

Scaling Up the Study of Wall Paintings in Roman Gaul: A Multi-Analytical Approach to Understand Painting Practices in *Limonum*

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Introduction - Archaeological question

Romans in Gaul from the 3rd c. BC → new technologies, including wall painting.

Gallo-Roman decorative traditions gradually acquired autonomy and originality in the 1st c. AD → Changes in the choice of raw materials and painting practices?

Lack of comprehensive archaeometric studies in Gaul → use of physico-chemical methods on a large corpus for the first time: *Limonum* (Poitiers).



Research aims

1. Characterise materials and painting technologies.
2. Investigate how pigments were prepared, combined and applied (e.g. *fresco*, *secco* or mixed techniques).
3. Identify, document, and explain tipping points in Gallo-Roman decorative traditions.

Results - Artists' Colour Palette

First discrimination by VNIR-HSI 1



Materials & Methods

7 SITES - 9 DECORS - 15 BOXES OF FRAGMENTS - 1ST-3RD C. AD

<p>15 rue Arthur Ranc 1st c. AD Thermal baths</p>	<p>10 rue de la Bretonnerie 1st c. AD Context undetermined</p>	<p>Chambre de Commerce mid. 1st c. AD Home?</p>	<p>Rue des Caillons mid. 1st - 2nd c. AD Garden decoration</p>
<p>Hôpital Pasteur (yellow background) beginning 2nd c. AD Villa</p>	<p>13 rue des Carmes (wall and vault) end 2nd - beginning 3rd c. AD Heated room (home?)</p>	<p>Saint-Stanislas end 2nd - beginning 3rd c. AD Home</p>	<p>Hopital Pasteur (marble imitation) end 2nd - 3rd c. AD Villa</p>

MULTI-ANALYTICAL APPROACH

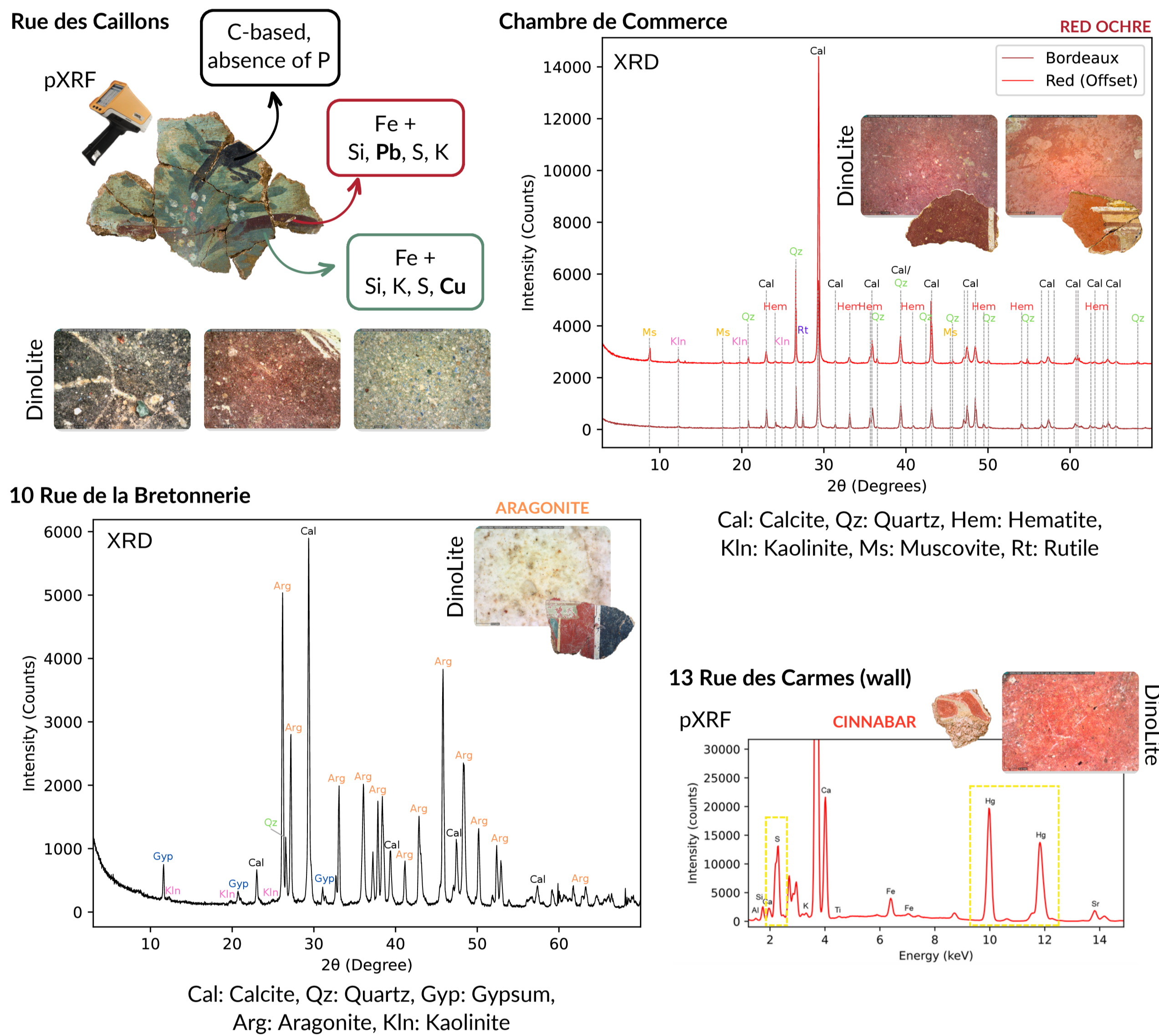
STEP 1 - NON-INVASIVE

- Hyperspectral Imaging (VNIR-SWIR-HSI);
- Photography and digital microscopy (DinoLite);
- X-ray Fluorescence Spectroscopy (XRF);
- X-Ray Diffraction (XRD) on plaster fragments.

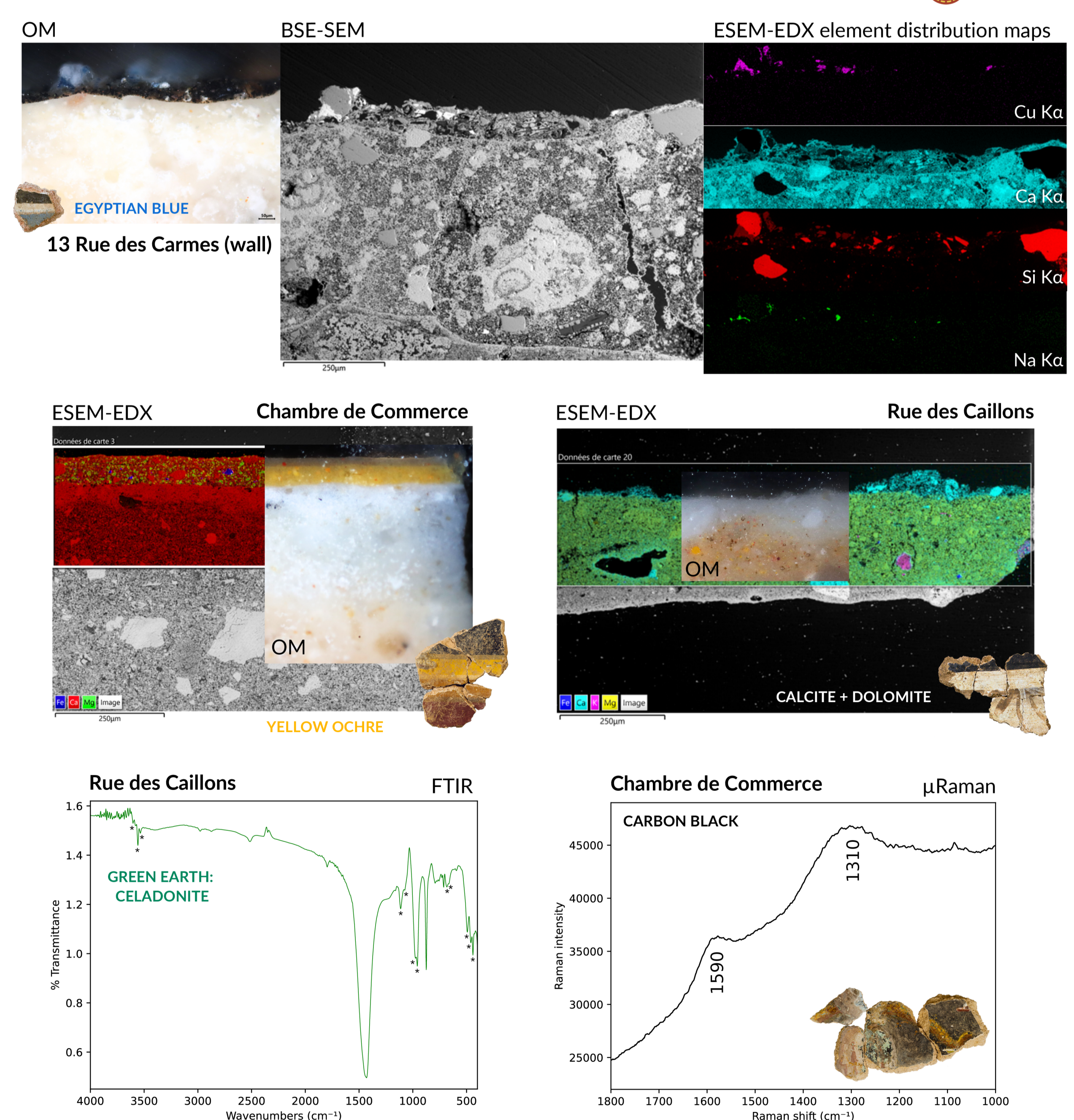
STEP 2 - MICRO-INVASIVE

- Optical Microscopy (OM);
- Cross-section preparation;
- Scanning Electron Microscopy - Energy Dispersive X-Ray Spectroscopy (ESEM-EDX);
- Fourier-Transform Infrared Spectroscopy (FTIR).
- μ -Raman Spectroscopy

Non-invasive analyses by DinoLite, XRF and XRD 2



Micro-invasive analyses by OM, ESEM-EDX, FTIR and Raman 3



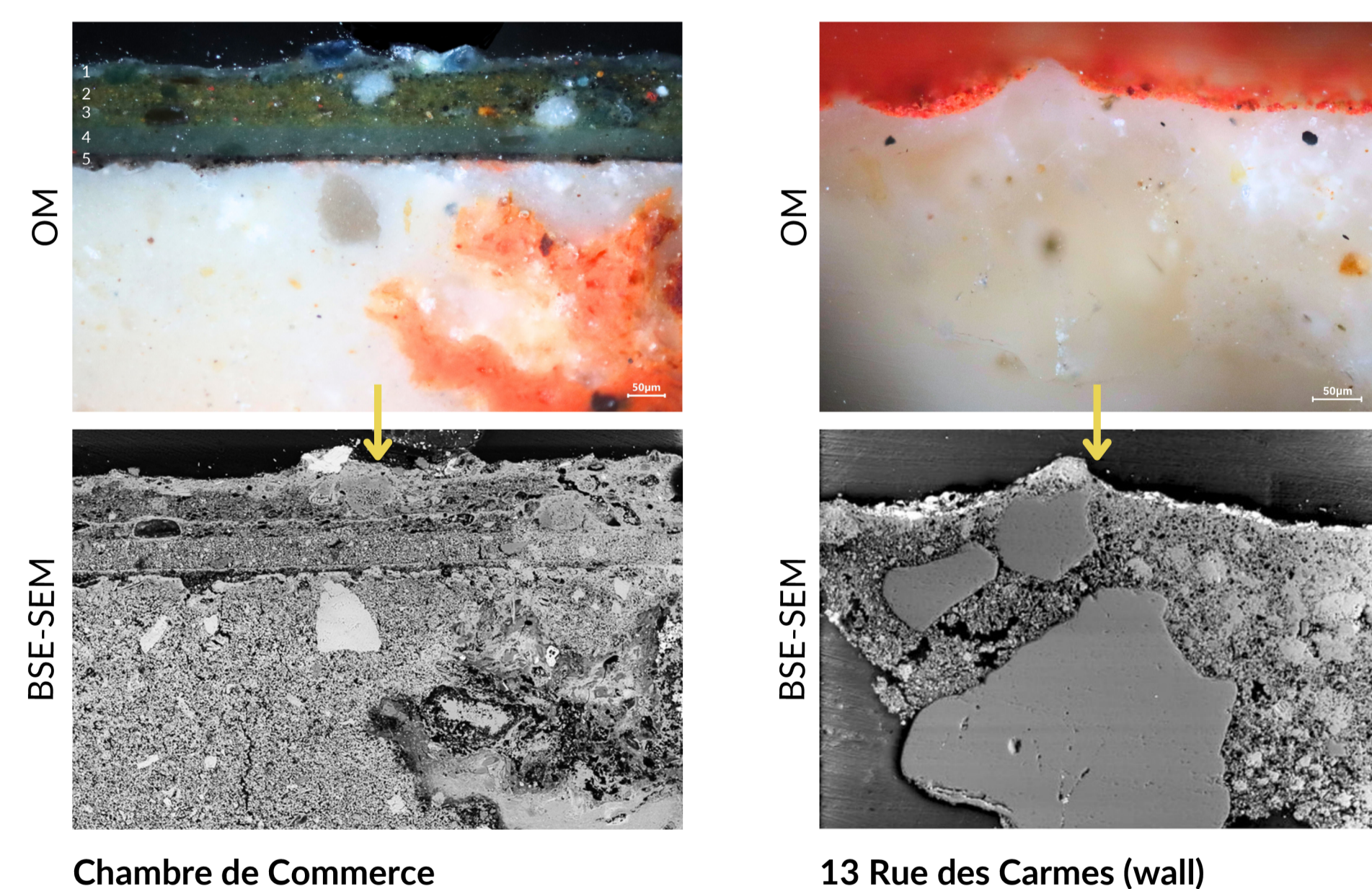
Results - Painting Technique

LIME PAINTING (SECCO)

- Defined, well-separated paint layers (polishing);
- Complex thick stratigraphies;
- Carbonatation at interfaces;
- Bright, saturated finish.

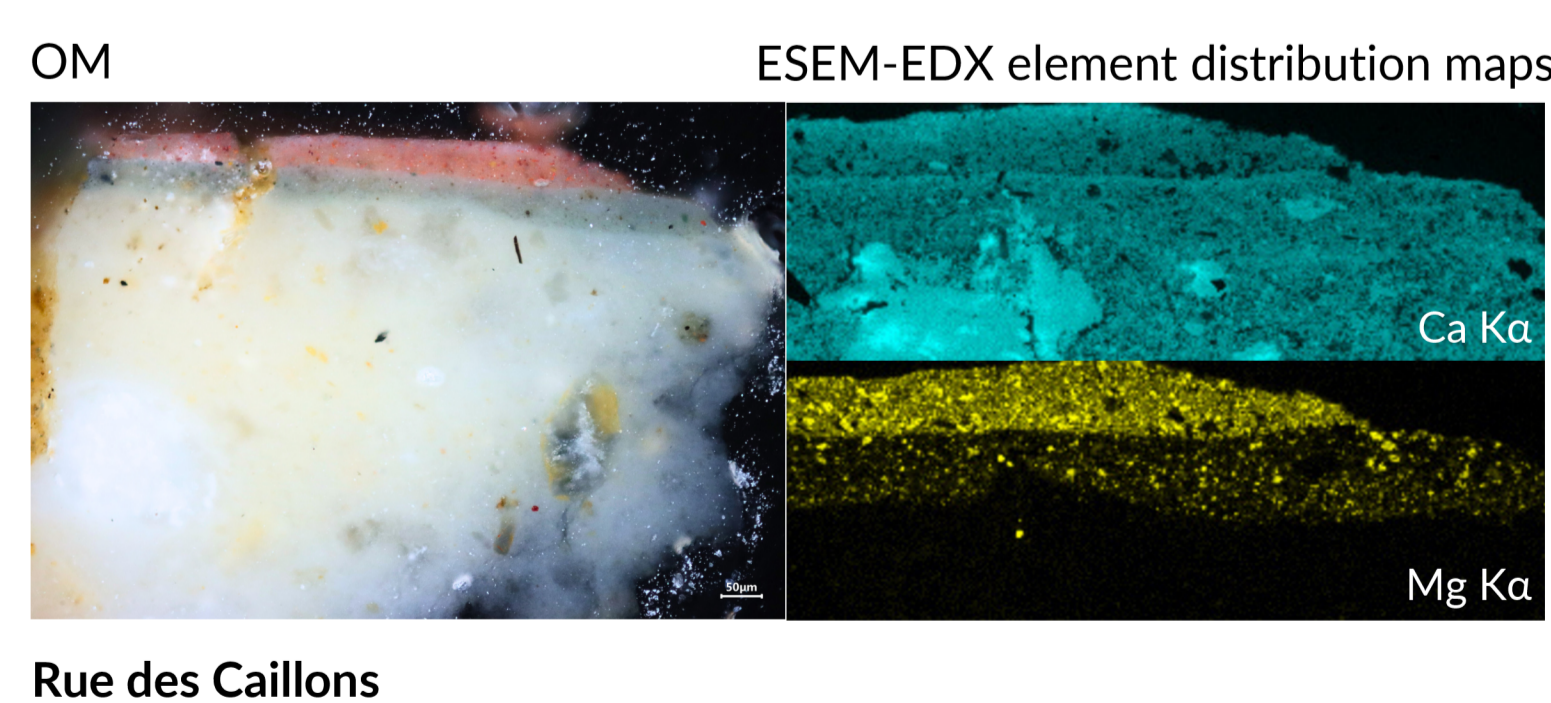
FRESCO

- Mostly thin paint layers;
- Irregular surface;
- One carbonatation layer;
- Opaque finish.



GENERAL PIGMENT FEATURES:

- Mainly pigments derived from earths: red ochres, yellow ochre, green earth (celadonite) + carbon black, calcite;
- Addition of Egyptian blue to darken greens, present from 1st to 3rd c. AD;
- Addition of dolomite to lighten colours;
- Use of aragonite for white details → information on social rank of client;
- Presence of cinnabar starting from the end of the 2nd c. → trade network.



Conclusions & Future Work

1. The pigments identified are consistent with historical descriptions and previous scientific studies;
2. Preliminary analyses by Py-GC-MS are in progress, further investigations and comparisons with mock-ups are necessary;
3. Combination of imaging, non-invasive and micro-invasive techniques has proven effective for large and heterogeneous collections;
4. Final phases of the research will allow to reach a complete understanding of the evolution of painting materials and techniques in *Limonum* from the 1st to 3rd c. AD.

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