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# Multi-analytical investigation of ceramic productions from Formative Mesoamerica to reassess the influence of Chupicuaro culture in the Basin of Mexico

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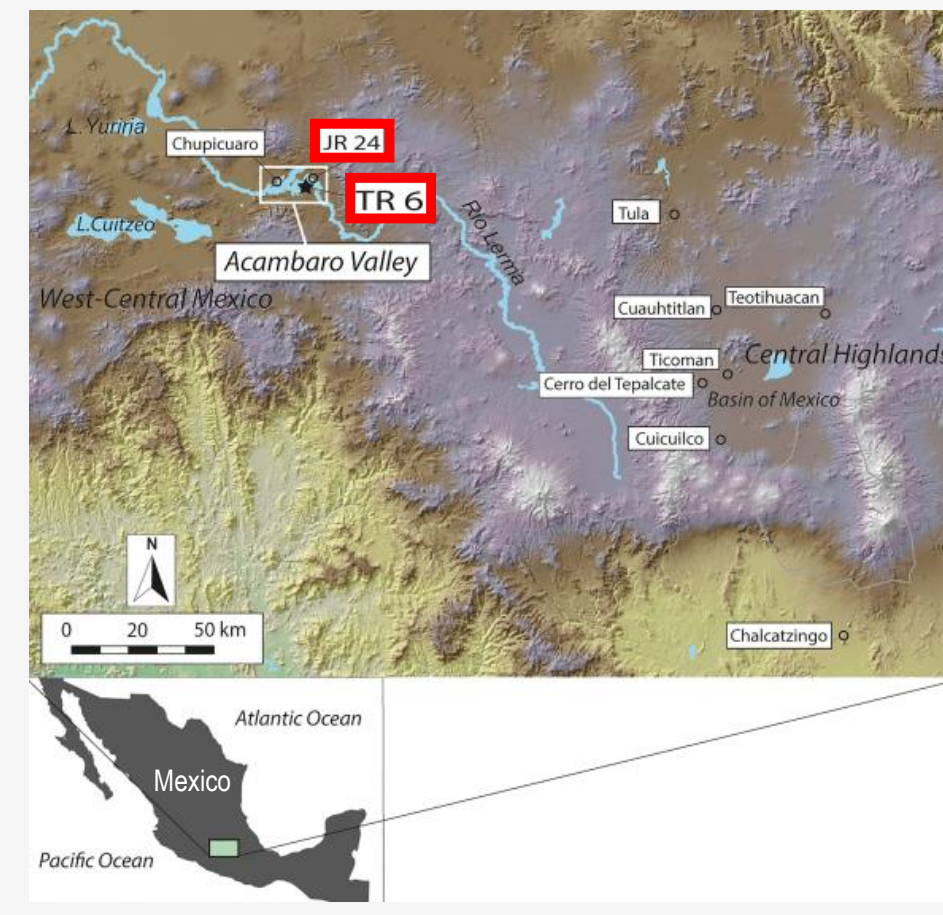
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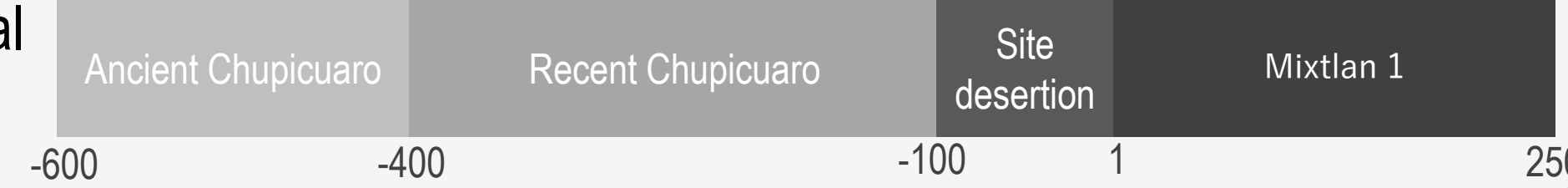


## CONTEXT

The Chupicuaro culture is known as one of the most dynamic traditions in Western Mesoamerica during the Middle / Late Formative periods (600 BCE – 250 CE). Excavations in the Acambaro Valley – especially on the sites TR6 and JR24 - have notably highlighted its well-polished ceramics combining complex shapes, shimmering colors and diversified iconographic motifs [1]. For the site TR6 in particular, a local production has been attested. Until now, little work has been carried out on Chupicuaro ceramics, while it is assumed that they could have influenced the ceramic productions of the Basin of Mexico, or to have been the source of local imitations and reinterpretations [2]. It is expected that the detailed study of the ceramic material will shed new light on the evolution of the Chupicuaro culture between Chupicuaro and Mixtlán periods, and on its social, cultural and economic relationships with Central Mexico.



Chronology of the Chupicuaro culture (Braniff, 1996)



## MATERIALS AND METHODS

- Over 180 **ceramic sherds** of the Chupicuaro culture from both archeological sites TR6 / JR24 } **4 corpus in total**  
from both periods Chupicuaro / Mixtlán



Sherds from TR 6 site, Mixtlán period

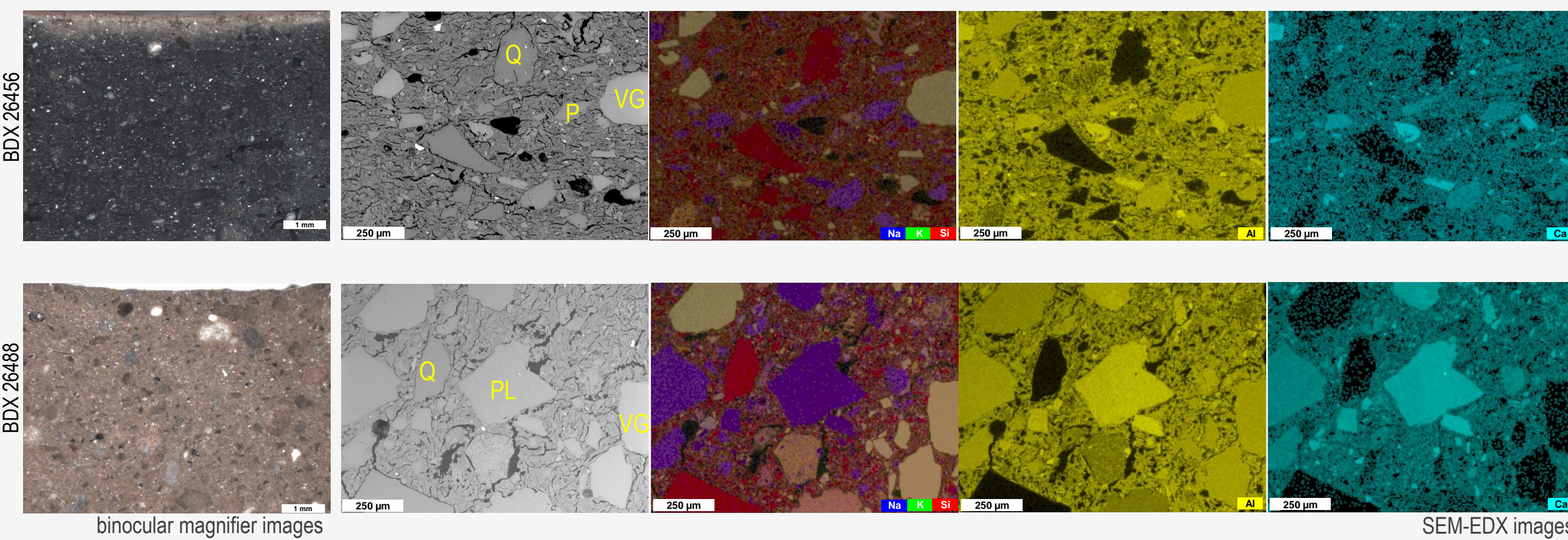
- Establishment of stylistic / technical / compositional groupings
  - Examination of the colors / patterns / shape of the sherds
    - Visual observation (macro / micro)
    - Hyperspectral imaging
  - Compositional, morphological and mineralogical analyses of the pastes and of the decorations
    - Non-destructive analyses (p-XRF, FTIR,  $\mu$ -Raman)
    - Preparation of polished cross-sections from a reduced number of sherds for their analyses by SEM-EDX

## AIMS OF THE STUDY

- To rediscover the **production techniques** of the Chupicuaro ceramic wares
- To trace the sources of supply of **raw materials** for the archeological sites TR6 and JR24 in the diachrony (Chupicuaro / Mixtlán periods)
- To compare Chupicuaro ceramics with ceramics from the Basin of Mexico from the same periods (Cuicuilco culture)

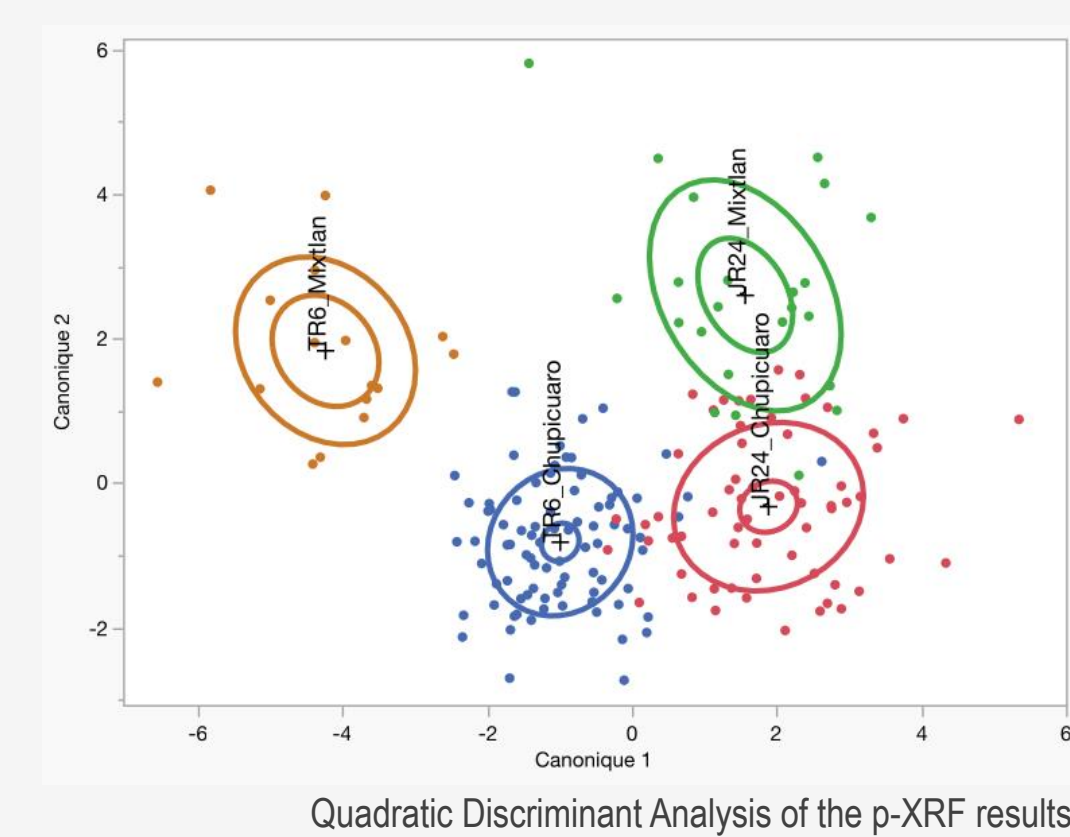
## RESULTS AND DISCUSSION

### 1 – Ceramic pastes



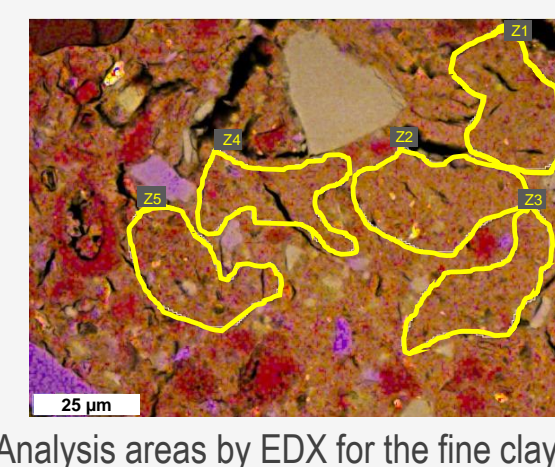
Whatever the corpus, the ceramic pastes

- are fine- to medium-grained
- show a high macroporosity
  - Low firing temperature – inf. 900 °C ?
- show a variability in color from one sherd to another (orange to grey to black). In most cases, they are grey to black at the core and light brown at the sub-surface.
  - Firing in a reducing atmosphere followed by a rapid cooling in an oxidizing atmosphere
- contain numerous non-plastic inclusions of type volcanic glass (VG), quartz (Q) and (Na, Ca)-plagioclase (PL)
- consist of non-calcareous clays (CaO < 2.8 wt%) with a relatively high Fe<sub>2</sub>O<sub>3</sub> content (between 3.4 and 5.2 wt%) (EDX results).



The composition of the pastes of each of the 4 corpus appear distinct, with K, Ca, Al (major elements) and Rb, Zr, Zn (trace elements) as discriminating elements (p-XRF results).

The composition of the fine clays of the 4 corpus appear also distinct, with Na, K, Ca, Al as discriminating elements (EDX results)



The sources of raw materials for ceramics at TR6 and JR24 and during the Chupicuaro period and the Mixtlán period are different.

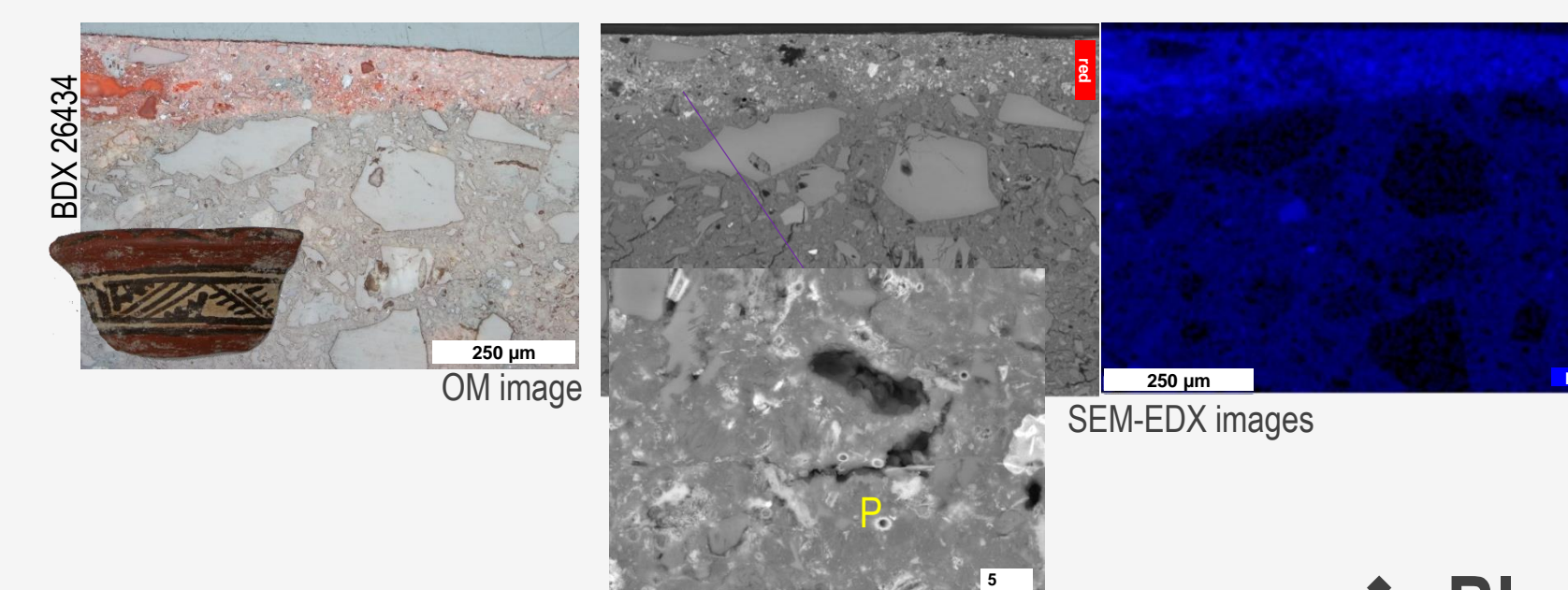
### 2 – Ceramic decorations

During the Mixtlán period, the geometric motifs of the Chupicuaro tradition continue but there is a **radical turn in iconography** with the appearance of **anthropomorphic** and **zoomorphic** figurative motifs: human beings, birds with spread wings, snakes, felines, etc.



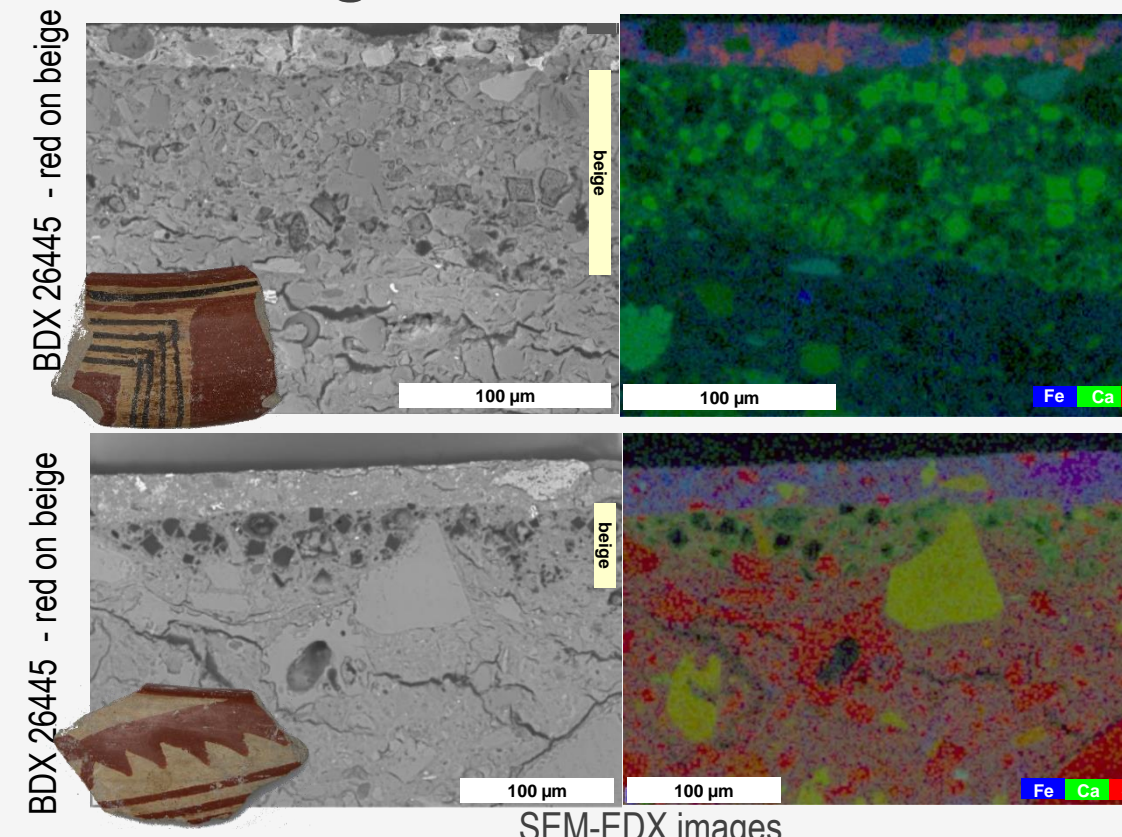
Mixtlán ware with figurative motif

#### ❖ Red



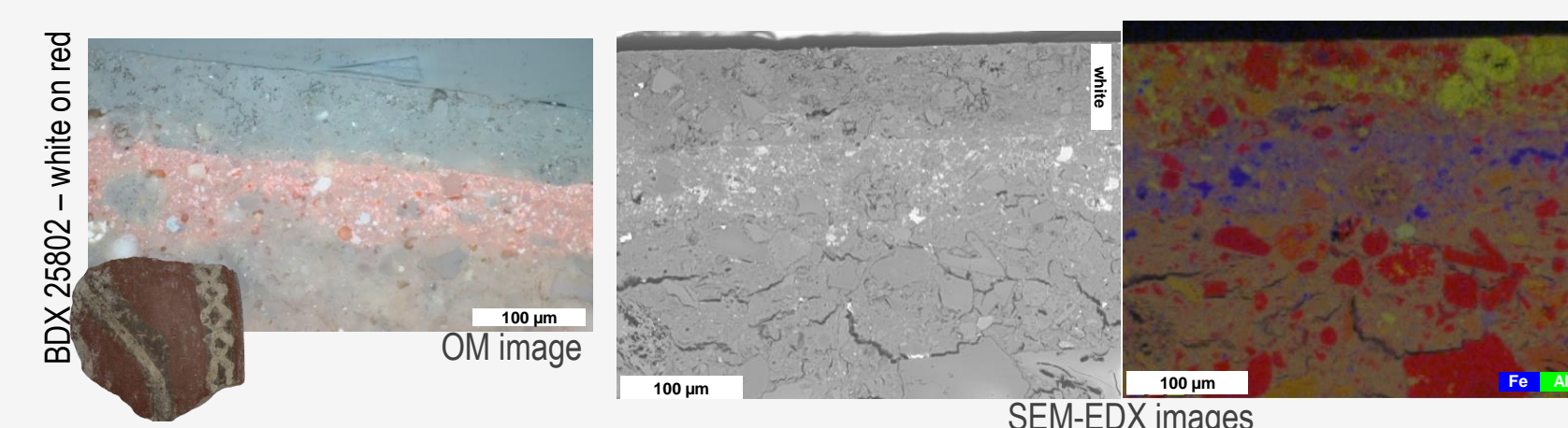
Whatever the corpus, the **red** decorations are fine-grained and consist of a high ferruginous clay. They contain numerous phytoliths (P).

#### ❖ Beige



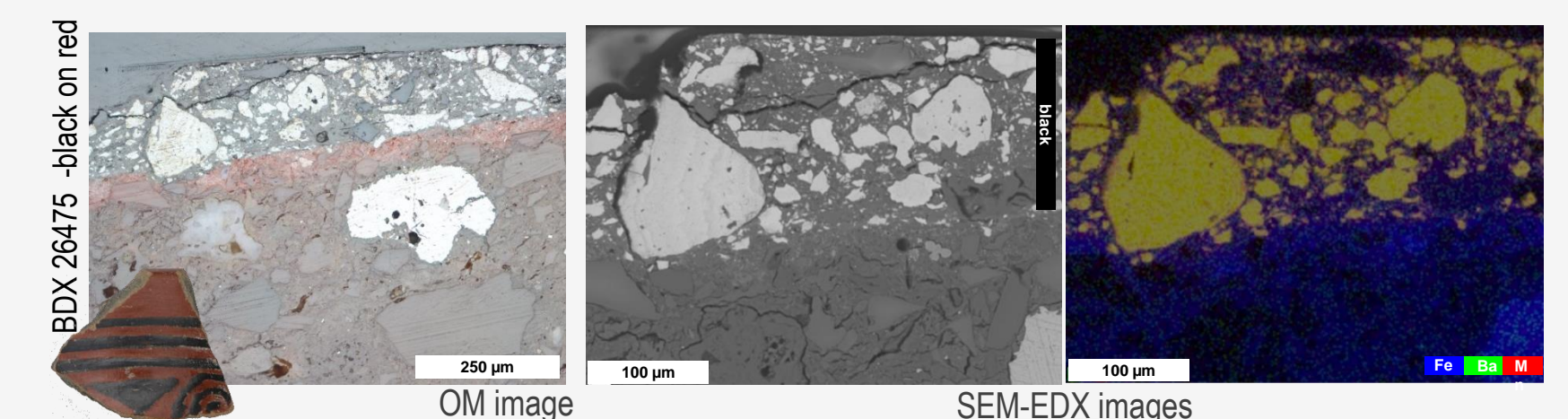
Whatever the corpus, the **beige** decorations are Ca-rich and show cubic inclusions assigned to CaCO<sub>3</sub> or voids attributed to the decarbonation of CaCO<sub>3</sub> that occurred during the firing of the ware.

#### ❖ White



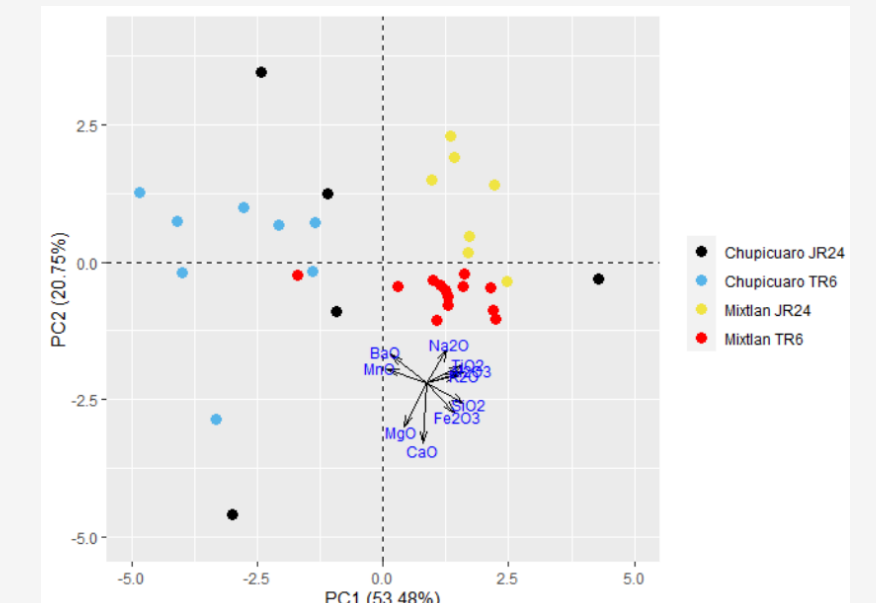
The **white** decorations are observed only for the Mixtlán period. It consists of a white clay, very likely a kaolinitic clay.

#### ❖ Black / Coffee



Whatever the corpus, there is no textural difference between the **black/coffee** decorations: they consist of coarse-grained inclusions, either Fe-rich for coffees or Mn- and Fe-rich for blacks (Ba associated to Mn).

The composition of the black decorations of the corpus Chupicuaro TR6 / Mixtlán TR6 / Mixtlán JR24 appear different.



Principal Component Analysis of the EDX results for the black decorations

## CONCLUSION

- Stylistic and technological similarities but compositional dissimilarity between the Chupicuaro ceramic wares of sites TR6 and JR24: **JR24 ceramics would not have been produced at TR6.**
- Technological continuity but stylistic evolution and compositional dissimilarities between the ceramic wares of periods Chupicuaro / Mixtlán: **disruption in the sources of raw materials at the transition Chupicuaro Period / Mixtlán period ?**

## PERSPECTIVES

- Petrographic and XRD analysis of the sherds.
- Provenance study: comparative analysis with **geological samples** from nearby sites and with **ceramic replicas** fired from these samples.
- Analysis of the **Cuicuilco material**.



## References

- [1] Darras V., Hamon C. (2020) Indicators of Household Pottery Production: A Case-Study from the Chupicuaro Formative Culture. *Journal of Field Archeology*, 45, pp.445-463  
 [2] Darras V. (2006) Las Relaciones entre Chupicuaro y el Centro de México durante el Preclásico Reciente. *Journal de la Société des Américanistes*, 92, pp. 69-110.

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