ALL THAT GLITTERS IS NOT PLUMBATE: DIFFUSION AND IMITATION OF PLUMBATE CERAMICS DURING THE EARLY POSTCLASSIC PERIOD (AD 900–1200) AT THE MALPAÍS OF ZACAPU, MICHOACÁN, MEXICO

Elsa Jadot, Grégory Pereira, Hector Neff, and Michael D. Glascock

Elsa Jadot Leiden University, Faculty of Archaeology, Einsteinweg 2, 2333 CC Leiden, Netherlands (elsa.j@sfr.fr, corresponding author)
Grégory Pereira CNRS, UMR8096, 21 allée de l'Université, Nanterre, F-92023, France (gregory.pereira@mae.u-paris10.fr)
Hector Neff California State University, Long Beach, USA (Hector.Neff@csulb.edu)
Michael D. Glascock University of Missouri, Columbia, USA (GlascockM@missouri.edu)

(Abstract)

In Mesoamerica, the Early Postclassic (AD 900–1200) is characterized by the long-distance circulation of pottery with a very hard and shiny coating with a metallic aspect: Plumbate ceramics. Plumbate is linked stylistically to the Toltec culture but was produced in workshops in Soconusco (Chiapas). The discovery of a similar assemblage of sherds during recent work at the site of El Palacio (Zacapu, Michoacán) shows that Plumbate ware also reached this region of Western Mexico.

Instrumental neutron activation analyses (INAA) were carried out on 11 of the Zacapu fragments and compared to the data from ceramic pastes from the region of Soconusco and Pátzcuaro basin (Michoacán). The results show that ten sherds were produced in Michoacán and are thus a local imitation, whereas the last fragment corresponds to a Tohil-type Plumbate paste and was transported over a long distance. This raises the question of the modalities for the circulation of this ceramic and the conditions allowing for an imitation production (transfer of technical know-how?), which we suggest is linked to the Toltec culture in the centre of Mexico.

(Keywords)

Mexico, Early Postclassic, Toltec, Plumbate ceramics, instrumental neutron activation analysis (INAA), imitation.

(Spanish abstract)

En México, durante el Posclásico Temprano (900–1200 d.C.), destaca la circulación a larga distancia de vasijas caracterizadas por un engobe de aspecto metálico muy duro y particularmente brilloso: la cerámica Plomiza. Por primera vez, hemos podido demostrar la presencia en el centro-oeste de México de tiestos del auténtico tipo Plomizo Tohil, producción típica de la región maya de Soconusco (Chiapas) así como la existencia de una imitación michoacana alejada de 1600 km. El aspecto de varios tiestos descubiertos durante las excavaciones arqueológicas del sitio urbano El Palacio (Cuenca de Zacapu, Michoacán, México) es similar a la cerámica Plomiza. Para comprobar la hipótesis de una imitación local o de una importación, se hicieron análisis por activación neutrónica (INAA) de 11 fragmentos. Los datos fueron comparados con los de las pastas cerámicas de la región de Soconusco y de la Cuenca de Pátzcuaro (Michoacán). Los resultados demuestran que 10 tiestos fueron hechos en Michoacán y son una imitación local, mientras que el último tiesto corresponde a la pasta del tipo Plomizo Tohil la cual implica una circulación sobre una larga distancia. Destaca entonces la cuestión de las modalidades de circulación de estas cerámicas y de las condiciones que permitieron una producción de imitación (¿transferencias de habilidades técnicas?), que proponemos relacionar con la cultura tolteca del centro de México.

(Palabras claves)

México, Posclásico temprano, tolteca, cerámica Plomiza, análisis por activación neutrónica (INAA), imitación.

Western Mexico has long been considered to be on the fringe of the main Mesoamerican interaction systems, but it is now perceived as a heterogeneous cultural complex with regular interactions with other regions of Mesoamerica at different periods of its history, and in particular with central Mexico. As early as the Preclassic period (Braniff 1972; Carot 1992; Darras 2006), then during the Classic period (Filini 2004; Filini and Cárdenas 2007; Hernández 2016; Jiménez Betts 1992, 2018), the societies occupying this vast region established links with their neighbors to the east, as shown by an ever-increasing list of material markers. We also now know that the role of the West was not just a passive one and that products, symbols and even populations from the West also impacted the historic trajectory of societies from Central Mexico (Braniff 1972, 1999; Hers 2005; Manzanilla 2005). Michoacán and the Bajío seem to hold a preponderant role in these interactions, through mechanisms that have yet to be explored. By way of example, the discovery of a "barrio michoacano" in Teotihuacan (Gómez Chávez 2002; Gómez Chávez and Gazzola 2007) showed that populations from the west took part in the development of the Classic Period metropolis and that productions from the metropolis were imported and often imitated in or beyond their regions of origin (Carot 2005; Filini 2004; Hernández 2016; Matos Moctezuma and Kelly 1974; Michelet and Pereira 2009).

After the fall of Teotihuacan, the appearance of new ceramic productions in the Basin of Mexico has been interpreted as a marker of migrations from the Bajío, as in the case of the Coyotlatelco complex (Braniff 1972, 1999; Manzanilla 2005), or certain productions from the Early Postclassic (Braniff 1999). During this latter period, the emergence and development of the Toltec state marked the setting up of a new system of macro-regional interaction, in which Tula seemed to play a driving role (Diehl 1993). In Western Mexico (Jiménez Betts 2018), this trend has been identified in diverse regions based on the presence of material markers, including Mazapa-style figurines, Tlaloc effigy censers, certain forms of incense burners, and the famous Plumbate ceramics. In southwestern Pátzcuaro Basin, elite burial goods from Urichu provide many types of goods known from Tula, including censers, ceramic vessels, flutes, and projectile point types found at the Palacio Quemado at Tula (Helen Pollard, personal communication 2018). According to the discovery contexts, which are generally ceremonial centres, Plumbate type ceramics seem to be reserved for ritual use and linked to the elite. In the words of R. Cobean (1990:481) "Tal vez eran artículos importantes 'de lujo' usados sobre todo por grupos de élite social para reforzar su alto estatus."

The aim of the present article is to provide new data pertaining to the circulation of Plumbate type ceramics in the Michoacán highlands, based on the analysis of a recently discovered assemblage at the site of El Palacio (Zacapu, Michoacán), as part of the Uacúsecha project. The

results of these analyses reveal that in addition to the examples imported from the region of Soconusco by the alleged intermediary of Tula, producers in Michoacan also imitated Plumbate vessels, which they supplied to local elites.

The long-distance diffusion of Plumbate ceramics

Origins

Plumbate ceramics originally come from the Pacific side of the region of Chiapas and Guatemala (Neff 2002a, 2003; Neff and Bishop 1988; Figure 1) and were very widely diffused throughout the whole of Mesoamerica (Shepard 1948:103–104).

Figure 1. Principal sites with presence of Plumbate ceramics in Mesoamerica, with the location of the site El Palacio, Michoacán, and the two main source zones of Plumbate in the Soconusco region, Chiapas (map by E. Jadot).

This production is diagnostic of the Toltec Horizon and is characterized by a very hard coating with a metallic aspect and a colour varying from orange to grey or olive green (Fähmel Beyer 1988:13–23; Shepard 1948:93, 101, 169–172). The first analyses of Plumbate type sherds carried out by A.O. Shepard (1948:143, 170 172) suggested that the iron and alumina-based composition of the slip gave it its vitreous aspect. More recent analyses by M. Glascock and

H. Neff on the material from the region of Soconusco also brought to light enriched concentrations of sodium and potassium, as well as an enrichment in copper and zinc (Neff 2001, 2002a, 2010). Petrographic (Shepard 1948:91–93) and chemical analyses (Neff 1984, 2000, 2002b; Neff and Bishop 1988) of the clays distinguished two Plumbate paste groups: San Juan and Tohil. During the Epiclassic period (AD 600–900), simple Plumbate vessels were the dominant serving vessels in Soconusco and many, mostly of the San Juan paste group, were exported to the highlands of Guatemala and western El Salvador. During the Early Postclassic (AD 900–1200), fancy vessels made of Tohil clay reached the northern Yucatán peninsula (Chichén Itzá), central Mexico (Tula; Cobean 1990:475–485), and western Mexico (Lake Chapala; Meighan 1976; Neff 1989; Shepard 1948:103–114). Plumbate production ceased around AD 1100, and as of yet, no satisfactory explanation can account for this discontinuation, although the hypothesis of demographic decline in the producing region has been advanced (Neff 2014a:8).

Diffusion and Imitation

Plumbate ceramics not only link to the places of discovery to the region of Soconusco, from where this type originates, but also to other regions of Mexico through which these products may have transited. It is particularly prominent at Tula. According to R. Diehl (Diehl 1981:289; Diehl et al. 1974:182–183), "Tohil Plumbate is the most notable ceramic import; over 1,000 sherds and 5 complete vessels were found in the excavations, and 300 sherds were collected during the survey, more than were collected of some of the rare local pottery types. Virtually all the identifiable vessel shapes are drinking goblets." One of the most noteworthy finds was in the main ceremonial centre, where a cache of five whole vessels was found in a well located in a structure near an altar (Diehl et al. 1974; Figure 2).

Figure 2. Plumbate type ceramics found in a ritual deposit at the site of Tula (after Diehl et al. 1974:Vessels 5–9).

Shepard (1948:37) described some imitation Plumbate, but these tend to be easily identified by non-Plumbate features such as polished surfaces or post-slip incising. Although no analyses have been carried out on the material from Tula to confirm that they are Plumbate, they clearly have the vitrified surfaces of true Plumbate, and we are quite certain that they are not imitations. In contrast, a Plumbate-like effigy vessel discovered in the Templo Mayor, at Tenochtitlán was determined by instrumental neutron activation analyses (INAA) to have been produced in the Basin of Mexico (López Luján 2006:138). Its similarity to other jar-effigies from the Early Postclassic period at Teotihuacán suggests that it may have been discovered at the site by the Mexicas and reused as an offering in Tenochtitlan (López Luján 2006:138–139), as was also probably the case for the famous 9-x vase (Lopez Lujan et al. 2000).

The Site of El Palacio and its links with the Toltec Culture

Context of Discovery

The site of El Palacio is located in the region of Zacapu (Michoacán; Figure 1), in the south-eastern portion of the Malpaís de Zacapu, a vast Holocene volcanic flow from the eruption of the Capaxtiro volcano. The site currently sits above the town of Zacapu and undoubtedly corresponds to the former city of Tzacapo Tacanendan cited in the *Relación de Michoacán*. This is one of the oldest known establishments in the region and has been studied by several

generations of archaeologists (Caso 1993; Freddolino 1973; Lumholtz 1973 [1902]). However, it underwent more rigorous research from the 1980s onwards, then in the 1990s, as part of the Michoacán project (Michelet 1992, 1998; Michelet et al. 1989), which outlined its morphological characteristics and defined the occupation chronology. Surveys showed that the site extends across about fifty hectares and located some of the ceremonial centres. Test-pits have shown that the site was mainly occupied during the Early (Palacio phase: AD 900–1200) and Middle Postclassic (Milpillas phase: AD 1200–1450). Later research carried out in the 1990s by E. Fernández-Villanueva (1992) focused mainly on the Milpillas phase occupation. More recently, new research was conducted on El Palacio as part of the Uacúsecha project (directed by G. Pereira, CNRS/MEAE/CEMCA) in order to gain a better understanding of the background of the Tarascan state. New surveys, cartography and surface collections in 2010 generated a new plan and a more detailed analysis of the site's spatial organization (Forest 2014). Most of the ceremonial structures have now been located and a habitation sector corresponding to the Milpillas phase occupation has been systematically mapped. Finally, in 2012, three stratigraphic test-pits were excavated in zones where material from the Palacio phase had been found on the surface (Jadot 2013:118–124). One of these (UT52) led to the discovery of several layers containing abundant material dated to the Early Postclassic (AD 900–1200). This 2 x 2 m test excavation penetrated deposits on one of the ceremonial places of the site, several metres to the west of pyramid Y5 (Figure 3). The Plumbate-like ceramics discussed in this article were discovered in these layers.

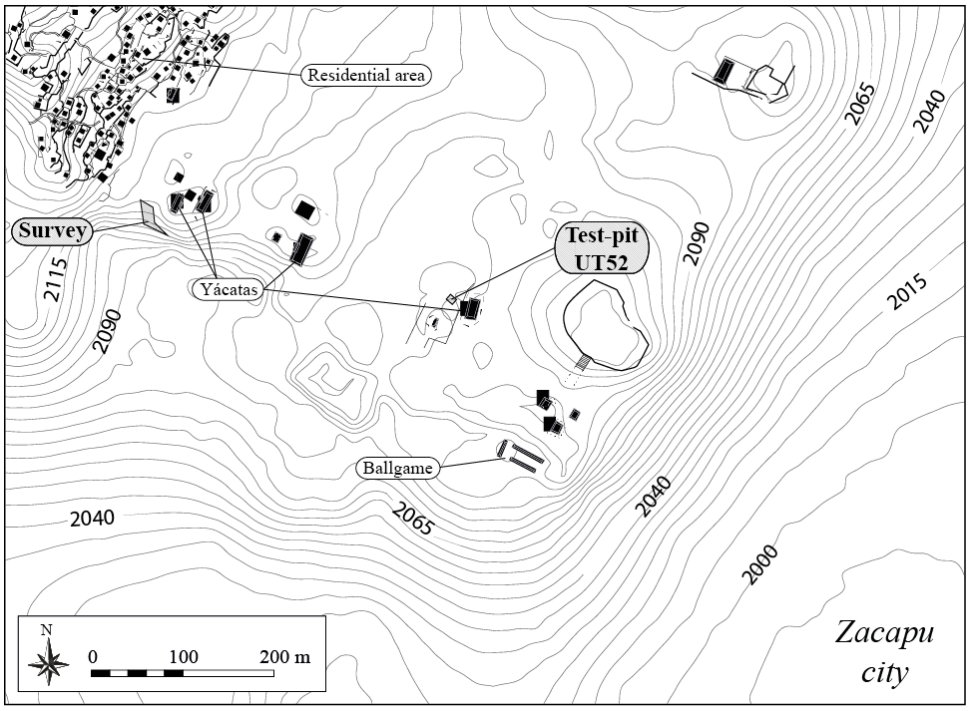

Figure 3. Location of test-pit UT52 and the prospected zone of the site of El Palacio that yielded the analysed sherds (after a map by M. Forest).

The stratigraphic contexts associated with this material were dated by two charcoal samples (from levels UE553 and UE555) and a faunal bone (from level UE554), which provided radiocarbon dates (Supplementary Figures 1–3): respectively, 953 ± 12 BP (GrM11623; charcoal; $\delta^{13}C$ = -24.06%), 1060 ± 12 BP (GrM 11625; charcoal; $\delta^{13}C$ = -24.25%), and 1055 ± 35 BP (Lyon-11162 [SacA36799]; faunal bone). The calibration of these dates (HPD 95%: UE555: AD 974–1017; UE554: AD 896–1027; UE553: AD 1026–1151) and their stratigraphic position (Figure 4) place the objects in these levels between AD 974 and 1151, which is strictly contemporaneous with the apogee of the Toltec culture. Note that the occupation of the site begins at the end of the Epiclassic period (La Joya phase) as revealed at the lower levels (UE530) of test-pit UT51 that yields an AMS radiocarbon date of 1275 ± 45 BP (Lyon-11161 [SacA36798]; faunal bone; Supplementary Figure 4); AD 659–869 after calibration (HPD 95%).

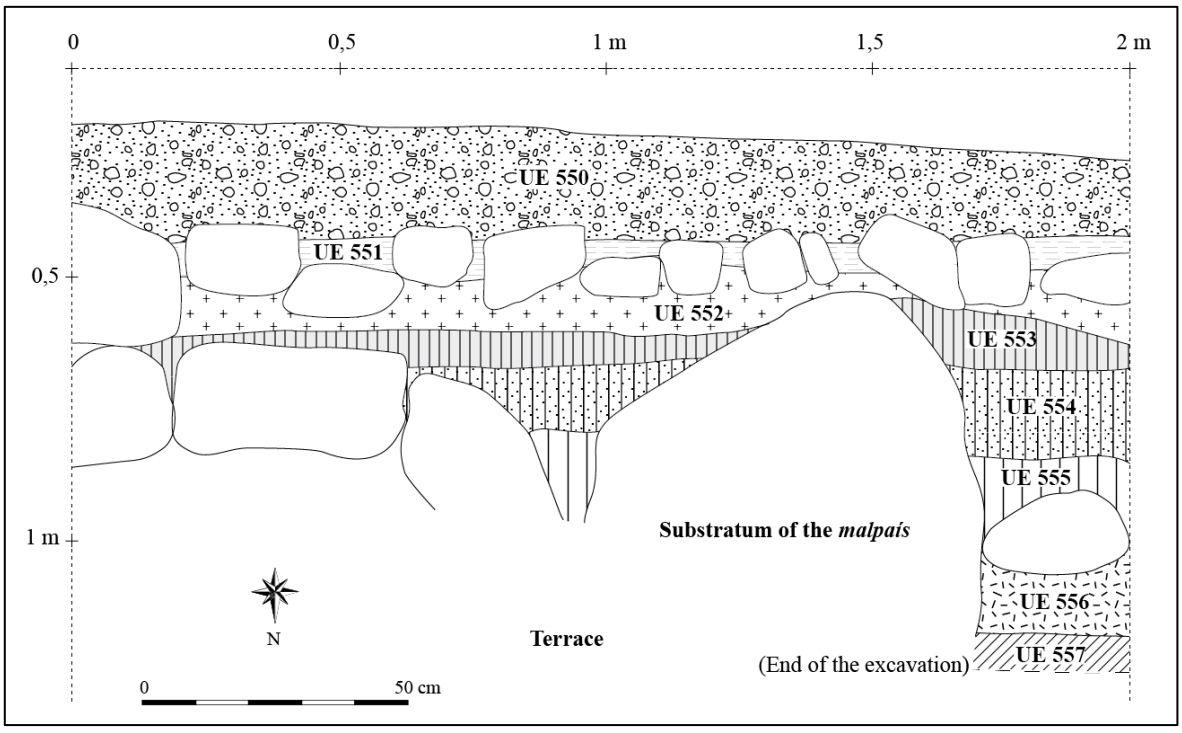

Figure 4. Stratigraphy of test-pit UT52 and Plumbate-like sherds in their discovery context.

Archaeological Links with the Toltec Culture

Some of the material from test-pit UT52 shows distinct links with the Toltec culture from the Tollán phase (ca. AD 950–1150/1200). For example, the fine monochrome ceramics of the

Palacio Pulido Inciso group (Supplementary Figure 5.a–b) present clear similarities with the Sillon Incised type bowls from Tula, as regards their form, finishing and decoration (see Cobean 1990:375–383; Supplementary Figure 5.f). The Braseros San Antonio type fragments (Supplementary Figure 5.c–d) found in UT52 possibly also show links with the Abra Coarse Brown braseros (see Cobean 1990:399–411; Supplementary Figure 5.g). In addition, Plumbate type sherds and ceramic fragments of anthropomorphic Mazapa-style figurines (see Diehl 1983:106–110; Stocker 1974) associated with the Toltec culture were among the material from the test-pit (Jadot 2016a; Forest et al. in prep.). Similarities between the material culture from the north-central Michoacán and the region of Tula had already been pointed out by D. Michelet and G. Pereira (2000) for the Palacio ceramic complex. In particular, strong stylistic similarities (decorative technique and motifs) were noted between the Hornos Rojo sobre Bayo type ceramics (Michelet 2013:98–99; Supplementary Figure 5.e) and the Mazapa Red on Brown type of the terminal Corral phase from Tula (AD 900–950; see Cobean 1990:267–280; Supplementary Figure 5.h). Other elements from the funerary adornments (Pereira 1999:181–184) also showed links with the warrior paraphernalia depicted in Toltec iconography. However, the authors concluded that "in contrast with the northwest (the Lake Chapala region) and the northeast (the Ucareo-Zinapecuaro zone), this northern-central part of the modern state does not seem to have received important influences from Tula nor, even less, to have been included within a Toltec political and/or economic sphere" (Michelet and Pereira 2000). The recent discoveries at the site of El Palacio enable us to discuss this interpretation.

The Plumbate Type Ceramics from the site of El Palacio

Test-pit UT52 at El Palacio (Figures 3–4) yielded numerous ceramic fragments comparable to Plumbate ware (Table 1).

Table 1. Quantities of Plumbate-Like Sherds in Test-Pit UT52.

Level	Number of sherds	Minimum number of individuals (MNI)
UE550	3	1
UE551	1	1
UE552	5	3
UE553	25	3

UE554	93	22
UE555	54	7
UE556	7	2
Total	*188*	*39*

No Plumbate ceramic had been recorded in the region of Zacapu before this discovery, apart from two sherds listed in the collections of the American Museum of Natural History, at New York (Ross 1939:Table 1). To our knowledge, no analyses were undertaken on these two sherds.

Technological Characteristics of the Plumbate-Like Ceramics

At the site of El Palacio, Plumbate-like pottery was first identified on the basis of its carefully polished and extremely glossy slip, with an almost metallic aspect, and a dark grey (Munsell Soil Color Charts 10YR 2/1–10YR 4/1), reddish-brown (7.5YR 4/2) or red colour (10R 3/6). Most of the fragments come from cylindrical forms with a diameter of 3.5 to 4.6 cm (Figures 5 and 6a–b); these are interpreted as necks of small bottles with a long, narrow neck and a shape similar to that of the jars discovered in a cache at Tula (Figure 2). Only a few of the sherds belong to open forms.

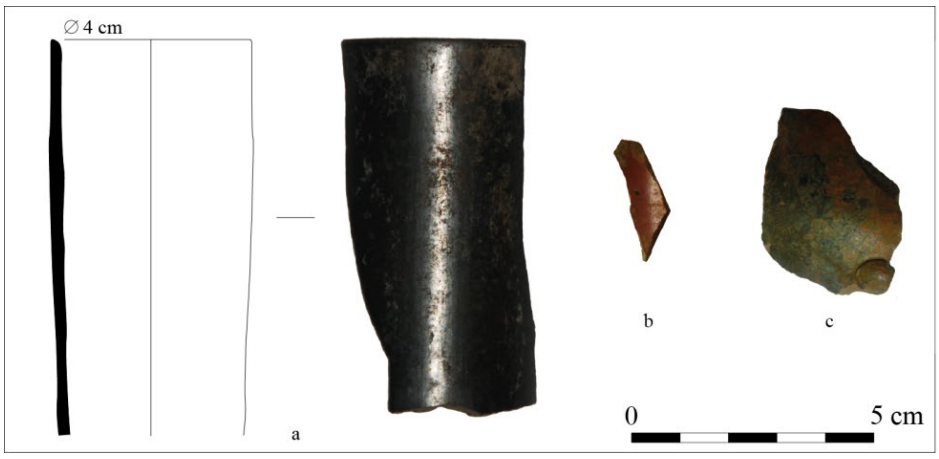

Figure 5. Examples of Plumbate-like sherds analysed for the study at El Palacio, Michoacán: (a–b) test-pit, CPP437 and CPP433; (c) survey, CPP435 (photographs by E. Jadot).

These ceramics are made with particularly fine stretched coils (1 cm) and are always polished with a horizontal movement on the internal face and a vertical movement on the external face, with a tool that leaves fine traces and gives the surface a very high degree of sheen. That the surfaces are polished is indicative that these are not Plumbate but imitations. We find the same finishing characteristics on the same type of pottery discovered in the Templo Mayor, at

Tenochtitlán but L. López Luján (2006:138–139) suggests that the latter was made by modelling, without specifying the criteria on which this identification is based. The discoveries made at UT52 include a dark grey coloured specimen with incisions made on the external surface of a wet paste before slipping and a reddish-brown coloured bowl fragment, discovered on the surface of a ceremonial zone of the site during surveys in 2010 (Figures 3 and 5c), with a decoration of *appliqué* pellet on the external face. In the case of the El Palacio ceramics, firing is oxido-reducing with a reducing phase followed by a very short oxidation phase: the core of the paste is dark-grey to black and very wide and the beige-coloured edges are very narrow.
Analyses by X-ray fluorescence (XRF), X-ray diffraction (XRD), and Raman spectroscopy were conducted on a sherd from UT52 (CPP437), as part of a more general study of the ceramic pigments used on the Malpaís de Zacapu (Jadot et al. 2016). The results showed the use of graphite, associated with a carbon deposited by smoking, at the end of the firing process, giving a shiny and metallic aspect to the surface of this sherd (Jadot et al. 2016). The graphite was applied on the ceramic surface before burnishing, perhaps by rubbing a solid graphite mass (plumbago) on the surface (see Balfet et al. 1992:123).

Paste Groups

Observed with the naked eye and the stereomicroscope, the Plumbate-like sherds all present a fine paste with a variable quantity of fine black inclusions. Some of these underwent a preliminary petrographic analysis with the help of M.-A. Courty (CNRS, UPR 8521 – PROMES), resulting in the identification of three main groups of pastes:
- a silty paste from a volcanic alteration soil, containing a lot of small volcanic glass and carbonaceous fibres, with a temper composed of volcanic breccia (Figure 6a).
- a sandy paste from an alteration soil, which was decanted and cleared of coarse inclusions, with carbonaceous elements well integrated in the mass, with a temper composed of volcanic breccia (Figure 6b).
- a clayey-silty-sandy paste containing altered tephra (Figure 6c). Unfortunately, the thin section corresponding to this sherd is too thin, which hinders observations.

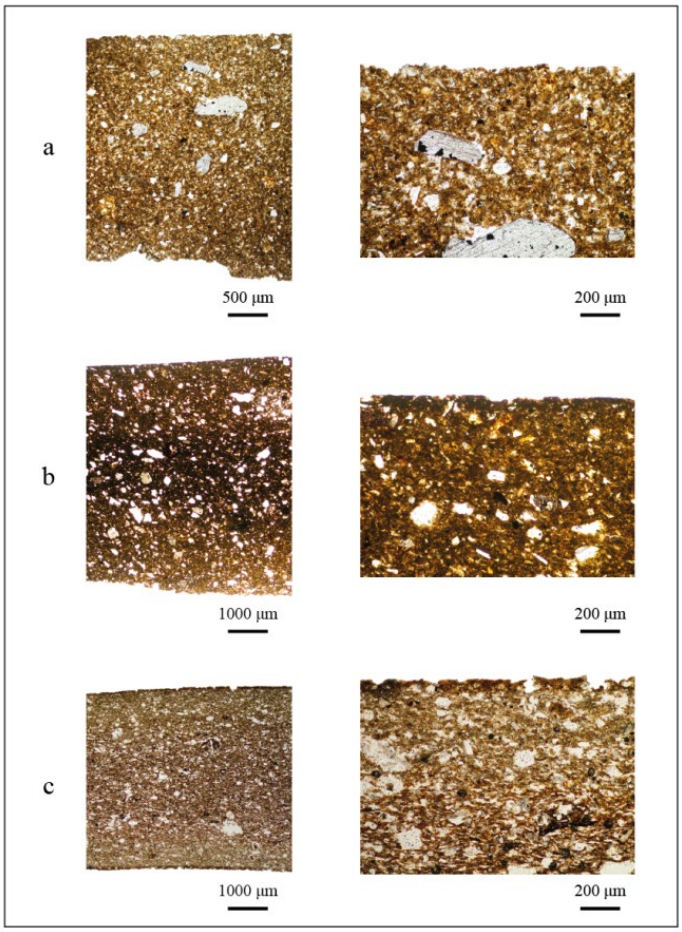

Figure 6. Types of pastes: (a) silty, CPP441; (b) sandy, CPP438; (c) clayey-silty-sandy, CPP435 (photographs by E. Jadot).

Cultural Implications

The unprecedented presence of such a quantity of Plumbate type ceramics in the region of Zacapu raises a number of questions regarding their provenance: were these objects imported from a Maya zone or do they represent local production Plumbate copies? Up until now, Plumbate imitations were easily identifiable as such (Shepard 1948:37), "convincing copies of Plumbate were never produced in the regions to which it was exported. In the case of Plumbate, instead, efforts to produce copies yielded obvious fakes […]" (Neff 2014b:5). Most of the Plumbate-like sherds from Zacapu have non-Plumbate features, such as polishing, but we decided to sample a range of pastes and surface types for the instrumental neutron activation analysis (INAA). The comparison of the chemical composition of the Plumbate ceramic paste from the site of El Palacio and that produced in Soconusco should enable us to define whether these ceramic pastes are from the same source or not. Overall, the goal of the analysis is to

determine to what extent the El Palacio Plumbate-like ceramics represent commercial exchange or local imitation.

Results

We selected sherds with a range of shiny surfaces, including some that were polished and others that were apparently not polished (Table 2). 10 monochrome fragments come from the test-pit UT52, whereas one sherd with *appliqué* decoration was discovered on the surface (Figure 3).

Table 2. Provenance and description of the analysed sherds.

Analytical ID	Form	Surface colour	Origin
CPP431	Miniature jar?	Red	UT52, UE554
CPP432	Miniature jar?	Brown	UT52, UE555
CPP433	Miniature jar?	Red	UT52, UE554
CPP434	Miniature jar?	Brown	UT52, UE553
CPP435	Bowl? With *appliqué* decoration	Reddish gray	Surface, parcel 45 south
CPP436	Restricted vessel	Gray	UT52, UE553
CPP437	Miniature jar?	Gray	UT52, UE555
CPP438	Restricted vessel	Gray	UT52, UE555
CPP439	Bowl?	Gray	UT52, UE555
CPP440	Bowl	Gray	UT52, UE556
CPP441	Miniature jar?	Gray	UT52, UE554

A study based on INAA (see Neff 2000) was conducted by H. Neff and M. Glascock at the University of Missouri Research Reactor center (MURR). Provenance was evaluated by comparing the ceramic pastes of Michoacán samples with two Plumbate reference groups and the reference groups available for the Lake Pátzcuaro Basin (Pollard et al. 2005; Speakman 2003), located near Zacapu.

Multivariate probabilities of membership in the reference groups (Table 3) rule out a Soconusco origin for all samples from the Zacapu area except one sherd.

Table 3. Probabilities of Membership in Various Reference Groups Calculated for 11 "Plumbate" Samples from El Palacio, Michoacán.

Analytical ID	San Juan Plumbate	Tohil Plumbate	General Pátzcuaro Basin	Main Patzcuaro Basin Reference Group
CPP431	0.000	0.000	4.058	0.020
CPP432	0.000	0.000	0.193	0.000
CPP433	0.000	0.000	44.071	2.425
CPP434	0.000	0.000	5.637	0.024
CPP435	0.000	3.444	0.000	0.000
CPP436	0.000	0.000	77.208	0.819
CPP437	0.000	0.000	4.231	0.069
CPP438	0.000	0.000	7.489	0.000
CPP439	0.000	0.000	0.918	0.106
CPP440	0.000	0.000	72.446	0.266
CPP441	0.000	0.000	5.529	0.107

The ten specimens fall within the range of variation of a "general Lake Pátzcuaro Basin" group, and one of them (CPP433) exceeds 1% probability of membership in the Main Pátzcuaro Basin reference group. Thus, although pottery and raw materials from Zacapu have not been sampled extensively, a local Michoacán source can be inferred for these ten specimens. On many bivariate projections of the data (Figure 7), these ten specimens fall within the range of variation of Pátzcuaro Basin Group 3, which was defined in a follow-up study of Pátzcuaro Basin pottery by Speakman (2003).

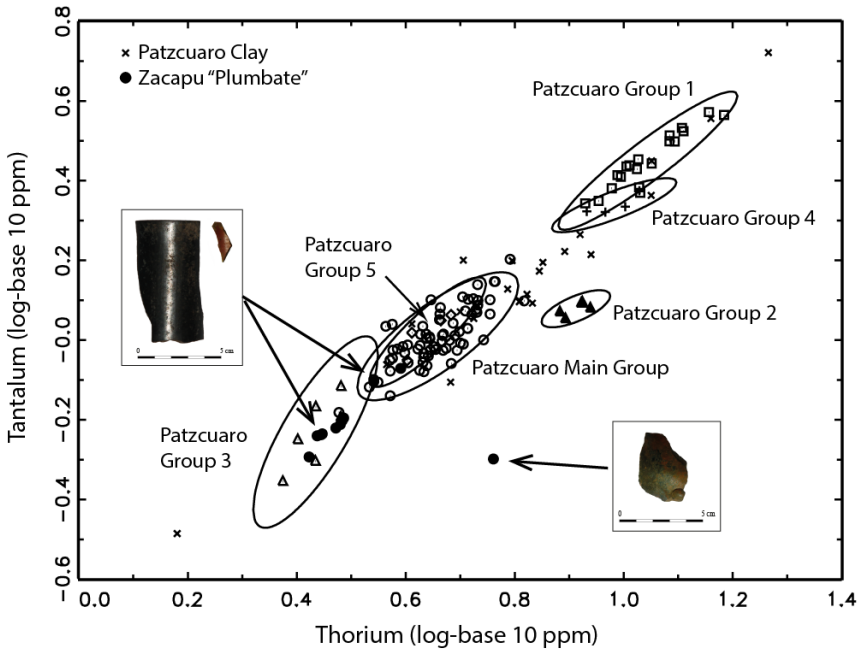

Figure 7. Thorium and Tantalum concentrations in Zacapu "Plumbate" together with ceramics and raw materials from the Lake Pátzcuaro Basin, Michoacán. Ellipses indicate 90% probability cutoff for membership in the reference groups. The outlier that lies to the right of Michoacán correlation line is CPP435.

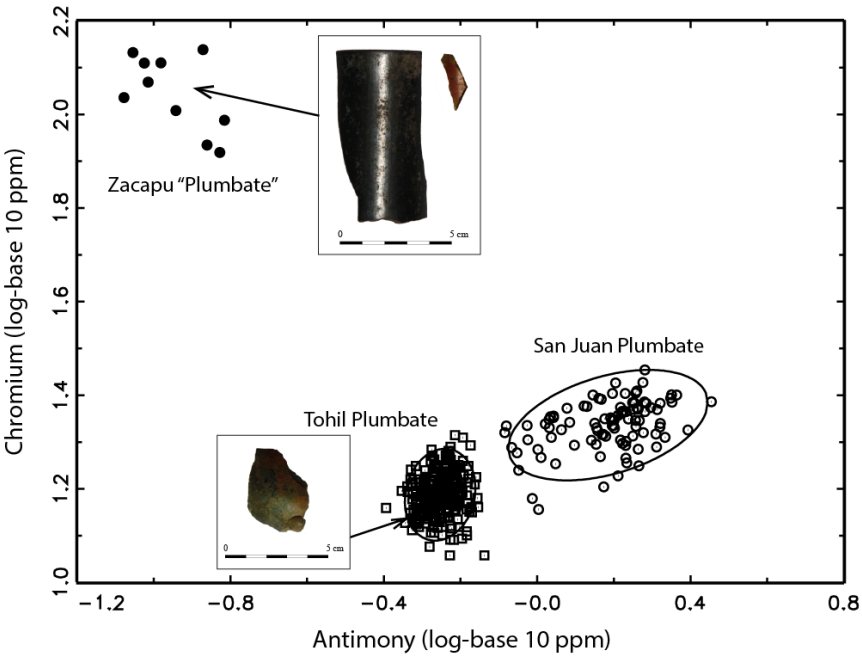

Figure 8. Antimony and chromium concentrations in Zacapu "Plumbate" together with two Plumbate reference groups. Ellipses indicate 90% probability cutoff for membership in the reference groups. CPP435 is within the cloud of Tohil Plumbate data points, although it is obscured by other data.

One specimen (CPP435) shows practically no similarity to the Pátzcuaro Basin pottery and raw materials and exceeds the 1% probability probability cutoff for membership in the Tohil Plumbate reference group (Table 2). CPP435 is also very divergent from Pátzcuaro pottery and raw materials on most two-dimensional projections of the data (Figure 7). Since the Tohil

Plumbate group is well represented (250+ members) and very tight (Figure 8), this result confirms the identification of CPP435 as an imported Tohil Plumbate vessel. The Tohil Plumbate reference group is securely linked to raw materials near the river mouth of Rio Cahuacán, in Southern Chiapas, Mexico (Neff 2002a), where Plumbate ceramic workshops have recently been excavated (Neff 2014b).

These results indicate that one sherd was produced in the Soconusco, then imported to the Zacapu region, while ten other sherds coincide with the chemical signatures of ceramic pastes produced in the southwestern Pátzcuaro Basin are most similar to the Pátzcuaro Main Group and Groups 3 and 5 (Hirshman 2003:221, 231; Hirshman and Ferguson 2012; Pollard et al. 2001, 2005). The silty and sandy clays from the alteration soil (Figure 6a–b) were thus extracted in the lowlands of the southwestern Pátzcuaro Basin, about forty kilometres from the site of El Palacio. It is likely that finished products rather than the raw materials were transported. These results still have to be compared to the compositions from the region of Zacapu, for which no analyses have yet been carried out. However, on the basis of the results presented here, we can envisage the existence of imports from Pátzcuaro Basin towards the site of El Palacio during the Early Postclassic (AD 900–1200).

Discussion

These results indicate that Early Postclassic long-distance exchange networks brought at least some Tohil Plumbate to Michoacán, where local potters also used local technological practices to produce Plumbate-like surfaces. Commercial exchanges have already been identified between Chiapas and the highlands of Michoacán following the discovery of obsidian from a Ucareo source at the site of Izapa, located in the region of Soconusco, and also of exchanges from central Mexico, such as Pachuca and Otumba, near the region of Tula (Braswell 2003:146). It is now important to assess whether these exchanges took place directly between the regions of Soconusco and Zacapu, or whether the contacts passed through the intermediary of another region, in particular the Basin of Mexico.

A.O. Shepard observed that all the original Plumbate type ceramics are incised before sliping whereas the imitations are all incised afterwards (Shepard 1948:102), as if there was no

technical transmission between the potters from the region of Soconusco and those trying to copy them. In the case of the productions found at Zacapu, not only did the potters imitating the Plumbate succeed in attaining a high level of shine, but, in addition, they made incisions before applying the slip. However, this does not enable us to assume that technical transfers could have taken place between the two regions: firstly, the incision technique before slipping is attested for other productions in the region of Zacapu during the Palacio phase (Palacio Pulido Inciso type bowls; Jadot 2016a, 2016b), and thus this is not a new characteristic exclusively linked to this ceramic. Secondly, there is at least one technique that was not transferred, the technique of dipping in the slip and achieving the shine purely by firing properties of the raw materials. Moreover, the slip "recipe" is different for the ceramics produced in Chiapas (with an iron and alumina base, completed by sodium, potassium, copper and zinc; Neff 2001, 2002a, 2010; Shepard 1948) and those from Zacapu (use of graphite; Jadot et al. 2016).

To date, there doesn't seem to be any technology transfer from the region of Soconusco to Michoacán: with the exception of the pre-slip incising, the Michoacan "Plumbate" is technologically very different from real Plumbate, the main difference being that graphite and polishing are used to get a shiny gray surface, while Plumbate potters achieved this effect by using special raw materials for the slip and firing in a special atmosphere. This is not a genuine reproduction of the whole *chaîne opératoire* but just the imitation of several characteristics without any understanding of the technology, which could be the result of the attentive observation of the visible traits of finished products issued from commercial exchanges associating the two regions. Contact could have been established in several stages, probably via Toltec populations from the central highlands of Mexico.

We saw earlier that several ceramic indications from the Early Postclassic (AD 900–1200) link the site of El Palacio to that of Tula. In this way, the discovery of Braseros San Antonio, Palacio Pulido Inciso, Plumbate and *comales* type sherds associated with several fragments of Mazapa-style figurines (Forest et al. in prep.) indicates contacts with the Toltec culture. The region of Tula could have operated as a transit point between the region of Soconusco and Zacapu in the case of Plumbate. El Palacio ceramics thus reflect the image of exchanges between populations from the regions of Tula and Zacapu during the Early Postclassic. This observation is valid for the site of El Palacio and requires confirmation for other sites of the Zacapu basin in order to determine that this is not just a specificity of this site. However, the presence of other objects associated with the Toltec culture at the site of Potrero de Guadalupe (Mich.215), located in the *lomas* (Pereira 1997:78), implies that several groups in Zacapu basin had established links with the Toltecs.

The nature of these links remains to be established. Were these links induced by commercial networks alone? Or by more complex and tighter links suggesting forms of alliances between certain elites from Michoacán and Tula? This latter hypothesis was recently put forward by P. Jimenez Betts (2018:157–161) in his analysis of the interactions between the west and the northwest of Mesoamerica with Central Mexico. The same "Toltec package" is found as far as in Jalisco and Nayarit where Plumbate-style sherds, toltec-type braseros, incensarios and especially Mazapa figurines are widespread and abundant (Meighan 1976); and it raises the question of the nature of the Toltec presence in western Mesoamerica. Based on evidence from the sites of Uricho (Pollard 2008:224; Pollard and Cahue 1999) and El Palacio, Jimenez Betts suggests that the links between the lacustrine zones of Michoacán and Tula are part of a political network system, as defined by C. Chase-Dunn and B. Lerro (2014) in their world system model. P. Jimenez Betts refers to "zones where sovereign polities have regular political or military exchanges with a core zone. In this case evidence of political alliances is examined" (Jimenez Betts 2018:63). For us, it still seems to be somewhat hasty to affirm the existence of direct political links between Tula and the sites considered here. The currently available material evidence clearly shows that these populations had sufficiently solid knowledge of the Toltec world to reproduce a wide range of objects for their own use, on a local scale. These do not only include table vessels, but also objects (braseros, Mazapa figurines, adornments and corporal insignia) linked to the ceremonial complex, as proposed by R. Diehl (1993). And the original or imitation Plumbate-style recipients described in this paper should undoubtedly be placed in this latter category of objects.

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Supplementary material. To view supplementary material for this article, please visit https://.

Supplementary Figure 1. Radiocarbon analysis results for the sample GrM11623 (charcoal; UE553, UT52, El Palacio).

Supplementary Figure 2. Radiocarbon analysis results for the sample Lyon-11162 [SacA36799] (faunal bone; UE554, UT52, El Palacio).

Supplementary Figure 3. Radiocarbon analysis results for the sample GrM 11625 (charcoal; UE555, UT52, El Palacio).

Supplementary Figure 4. Radiocarbon analysis results for the sample Lyon-11161 [SacA36798] (faunal bone; UE530, UT51, El Palacio).

Supplementary Figure 5. Similar ceramic types between the El Palacio and Tula sites: (a–b) Palacio Pulido Inciso type, El Palacio, UT52 (drawing by E. Jadot); (c) Braseros San Antonio type, El Palacio, UT52 (drawing by E. Jadot); (d) Braseros San Antonio type, El Palacio (after Michelet 2013:fig.15.2); (e) Hornos Rojo sobre Beige type, El Palacio, UT52 (drawing by E. Jadot); (f) Sillon Incised type, Tula, Unit 03N7E12D279 (after Cobean 1990:pl. 183); (g) Abra Coarse Brown type, Tula, 03534020D145 (after Cobean 1990:Pl. 192); (h) Mazapa Red on Brown type, Tula, 070204130 (after Cobean 1990:Pl. 132).

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Figure Captions

Figure 1. Principal sites with presence of Plumbate ceramics in Mesoamerica, with the location of the El Palacio site, Michoacán, and the two main source zones of Plumbate in the Soconusco region, Chiapas (map by E. Jadot).

Figure 2. Plumbate type ceramics discovered in a cache on the site of Tula (after Diehl et al. 1974: Vessels 5–9).

Figure 3. Location of test-pit UT52 and the prospected plot at the site of Palacio, which yielded the analysed sherds (after a map by M. Forest).

Figure 4. Stratigraphy of test-pit UT52 and discovery context of the Plumbate-like sherds.

Figure 5. Examples of sherds analysed for the study at El Palacio, Michoacán: (a–b) test-pit, CPP437 and CPP433; (c) survey, CPP435 (photographs by E. Jadot).

Figure 6. Types of pastes: (a) silty, CPP441; (b) sandy, CPP438; (c) clayey-silty-sandy, CPP435 (photographs by E. Jadot).

Figure 7. Thorium and Tantalum concentrations in Zacapu "Plumbate" together with ceramics and raw materials from the Lake Pátzcuaro Basin, Michoacán. Ellipses indicate 90% probability cutoff for membership in the reference groups. The outlier to the right of Michoacán correlation line is CPP435.

Figure 8. Antimony and chromium concentrations in Zacapu "Plumbate" together with two Plumbate reference groups. Ellipses indicate 90% probability cutoff for membership in the reference groups. CPP435 is within the cloud of Tohil Plumbate data points, although it is obscured by other data.

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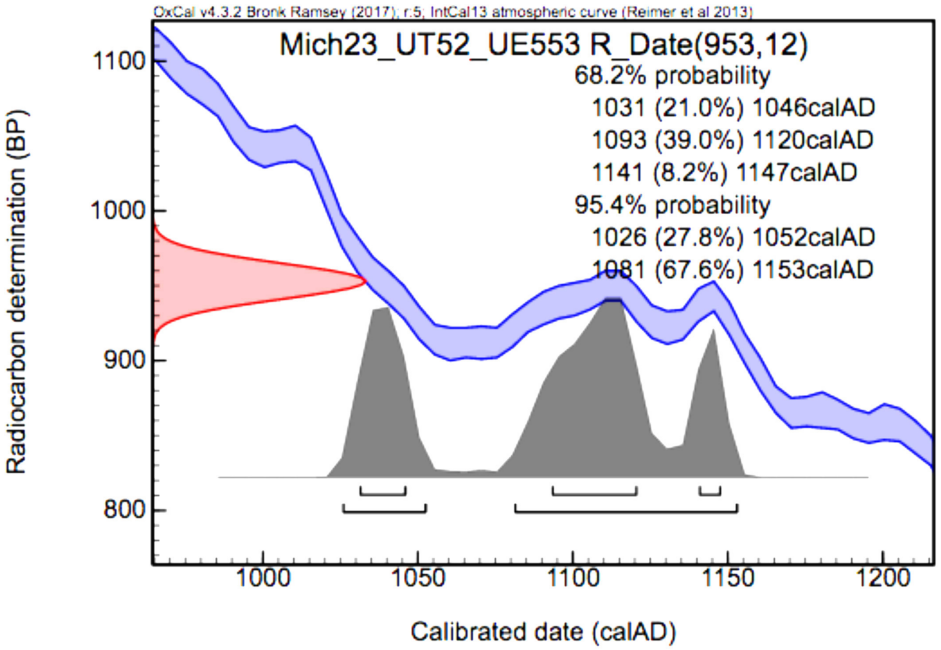
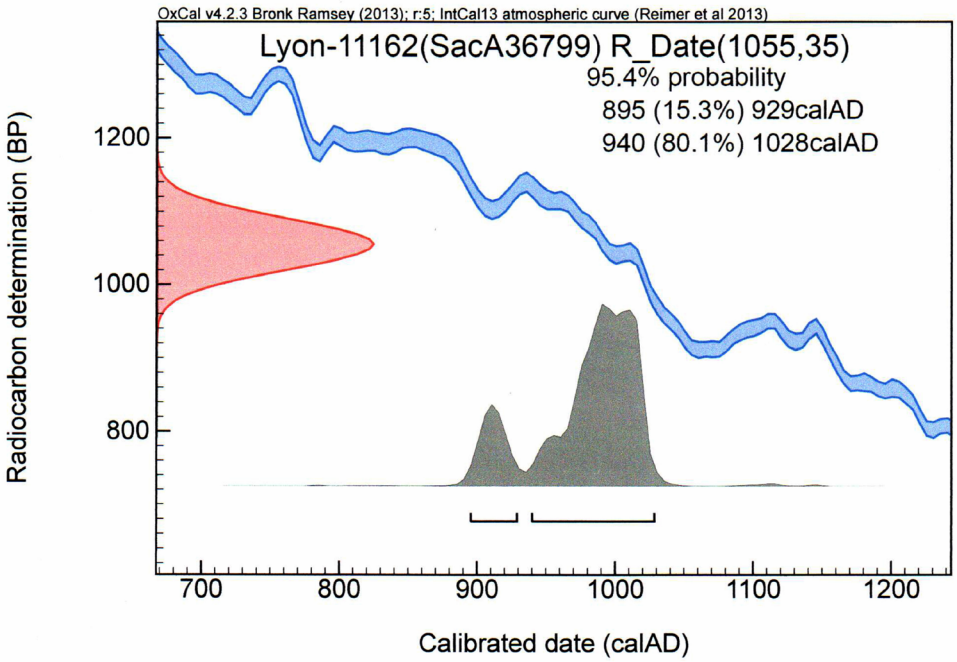
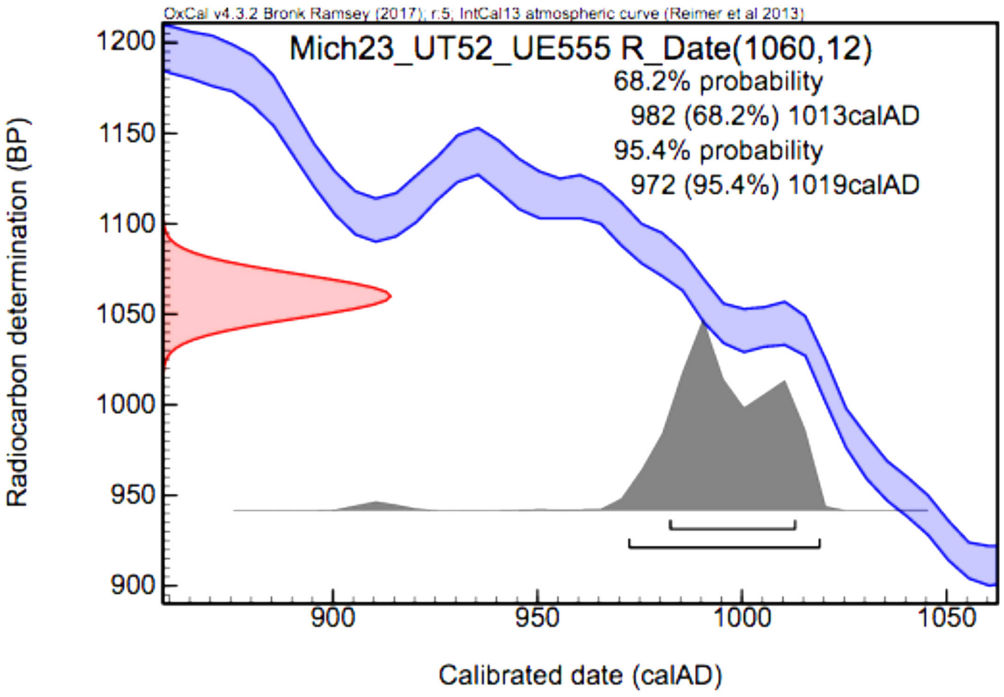


Supplementary Figure 1. Radiocarbon analysis results for the sample GrM11623 (charcoal; UE553, UT52, El Palacio).



Supplementary Figure 2. Radiocarbon analysis results for the sample Lyon-11162 [SacA36799] (faunal bone; UE554, UT52, El Palacio).



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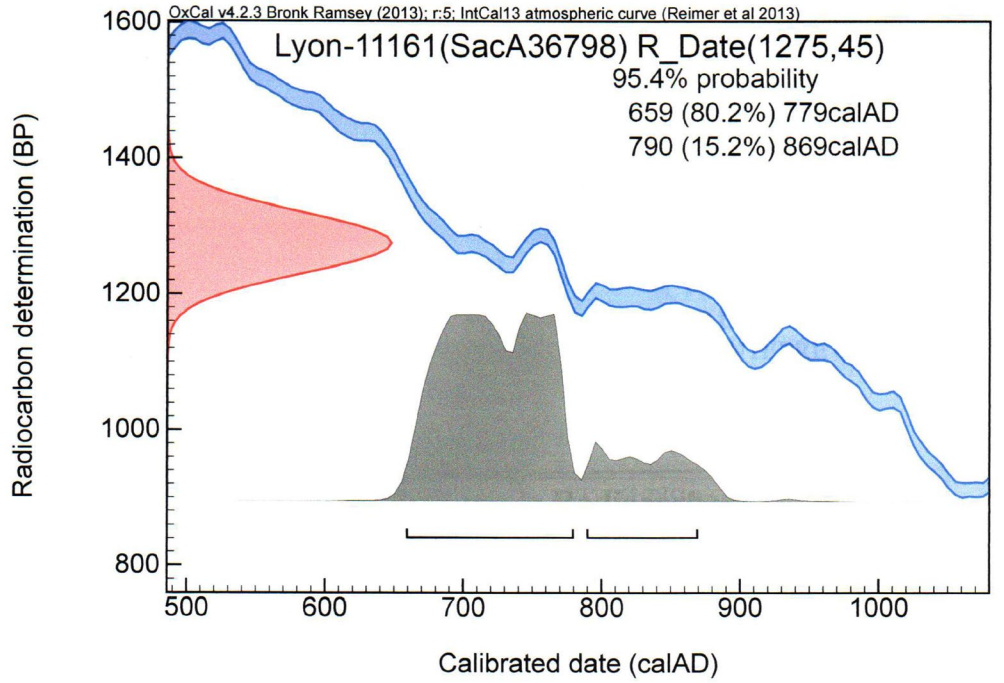
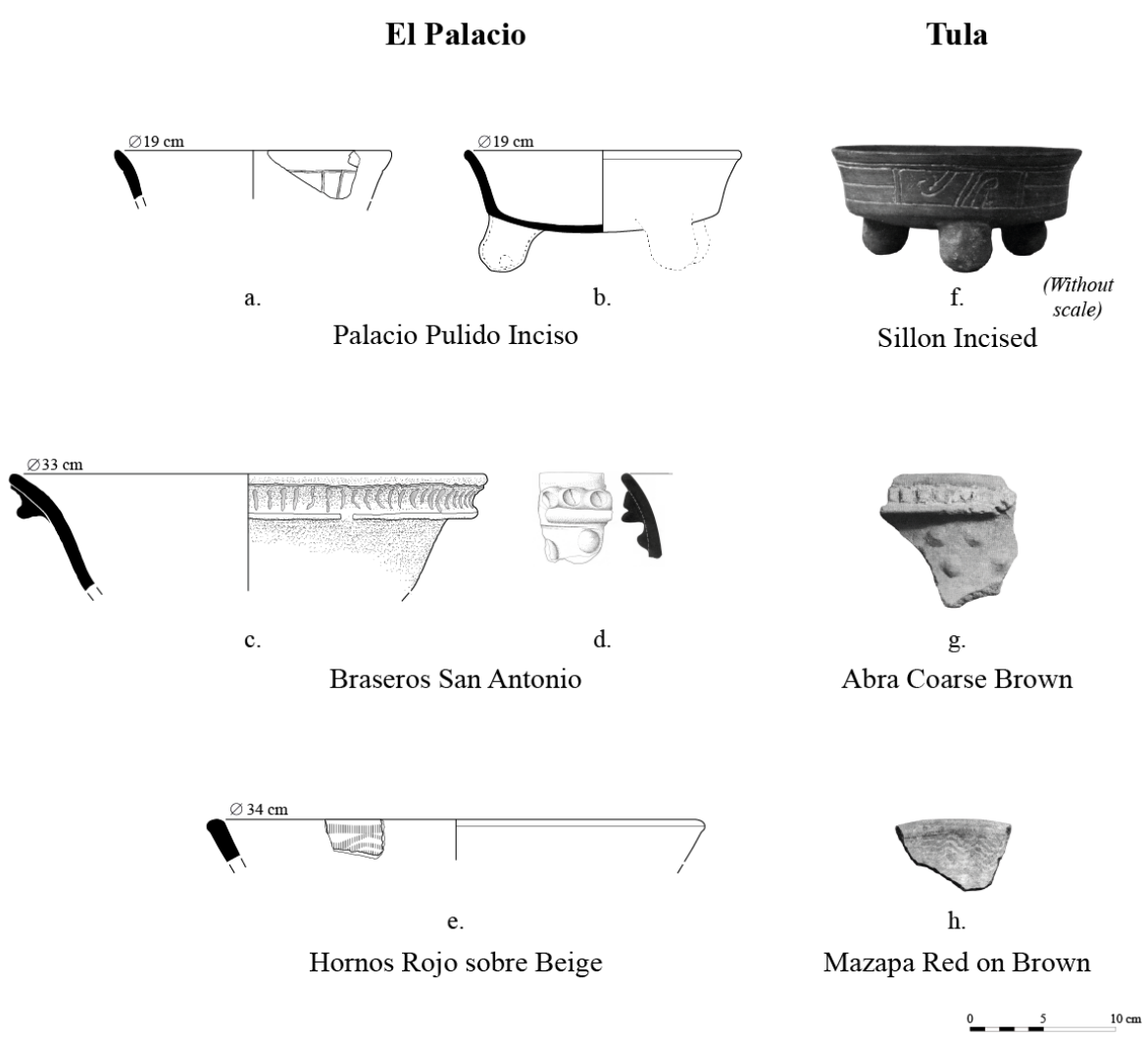


Supplementary Figure 4. Radiocarbon analysis results for the sample Lyon-11161 [SacA36798] (faunal bone; UE530, UT51, El Palacio).



Supplementary Figure 5. Similar ceramic types from the El Palacio and Tula sites: (a–b) Palacio Pulido Inciso type, El Palacio, UT52 (drawing by E. Jadot); (c) Braseros San Antonio type, El Palacio, UT52 (drawing by E. Jadot); (d) Braseros San Antonio type, El Palacio (after Michelet 2013:fig.15.2); (e) Hornos Rojo sobre Beige type, El Palacio, UT52 (drawing by E. Jadot); (f) Sillon Incised type, Tula, Unit 03N7E12D279 (after Cobean 1990:Pl. 183); (g) Abra Coarse Brown type, Tula, 03534020D145 (after Cobean 1990:Pl. 192); (h) Mazapa Red on Brown type, Tula, 070204130 (after Cobean 1990:Pl. 132).