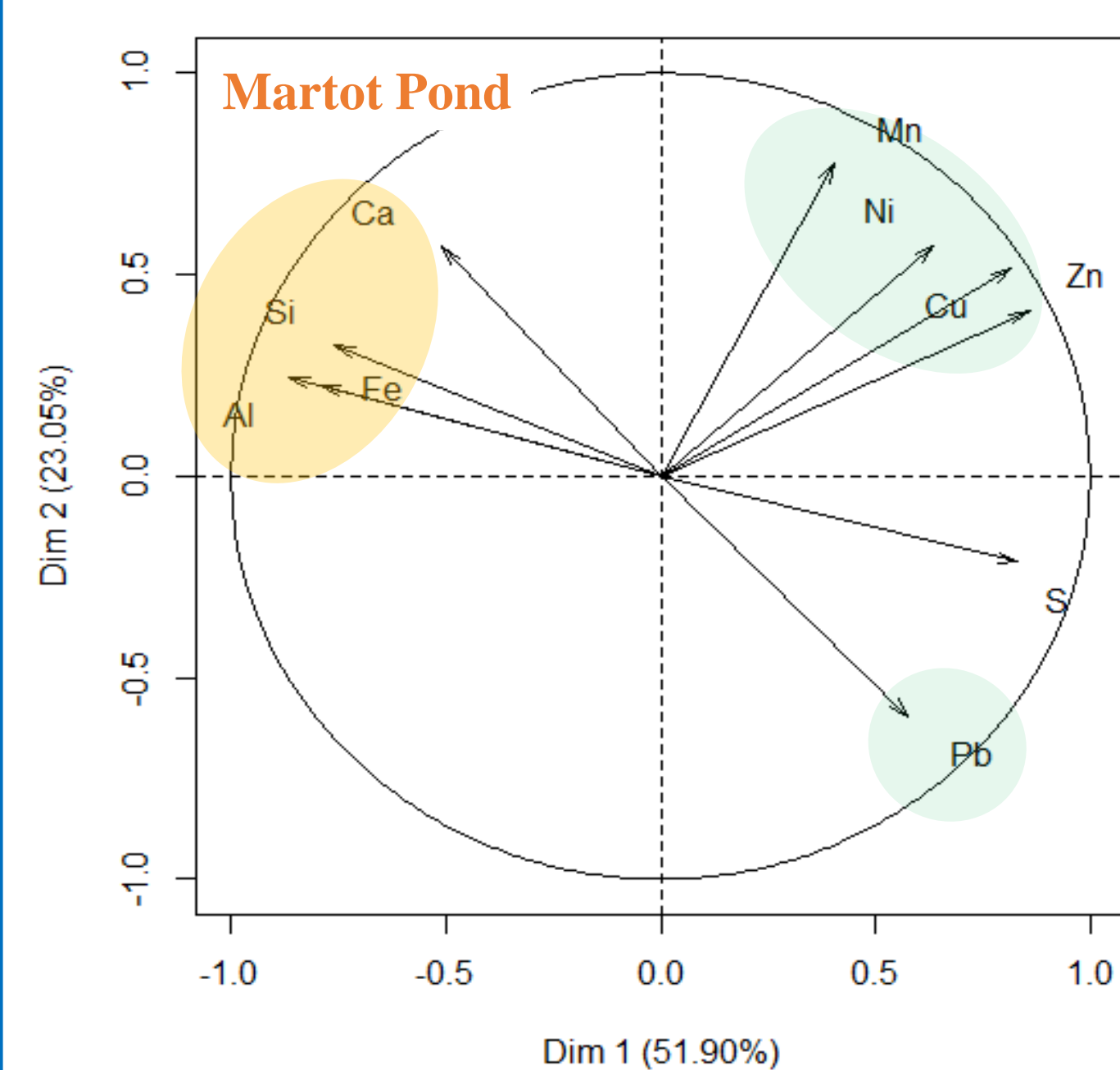
- ~ 10 km long upstream Eure-Seine Rivers confluence
- Two ponds cored:
 - Martot pond:
 - Filled by Seine until ~ 1940 then Eure River inputs
 - Les Damps pond:
 - Filled by Eure River inputs
- Cores used in this study: MAR15-01, MAR16-02 and MAR16-03
- Core used in this study: DAM17-02

T.M.E IN SEDIMENTARY CORES: HIGHLIGHT THE INDUSTRIAL PAST OF THE EURE RIVER WATERSHED

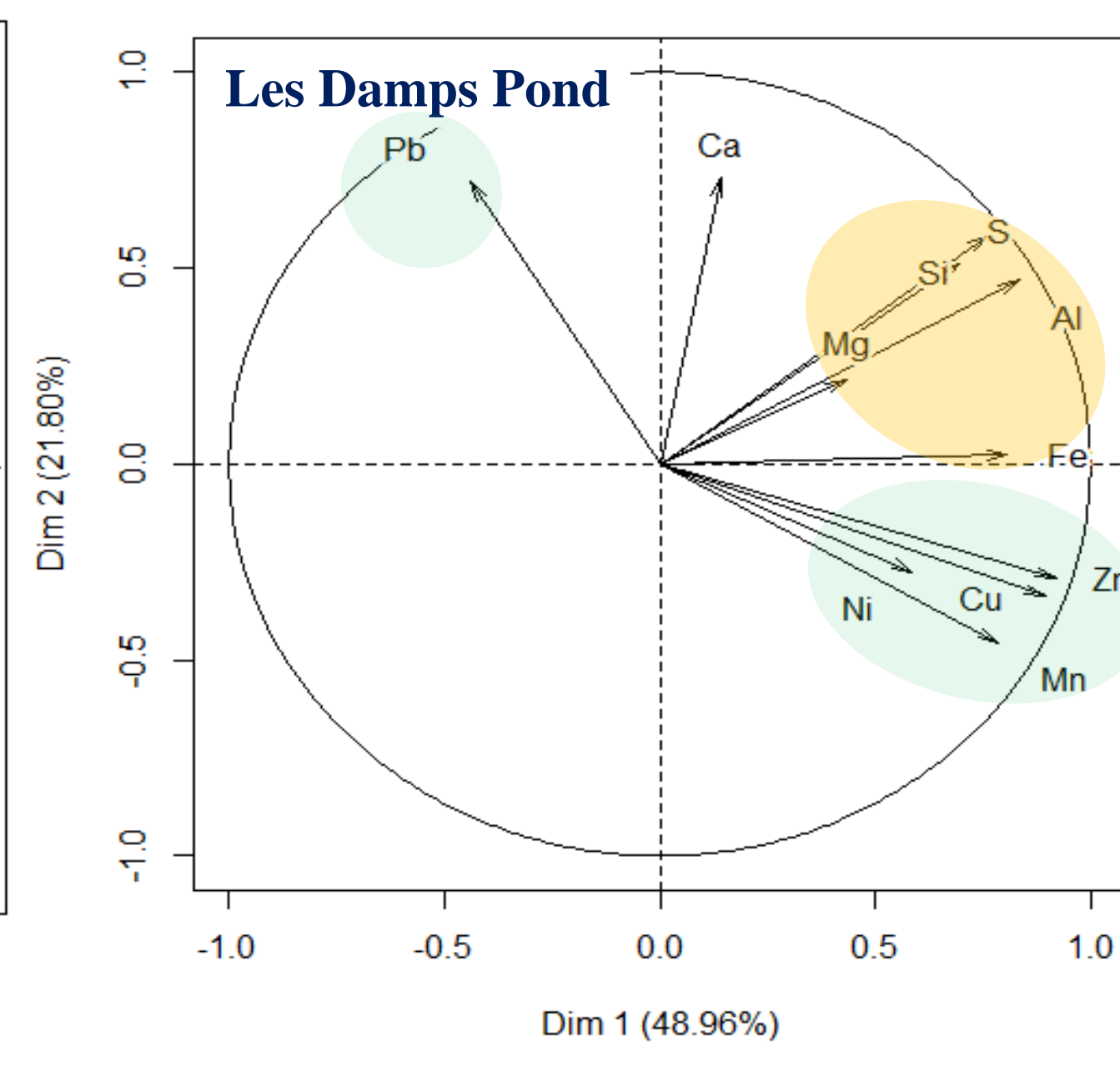
Principal Component Analysis (PCA):

- XRF Core Scanner data
- Sedimentary cores used:
 - Martot Pond: MAR15-01
 - Les Damps Pond: DAM17-02

Variables factor map (PCA)



Variables factor map (PCA)



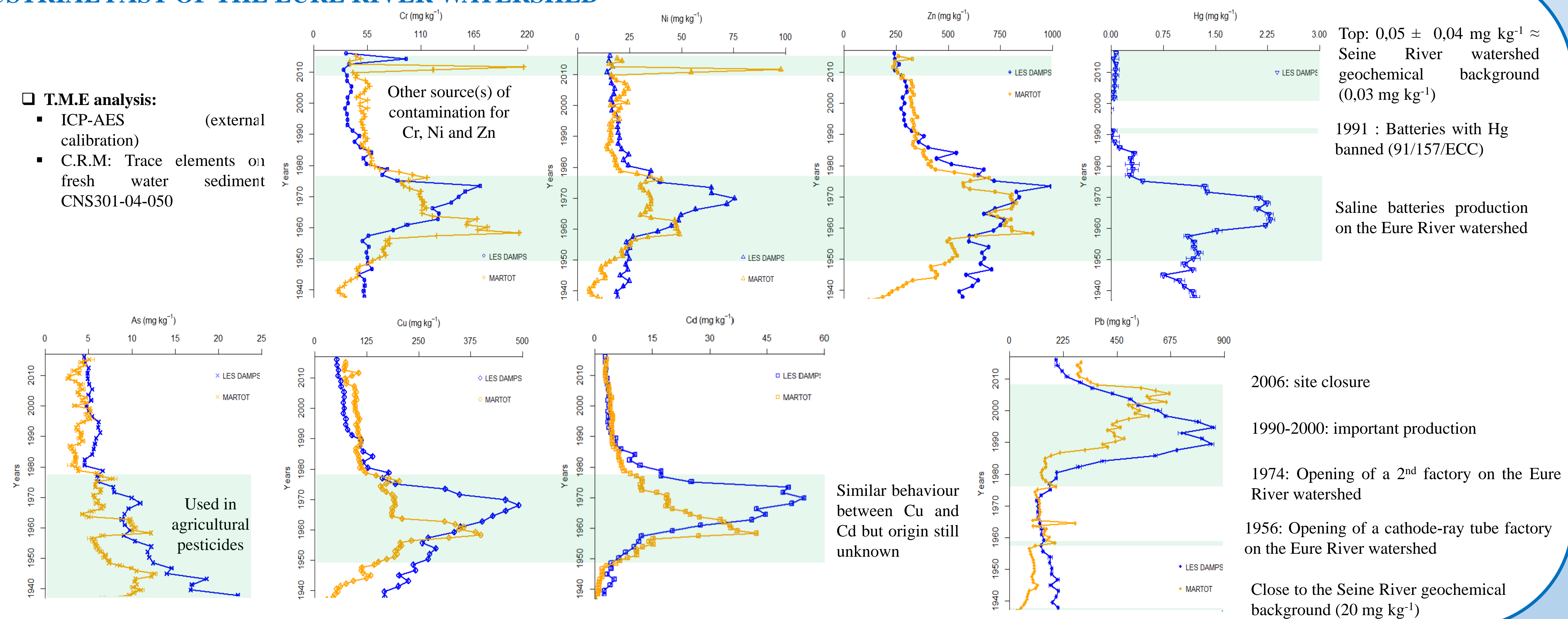
- Legend:
 - Sedimentary inputs (yellow circle)
 - Anthropogenic inputs (green circle)

For Martot and Les Damps Ponds:

- T.M.E came from non-natural sources
- Common origins for Ni, Cu, Zn.
- Pb: one anthropogenic sources.

T.M.E analysis:

- ICP-AES calibration (external sediment)
- C.R.M: Trace elements on fresh water sediment CNS301-04-050



CONCLUSION & PROSPECTS

- Sedimentary cores from Eure River ponds showed several decades of metallic contamination from multiple anthropogenic origins.
- The origins of contamination (Pb, Hg, etc.) are determined, nevertheless there is still other past and recent contaminations sources to identify
- After the dam removal, it becomes important to study the potential remobilization of contaminated sediments from ponds and Eure River's channel.

