Title
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Publication Date
1986-08-25
X-RAY FLUORESCENCE ANALYSIS OF OBSIDIAN ARTIFACTS FROM THE LA PALOMA AND PAPAGO WATER SUPPLY ARCHAEOLOGICAL PROJECTS

by

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8.25.86

INTRODUCTION

The following is a report of an x-ray fluorescence (XRF) analysis of 8 obsidian artifacts from the La Paloma and Papago Water Supply Archaeological Projects in central and southern Arizona. Probable sources ranged from southwestern New Mexico to northern and eastern Arizona. The majority of the material is from the Antelope Wells Tertiary age glass source in southwestern New Mexico and northwestern Chihuahua (see discussion below).

Methodology

All obsidian debitage, flake tools and projectile points were subjected to the same analytic conditions. High temperature melt incompatible trace elements were utilized to attempt source determination.

The samples were analyzed for rubidium (Rb), strontium (Sr), zirconium (Zr), and niobium (Nb) using the semi-quantitative rapid scan method (Jack and Carmichael 1969) on a manual Philips PW 1410 wavelength x-ray spectrometer with a Philips power supply, ratemeter and teletype in the Chemistry
Department at Arizona State University. A tungsten (W) x-ray tube, scintillation counter and LiF (200) crystal were used operated in a vacuum path at 45Kv and 45mA for 80 live-seconds per element. The intensity values for all elements were computed for ratios of RbKa, SrKa, ZrKa, and NbKa radiation lines. The data were reduced through specific programs with a Zenith Z-161 Data Systems microprocessor. The elemental proportions are divided by the rubidium peak intensity and summed. These results are then divided by the summed intensities and the resulting element proportions are plotted in a ternary system for comparison to known obsidian sources in the Southwest. The solid incompatible elements Rb, Sr, and Zr, and Nb are quite sensitive in separating rhyolite glass sources (Cann 1983; Zielinski et. al. 1977). Niobium (Nb) is normally utilized when strontium values are low and two or more sources overlap with strontium solution. The niobium plot indicates that the San Francisco Peaks or Antelope Wells material is indeed most probably from Antelope Wells in southwestern New Mexico and northwestern Chihuahua. One specimen (FN 197) that could have been from one of a number of sources in Arizona or New Mexico was found to be an "unknown" using a 'niobium solution' (see Figures 1 and 2).

Discussion

Figures 1 and 2 exhibit the data and the elemental positions of known Southwestern glass sources with the plot of the archaeological obsidians (see also Shackley 1986). The
Antelope Wells material in Archaic contexts is a common pattern in central Arizona and may reflect the high occupation density in the "international four-corners region" in the Archaic. The Cow Canyon piece is from a newly discovered source in southern Greenlee County, eastern Arizona. This material has also been reported in the Clovis strata at the Murray Springs Site (Shackley 1986). The large Government Mountain source biface from the Papago project, is unusual as an Archaic artifact. San Francisco Volcanic Field obsidian is relatively common in pre-Classic Hohokam contexts in central Arizona and this artifact may reflect this occupation. No San Francisco field material has been found in Archaic contexts south of New River (Maricopa County). The unknown b piece is common in sites in central Arizona and is probably from that region.

The 'unknown' sources outlined on Figure 1 are the same used by Shackley (1986).

REFERENCES/BIBLIOGRAPHY

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Cox, K.G., J.D. Bell, and R.J. Pankhurst
Findlow, Frank J., and Marisa Bolognese  

Jack, Robert N.  

Jack, Robert N., and I.S.E. Carmichael  

Newman, Jay R., and Roger L. Nielsen  

Shackley, M. Steven  


SOUTHWEST XRF PAPER
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**PAPAGO WATER SUPPLY SURVEY**

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Figure 1. Ternary Plot of Archaeological Obsidian from the La Paloma and Papago Water Supply Archaeological Projects (Zr, Sr, Rb solution)
Figure 2. Ternary Plot of Figure 1 data for obsidians depleted in strontium (Zr,Nb,Rb solution)