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Visual and geochemical analyses of obsidian source use at San Felipe Aztatán, Mexico

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ABSTRACT

Social inequality is a problem at the forefront of anthropological inquiry. The material record can give us valuable information about what resources were used at a given archaeological site. In this study, I have used obsidian and its distribution as a proxy for access to resources. By determining which obsidian sources were used and by whom, we can begin to understand the differential access to resources which is paramount to understanding social inequalities.

This research uses a combination of visual sourcing and XRF geochemical sourcing to identify patterns in volcanic sources of obsidian artifacts at Post-classic San Felipe Aztatán in Nayarit, Mexico. Despite excellent quality sources being easily accessible, more sophisticated lithic reduction techniques such as prismatic blade production, seem to have been used only with more distant sources. With no substantial qualitative differences among obsidian sources, purely social factors likely resulted in the temporal and spatial distribution patterns at San Felipe Aztatán. Here, the limited area in which Pachuca obsidian is found may indicate an area of elite residence or elite activity, while its limited temporal distribution may reflect the emergence of trade and influence of the Aztatlán tradition dating to the Amapa phase during the Classic Period (500–750 CE).

This research may have greater application for other sites across space and time. If obsidian source can be utilized to identify social stratification, we may be able to understand the spatial and social organization of specific sites as well as the complex dynamic trading relationships among sites.

1. Introduction

Access to resources has long been understood as one of the most important indicators of social status. As one's status increases, the access to more costly and diverse resources may also increase. Given this, we can use the material record and distribution of resources as indicative of social stratification. Commonly, this concept has been utilized through studies of ceramics, architecture, faunal remains, etc. But rarely has obsidian been used despite its abundance. In this study, obsidian source correlated with artifact distribution has been used to indicate the development of more complex socioeconomic structures. Through time, more resources became available as they were more limited in their distribution, indicating purposeful differential usage.

This project focuses on the obsidian exchange in the Aztatlán trading system as reflected at San Felipe Aztatán in northern Nayarit, Mexico. The Aztatlán complex was a trade-oriented tradition centered in Western Mexico. Once thought to be a product of Mixteca-Puebla colonization (Smith and Heath-Smith, 1980), researchers are beginning to acknowledge that the underlying trading and cultural relationships far predate such influence (Garduño Ambriz and Gamez Eternod, 2005; Ohnersorgen et al., 2012). Though initially limited to the coastal plain, the trading network grew through time to eventually stretch from West Mexico to the Northern Arid Zone into the American Southwest (Kelley, 2000; VanPool et al., 2008). Aztatlán traders traded shell, ceramics, copper, and cloth far from their western Mexican homeland. Obsidian was also central to this trading network as reflected by its widespread distribution. Fortunately, distinct geochemical signatures of obsidian sources grant us an excellent opportunity to identify from where the artifacts originated. Scholars have noted the expansive trade networks but the complexities and specific trade relationships of this system remain unclear. This research attempts to clarify the issue by better identifying how specific obsidian sources were used within the Aztatlán settlement of San Felipe Aztatán and how use patterns may have shifted over time.

For decades, researchers have attempted to identify obsidian source through visual sourcing, but have largely abandoned macroscopic sourcing with the increase in availability of more sophisticated geochemical archaeometric methods such as X-ray

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florescence (Andrefsky, 2005). However, as discussed below, visual sourcing can still be a valuable, viable method in cases when there are macroscopically distinct obsidian sources, and when geochemical sourcing cannot be applied due to a lack of access to equipment or the inability to transport lithic material for analysis. In this project, I macroscopically examined approximately 1500 obsidian artifacts to identify obsidian color groups based on color and texture. These groups were used to identify visual source categories of the obsidian artifacts. I then geochemically sourced 13% of the total artifact assemblage to establish correlations between visual categories and specific geochemical sources. Through chi-square tests, these sources were then correlated to artifact morphology. Changes in source use over time were also identified based on temporally diagnostic ceramic types identified for many of the strata. Each source group was treated as an independent assemblage and then compared with other sourced groups to identify diachronic consumptions patterns in source frequencies, as well as differences in reduction techniques. Finally, I considered spatial differences in frequencies of lithic sources within San Felipe Aztatán. Four separate areas have been excavated, likely reflecting household refuse (and minimal moundfill in upper strata of two of the four units). However, the relative frequencies of each lithic source vary from location to location. Given the statistically significant distributions, the differential source frequencies likely reflect social factors such as varied economic status of the household as opposed to random differences in source selection.

1.1. Cultural historical background

San Felipe Aztatán was an Aztatlán regional center and potential production center for obsidian artifacts (Garduño Ambriz and Gamez Eternod, 2005). This site is part of a larger physiographic province extending from San Blas on the central Nayarit coast northward approximately 200 km to Mazatlan in southern Sinaloa (Garduño Ambriz, 2007: 37; Scott and Foster, 2000). Historically, the waterways here were an important corridor of transportation, trade, and communication that connected the coastal plains to the highlands of western Jalisco. This area served as a rich refugia containing a plentiful assortment of various floral and faunal resources corresponding with the numerous microenvironments.

Several important Aztatlán regional centers arose during the Early and Middle Post-classic periods. These settlements, including Amapa (Meighan, 1976), Chacalilla (Ohnersorgen, 2004, 2007), Coamiles (Duverger, 1998; Garduño Ambriz, 2006), and San Felipe Aztatán (Gamez Eternod and Garduño Ambriz, 2003; Garduño Ambriz, 2007; Garduño Ambriz and Gamez Eternod, 2005), feature many mounds, platforms, plazas, and ball courts. Smaller secondary centers have also been identified by Mountjoy (2000) (Fig. 1).

The Aztatlán tradition continued to thrive into the Middle Post-classic. But, no diagnostic artifacts beyond this, dating from the Late Post-classic Santiago phase (1350–1530 CE), have been identified at San Felipe Aztatán (Garduño Ambriz and Gamez Eternod, 2005). Though we are not certain what led to the decline of this far reaching mercantile tradition, scholars have speculated that the developing Tarascan empire may have inhibited further growth and ultimately led to the decline of the Aztatlán system (e.g., Pollard, 2000).

Obsidian has proven to be an interesting avenue for studying the Aztatlán system. Prismatic blades are razor sharp and efficiently created with minimal waste once the core is prepared. The technology is more complex than generalized lithic reduction and often requires trained specialists. Though obsidian is readily available throughout the region, we know it was traded extensively. Regardless of the reason for it, trade does not appear to be driven by demand for useful blades alone, given the abundance of blades from various local sources as well as distant ones. Rather, the obsidian trade may simply be a byproduct of the general Aztatlán emphasis on trade. In understanding the provenance of the traded obsidian we can then begin to understand the trading relationships between these regional centers and the people living at San Felipe Aztatán.

The site, first discovered by Sauer and Brand (1932), was initially called *Loma de la Cruz* and is now believed to represent the remains of the ethnohistorically documented capital town of the Aztatlán province (Anguiano, 1992). Similar to other Aztatlán regional centers, little is known of its cultural past. Unfortunately, excavations have been limited to salvage projects by the Instituto Nacional de Antropología e Historia (INAH) in the past decade in response to modern development (Gamez and Garduño Ambriz, 2003; Garduño Ambriz, 2007; Garduño Ambriz and Gamez Eternod, 2005).

1.1.1. Previous obsidian provenance research

Obsidian is extremely abundant in West Mexico. Shifting tectonic plates produced by the convergence of the Sierra Madre Occidental and the Trans Mexican Volcanic Belt have created an active volcanic zone across southeastern Nayarit, northwestern Jalisco, and southern Zacatecas (Ohnersorgen et al., 2012). To date, 26 geochemically distinct obsidian sources have been chemically characterized in the region (Glascock et al., 2010), with most research focusing on the source areas of northwestern Jalisco and Durango (Darling, 1993, 1998; Darling and Hayashida, 1995; Esparza Lopez, 2008; Jiminez Betts and Darling, 2000; Trombold et al., 1993; Weigand, 1989; Weigand and Spence, 1982). Comparatively scant research has focused on the relationship between these sources and the distribution of obsidian artifacts on the west coastal regions, which is a focus of this study.

Along the west coast of Mexico, obsidian was the most common lithic material and was used for the production of flaked stone artifacts including prismatic blades. At the large Aztatlán site of Chacalilla for example, over 99.5% of the 3849 chipped stone artifacts were produced from obsidian (Ohnersorgen, 2007). Similarly, at San Felipe Aztatán, 1501 of the 1562 (96.1%) lithic artifacts are obsidian. Polyhedral cores have also been recovered from several other Aztatlán sites indicating local production. However, few cores have been recovered relative to the abundant blades. There are multiple possible explanations for this discrepancy. It is possible that San Felipe Aztatán was not a blade production site and rather imported finished blades from certain sources. It is similarly possible that the limited excavations at this site did not sample the production area within the site. Future study may shed light on the cause for the disparity between cores and the abundance of blades.

Obsidian is typically sourced using various geochemical methods, but macroscopic analysis can be useful in many cases (Braswell et al., 2000; Stark et al., 1991). Though a great way to identify the provenance of each artifact, often full geochemical sourcing is not feasible for a multitude of reasons. Often, only small samples of material are allowed to leave foreign countries for analysis. Furthermore, expensive equipment such as is required for geochemical analysis is frequently unavailable in many Latin American countries. Finally, when only a sample is geochemically sourced, often the sample selection process will be necessarily biased based on various factors, such as the research question itself and the inherent destructivity of certain bulk geochemical sourcing methods. Therefore, the sample may not represent the full range of variation in obsidian usage at the site.

Luckily, geochemical sources are often so visually distinct that one can identify volcanic source purely through visual categorization with sufficient accuracy (Braswell et al., 2000). This method has been tested on numerous occasions. Through blind testing, Braswell et al. (2000) have demonstrated the great efficacy of visual sourcing. In their test, the four authors blindly sourced the