Geochemistry and Provenance Research on Obsidian from the Kamchatka Peninsula

Michael D. Glascock

Research Reactor, University of Missouri, Columbia, MO 65211, glascockm@missouri.edu

Robert J. Speakman

Research Reactor, University of Missouri, Columbia, MO 65211, speakmanr@missouri.edu

Vladimir K. Popov and Yaroslav V. Kuzmin

Far Eastern Branch, Russian Academy of Sciences, Vladivostok, Russia

INTRODUCTION

The presence of obsidian artifacts on archaeological sites provides archaeologists with some of the most compelling evidence for contact and exchange between prehistoric humans. Acquisition of obsidian developed in different ways ranging from local collection to complex systems involving long-distance commerce over land and/or sea. Chemical analytical methods are frequently used determine provenance of obsidian artifacts to support studies of the cultural, social and economic development of prehistoric societies.

A region where the geochemical studies of obsidian suffered neglect until quite recently is the Kamchatka Peninsula of the Russian Far East. Kamchatka is one of the most volcanically active regions in the world with more than 100 volcanoes spreadout across the landscape, a dozen or more of these are currently active. Since archaeological work began in Kamchatka in the early 1900's, obsidian artifacts have been discovered at more than 800 archaeological sites and at least 30 volcanic glass localities have been found. Studies of obsidian from the Kamchatka Peninsula region are important to archaeologists because Kamchatka may have been one of the major points of departure for prehistoric human's migration from Asia to the Americas.[1]

DESCRIPTION

Since 2000, scientists and archaeologists from the University of Missouri and the Russian Academy of Sciences have been collaborating on studies of obsidian sources and artifacts from Kamchatka with NAA serving as the primary analytical technique. Obsidian from geologic contexts were collected during the summer of 2004 and brought to the University of Missouri Research Reactor (MURR) for analysis using routine NAA procedures.[2] Artifacts from existing archaeological collections in Russia were also made available to augment the study. To date, more than 400 artifacts and 80 source samples have been characterized.

Although NAA is a highly successful method for assigning obsidian artifacts to their sources, sample preparation for NAA requires removal of a portion of the artifact to produce an analytical sample. In addition, the analytical sample is made radioactive and cannot be returned to the archaeologist or museum from which it was obtained. This limits access to some potentially interesting artifacts.

RESULTS

Use of non-destructive XRF as a method for sourcing obsidian artifacts from Kamchatka was investigated. XRF offers the potential for *in situ* analysis with a portable XRF instrument. The first step in this research has been to employ XRF to characterize the sources originally identified by NAA. Figures 1 and 2, respectively, show NAA and XRF results for the main obsidian sources in the region. The comprehensive database permits a choice of methods to optimize provenance determination for obsidian artifacts from Kamchatka and neighboring regions.

REFERENCES

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2. M. D. Glascock, G. E. Braswell, R. H. Cobean, A Systematic Approach to Obsidian Source Characterization, In *Archaeological Obsidian Studies*, edited by M. S. Shackley, Plenum Press, New York, pp. 15-65 (1998).

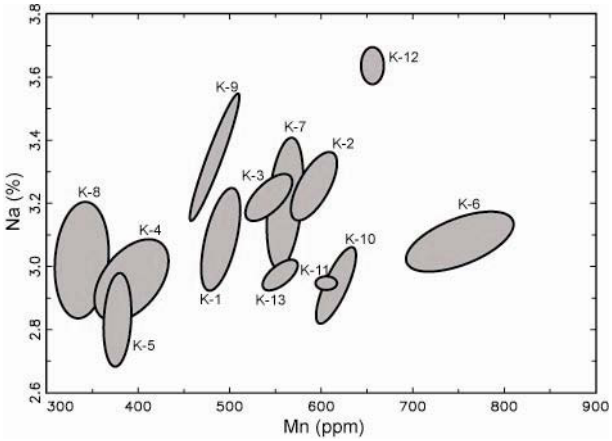

Fig. 1. Plot of Na versus Mn concentrations for obsidian from the Kamchatka region measured by NAA. Ellipses represent the 95 percent confidence interval for group membership.

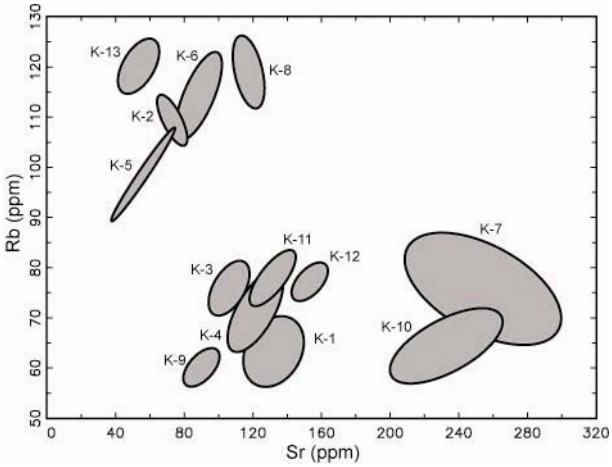

Fig. 2. Plot of Rb versus Sr concentrations for obsidian from the Kamchatka region measured by XRF.