



Research paper

Chemical analysis of Late Classic Maya polychrome pottery paints and pastes from Central Petén, Guatemala

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ABSTRACT

This paper examines political-economic relationships among Late Classic (ca. 600–900 CE) political centers in the Petén Lakes region, Guatemala, through the chemical analysis of red paints and pastes of polychrome vessels. Chemical analysis of red paints was conducted using Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS), and chemical analysis of vessel pastes was conducted using Instrumental Neutron Activation Analysis (INAA). These analyses indicate that a number of political centers along the western shore of Lake Petén Itzá, namely Motul de San José, Tayasal, and Flores, had access to different polychrome pottery production communities. Nonetheless, inhabitants of these Petén Lakes sites moved between, gifted, or exchanged polychrome pottery with each other, indicating that western Petén Lakes region centers closely interacted with each other. We suggest that these sites may have been part of or allied with the epigraphically known Ik' polity. As such, we find that one of the strengths of 'second-tier' polities, such as the Ik' polity, did not depend on an individual site's size or monumental expression, but on the relationships they forged with other centers.

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1. Introduction

This paper examines political-economic relationships among Late Classic political centers in the western Petén Lakes region, Guatemala, through the chemical analysis of red paints and pastes of polychrome vessels. A growing body of hieroglyphic evidence has revealed that during the Late Classic period (ca. 600–900 CE) small "second-tier" or provincial Maya polities were entangled in complex webs of political alliances, conflicts, and negotiations with prominent regional capitals across the Southern Maya Lowlands. Since the more dominant primary capitals, such as Tikal, Calakmul, Palenque, and Piedras Negras, were responsible for producing a greater proportion of the known texts, our textual understandings of political relations between these large regional capitals and second-tier capitals are better than those between second-tier capitals or between these second-tier capitals and other provincial centers (Marcus, 1976, 1998; Martin and Grube, 2000). For

example, textual sources indicate that the relatively small-sized sites of Motul de San José and Zacpetén were subordinate to Tikal during at least part of the Late Classic period (Fojas and Emery, 2012; Rice and Rice, 2009). These sites are considered to have been secondary centers possessing their own provincial domains.

While political provinces are often perceived as the strongest and most stable of political units (LeCount and Yaeger, 2010; Marcus, 1998), textual sources are relatively silent on interaction within and between these smaller political centers, such as between Motul de San José and other archaeological sites in the Petén Lakes region of Guatemala. Likewise, little comparative archaeological research has been undertaken between Late Classic centers of similar size in the Petén Lakes region, such as between Motul de San José and Tayasal. One exception is a ceramic figurine study by Halperin (2014), which indicates that western Petén Lakes region sites (Motul de San José, Nixtun Ch'ich', Tayasal, Flores, Trinidad, Buenavista, and Chäkokot) had political-economic ties with each other. The current study provides evidence for the movement of polychrome pottery and, in some cases the raw materials used to produce such pottery, among the Petén Lakes region centers of Motul de San José, Tayasal, Flores, and Zacpetén, as well as among Petén Lakes centers and the primary capital of Tikal. We suggest

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that centers along the western shores of Lake Petén Itzá allied or affiliated themselves with one another, serving to strengthen provincial relations.

Iron oxides, such as hematite, magnetite, goethite, and lepidocrocite, are minerals commonly found in red slips and red slip-paints decorating Classic period Maya pottery (Beaudry, 1989; Goodall et al., 2009; Smith, 2013). These slips and slip paints were applied to the vessel before it was fired at approximately 550–1000 °C. Because these minerals are thermally unstable (e.g. magnetite and goethite convert to hematite when heated ca. 300–400 °C, lepidocrocite converts to maghemite between 275 and 300 °C and maghemite to hematite ca. 700 °C) (Cornell and Schwertmann, 2003, pp. 365–377; Goodall et al., 2009; Walter et al., 2001), mineral analysis of red slips or slip paints can be problematic for identifying paint recipes. On the other hand, chemical analysis of vessel paints in conjunction with vessel pastes can provide a high-resolution, multi-component perspective of materials composition useful for identifying pottery production recipes and sources. While paint and paste composition data may co-vary with each other to offer a robust designation of production source, paint and paste groups may not always co-vary (Backes Jr. et al., 2012; Cecil and Neff, 2006; Vaughn, 2005). Paste recipes and sources may have been shared while paint recipes (or the raw materials used to produce them) were not, or paint recipes (or the raw materials used to produce them) were shared while paste recipes and sources were not. Thus, multiple lines of evidence are garnered here to provide a more nuanced understanding of the composition, trading, and artisan-patron relationships surrounding polychrome pottery and their links to political-economic relations among Late Classic Maya centers.

2. Archaeological and epigraphic context

The Late Classic Maya political landscape comprised multiple polities with shifting domains and relations of power (Chase and Chase, 1996; Foias, 2013; Fox et al., 1996; Martin and Grube, 2000; Rice, 2004). These political relations included centralized polities with paramount rulers at regional capitals who were in charge of their own provinces and oversaw, to varying degrees, the political and religious affairs of secondary and tertiary polities and their provinces. In some cases, annexed polities may have broken away from their paramount rulers or co-existed in relative autonomy alongside such dominant powers (LeCount and Yaeger, 2010; Marcus, 1993). In turn, these smaller second- or third-tier polities may have exhibited their own shifting centralized and decentralized relationships on smaller provincial scales. One of the key questions explored here is whether smaller Late Classic polities forged confederacies or loose alliances with each other and if so, how might we identify such relationships archaeologically?

Polychrome pottery had important political roles (Callahan, 2014; Foias, 2007; Halperin and Foias, 2010; LeCount, 1999; Rice, 2009a, 2009b). Elites patronized the production of polychrome pottery, and such pots were gifted or exchanged hands between elite patrons and subordinates or among different noble families as material expressions of dominance, alliance, and affiliation. More than a reflection of elite status and affiliation, however, polychrome pots were also serving vessels for chocolate and corn-based drinks as well as a variety of foodstuffs. As such, they were instrumental in the political obligations and alliances formed through hosting and being invited to feasts.

Current scholarship suggests that the archaeological site of Motul de San José was the capital or one of several capitals of the Late Classic Ik' polity, named for its Emblem Glyph (political titles and designations of rulership) featuring the *ik'* (wind) sign (Fig. 1) (Foias and Emery, 2012). It is a relatively small site at approximately

4.2 km² in size with a ceremonial core approximately 1.4 km² and a large Acropolis complex (Group C) that likely served as the site's principal royal court. Some of the richest sources of written evidence on the Ik' polity derives from a corpus of largely unprovenanced polychrome pottery in the Ik' style. Ik' style pottery details the histories and ritual lives of the Ik' royal family (Just, 2012; Reents-Budet et al., 1994, 2012). Because the Ik' style vessels possess multiple sub-styles and derive from multiple paste recipes, Reents-Budet et al. (1994, 2012) have suggested that the Ik' polity may have been composed of a confederation of noble families or multiple political centers who shared or rotated power amongst themselves (see also Rice, 2009a).

Excavations at the northwestern edge of Motul de San José's Acropolis complex provide archaeological evidence that Motul de San José elites patronized the production of polychrome pottery. These excavations uncovered large secondary middens containing debris from a polychrome pottery production workshop or workshops, including paint pots, possible bone painting tools, iron oxide mineral pigments (goethite and hematite) possibly used for the preparation of red paints, ceramic burnishing tools, a figurine mold, burnt clay, large quantities of ash, and wasters of elaborate Ik' style polychrome vessels, non-Ik' style vessels with hieroglyphs and figural scenes, and simple polychrome vessels with abstract or geometric designs (Halperin and Foias, 2010; Smith, 2013). Previous INAA analysis of vessel wasters from this context reveals that the pastes of these wasters chemically match those of unprovenanced Ik' style vessels as well as excavated pottery from the site (Halperin and Foias, 2010; Reents-Budet et al., 2012). While archaeologists have found possible evidence of a polychrome pottery neighborhood at the site of Tikal, direct archaeological evidence of pottery workshops is rare in the Maya area (Halperin and Foias, 2012), leaving current scholarship to turn to the indirect evidence of paste and paint recipes among other analyses of the finished products (Foias and Bishop, 1997; Rice, 1984, 2009a).

In addition to Motul de San José, it is possible that the site of Tayasal was part of or allied with the Ik' polity. Not only is the site located close to Motul de San José, but an Ik' style vessel was excavated from a child's burial at the site (Fig. 2). A member of the Ik' royal family may have given this vessel to an elite family living at Tayasal to foster alliances. Alternatively, Ik' royalty or their close kin may have resided at Tayasal. Tayasal's monumental architecture was similar in size to Motul de San José as its Late Classic ceremonial core zone (centered at the "Main Group") was approximately 1 km² and included a single large Acropolis complex (Chase, 1983; Cowgill, 1963). Likewise, both sites possessed Late to Terminal Classic carved stone stela monuments, suggesting they were both important political seats of power (Barrios, 2010; Morley, 1938, pp. 426–429; Tokovinine and Zender, 2012). Our understandings of the relationships between the sites, however, require further investigations.

Likewise, it is unclear whether the smaller sites of Flores, a small island site (0.5 km²) adjacent to the site of Tayasal, and Zacpetén, a peninsular site (0.23 km²) located approximately 20 km to the east of Motul de San José, were politically tied to Motul de San José during the Late Classic period. Zacpetén and Flores were important political centers during the Postclassic period and may have held prominent roles during earlier times (Rice and Rice, 2009). Less is known about these sites during the Late Classic period, however, since their settlements are largely covered by Postclassic and contemporary period ones.

We propose three possible models of political-economic relationships among Lake Petén region centers, which we examine through the chemical analysis of polychrome vessel paints and pastes excavated from the archaeological sites of Motul de San José and its satellite sites, Tayasal, Flores, Zacpetén, and Tikal. (1) Motul

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