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A provenance study of archaeological obsidian from the Andahuaylas region of southern Peru

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ABSTRACT

To date, most obsidian sourcing studies in the Andes have concentrated on the highlands and Titicaca Basin of far southern Peru and northern Bolivia. Toward achieving a more complete understanding of the region, this paper offers new data on the long-term prehistoric obsidian procurement and consumption patterns in the Andahuaylas region of the south-central Peruvian highlands. Obsidian sourcing data from Andahuaylas are particularly interesting since the area is centrally located among several important regional obsidian sources. A total of 94 obsidian samples from a range of sites of different temporal periods were chemically analyzed using portable X-ray fluorescence (PXRF), as well as laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS). The results demonstrate a number of interesting trends, the first of which is the long-term importance of the Potreropampa obsidian source to populations of the Andahuaylas region from at least the early Formative period (~2500 BCE). Secondly, the results indicate that procurement strategies by local populations in Andahuaylas were primarily reliant on nearby (<150 km) obsidian sources. Finally, the paucity of more distant, yet widely exchanged, high quality obsidian (i.e., Chivay, Alca) confirm that as a region, Andahuaylas was more heavily connected economically (and likely culturally) with local areas to the south (Apurímac) and to the west (Ayacucho).

1. Introduction

In the last two decades, obsidian sourcing studies in the central Andes have progressed rapidly, and archaeologists are now using them to reconstruct the long-term economic and political interactions of prehistoric polities across the region (e.g., Burger and Asaro, 1977, 1979; Burger et al., 2000; Glascock et al., 2007; Tripcevich, 2007, 2010). A large number of primary obsidian sources have been identified on the ground, from which specific macroscopic descriptions and geochemistries are now known (Burger and Asaro, 1977, 1979; Glascock et al., 2007). With archaeologists encountering and chemically analyzing increasing numbers of regional obsidian sources, we now have an excellent source database to compare archaeological specimens from a multitude of sites across varying time periods. Andean scholars have focused on a range of analytical techniques, which include laboratory-based X-ray fluorescence (XRF), field-based portable X-ray fluorescence (PXRF), instrumental neutron activation analysis (INAA), and laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) (e.g., Burger and Asaro, 1977, 1979; Burger et al., 2000; Craig et al., 2007; Glascock et al., 2007; Ogburn et al., 2009; Williams et al., 2012). Of course each of these analytical techniques has specific advantages and constraints in terms of cost, precision, portability and required time for analysis and data processing. In this study we used both PXRF and LA-ICP-MS to analyze a sample of obsidian artifacts since these are widely used and also provide comparable results to studies carried out in other regions of the Andes.

To date, archaeologists have identified nine principal sources of obsidian in the south-central Andes (central and southern Peru and the Titicaca Basin) which were utilized prehistorically (Fig. 1, Tables 1 and 2). These sources include the major sources of Quispisisa (Burger and Glascock, 2000; Tripcevich and Contreras, 2011), Alca (Burger et al., 1998b; Jennings and Glascock, 2002), Chivay (Brooks et al., 1997; Burger et al., 1998a; Tripcevich and Mackay, 2011; Tripcevich et al., 2012) and Jampatilla (Burger et al., 1998c); the minor sources of Puzolana (Burger and Glascock, 2001), Potreropampa (Burger et al., 2006), Lisahuacho (Burger et al., 2006), Aconcagua (Aldenderfer, 1999: 383) and Macusani (Craig et al.,

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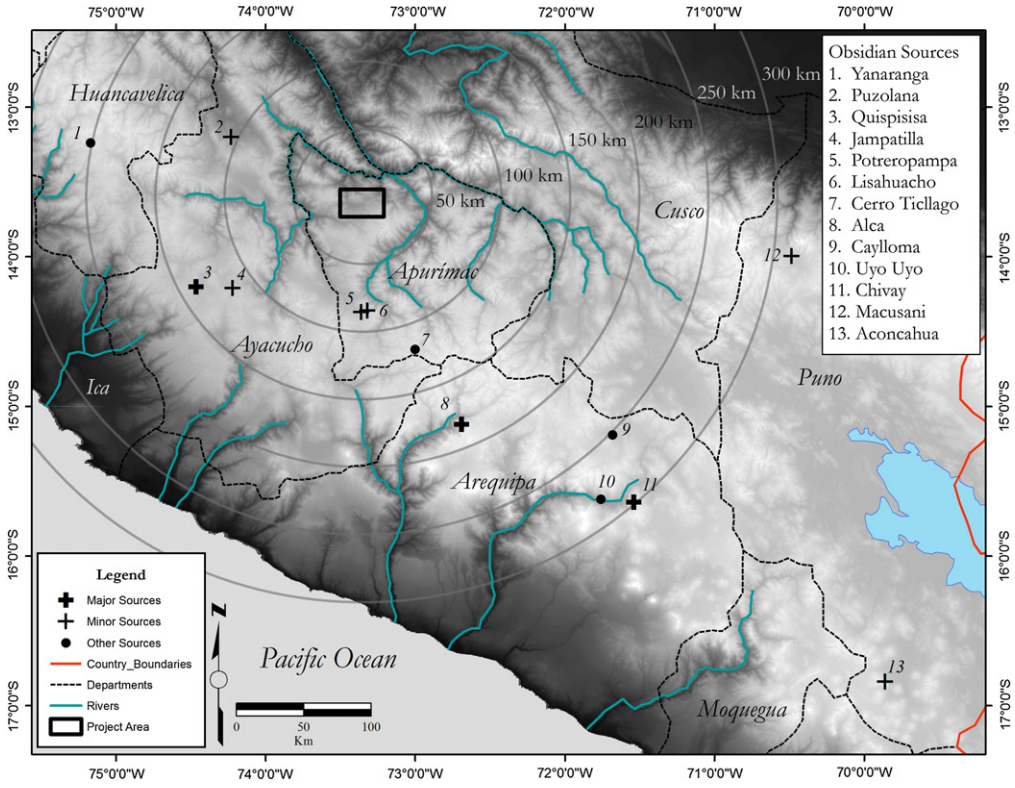

Fig. 1. Spatial distribution of obsidian sources relative to the Andahuaylas region. Distance radii are shown in 50 km intervals (adapted from Glascock et al., 2007: 533).

2010). In addition, there are four known obsidian sources which appear to not have been exploited: Cerro Ticllago, Yanarangra, Uyo Uyo, and Caylloma (Glascock et al., 2007; Fig. 1).

To date, the largest number of obsidian studies have focused on the region between Cuzco and the southern Titicaca Basin (e.g., Burger and Asaro, 1977, 1979; Burger et al., 2000; Glascock et al., 2007). Despite the fact that the areas to the north and west of this region (e.g., Departments of Ayacucho, Apurímac and Arequipa) contain a relatively high density of identified obsidian sources (see Fig. 1) these areas have produced relatively few prehistoric obsidian studies. In an effort to continue work in this important region, this paper contributes recent obsidian sourcing data from the Andahuaylas area, which is located in northwestern Apurímac (Fig. 1). These artifacts were collected during two recent research projects; the Andahuaylas Archaeological Project (PAA [2002–2004]; Bauer et al., 2010) and the Chanka Settlement Project (PAC [2005–2006]; Kellett, 2010), and were analyzed using Portable X-ray Fluorescence (PXRF) and Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry (LA-ICP-MS). The data offer a unique long-term perspective on obsidian procurement strategies in the Andahuaylas region for nearly five millennia from the early Formative period (~2500 BCE) to the terminus of the Late Intermediate Period (~1000–1400 CE, hereafter LIP; Fig. 3).

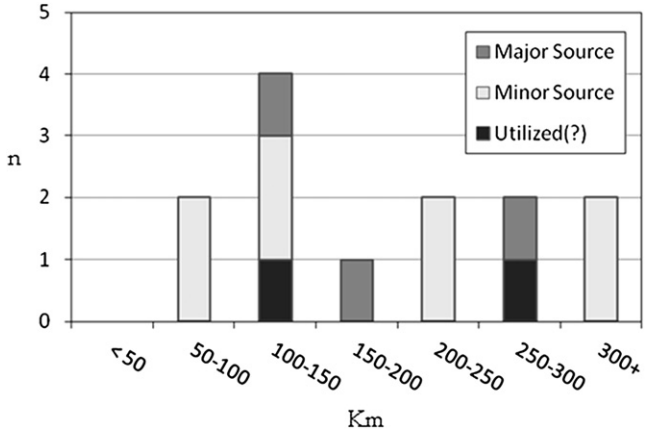

Fig. 2. Linear distance between Andahuaylas and regional obsidian resources (source types [major, minor, unutilized(?)] following Glascock et al., 2007).

2. Archaeological context

In their watershed synthesis of obsidian procurement and exchange, Burger and Asaro (1977, 1979; see Burger et al., 2000) outline eight geological sources of obsidian in the south central Andes, of which five (major and minor sources) are located within 150 linear km from the Andahuaylas region (Fig. 1; Tables 1 and 2). There exist three known sources to the west of Andahuaylas in the Department of Ayacucho: Puzolana, Quispisisa and Jampatilla, as well as the Alca source located in the Cotahuasi Valley in the Department of Arequipa, to the south of the project area. The closest obsidian sources to the Andahuaylas area (~85 km) are the neighboring sources of Potreropampa and Lisahuacho, which were recently located by Burger et al. (2006) in the Pachachaca drainage basin near the modern town of Chalhuanca in southern Apurímac (Province of Aymares). The spatial distribution of obsidian sources shows that Andahuaylas was well positioned to access a number of sources up to a distance between 100 and 150 km, after which higher quality sources (e.g., Alca, Chivay) are much farther away (150–300 km) (Figs. 1 and 2 ,Tables 1 and 2). Calculations within a geographical information system (GIS) also indicate that at the minimum, the nearest obsidian sources of Potreropampa and Lisahuacho were a 3 day walk from Andahuaylas, while the high quality sources of Alca and Chivay were approximately a 5 and 9 day walk, respectively (Table 2).

The Andahuaylas region is well suited for diachronic study of obsidian procurement, given its central location amongst a suite of