

Characterization of New England Chert Sources by Neutron Activation

Matthew T. Boulanger

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

Robert J. Speakman

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

Michael D. Glascock

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

INTRODUCTION

Throughout northeastern North America, stone tools and flakes are some of the most commonly encountered Native American artifact types. Strongly acidic soils and harsh freeze-thaw cycles have conspired to destroy the more-fragile artifacts useful for studying prehistoric cultures. The identification of stone sources is therefore an essential step in the construction of hypotheses about trade routes, ethnic areas, and migrations. Despite the potential significance of sourcing stone artifacts, most archaeologists in the Northeast rely on visual identification as the primary method of stone identification. Although visual identification is useful in a general sense, it does not address the complex geology of the New England in general, and the State of Vermont in particular.

BACKGROUND

During the 1970s, NAA emerged as a viable method of characterizing prehistoric chert quarries. [1] Some projects have been quite successful; however, chemical heterogeneity of some chert-bearing formations may lead to the failure of such projects. Analysis by NAA is particularly appealing for chert-sourcing studies. Unlike XRF, it is a bulk technique and provides whole-rock compositional data. Additionally, NAA (as conducted at MURR) provides quantitative data for 32 elements including many of the REEs.

Despite the potential utility of chert-sourcing projects, virtually no such work has been conducted within the state. Characterizations of Vermont chert types are based on gross qualitative descriptions. These visual characterizations fail to discriminate between geologically different sources, and result in broad categories such as Black Chert that are of limited usefulness in archaeological explanation. [2]

DESCRIPTION

Understanding the geological context of chert-bearing formations is fundamental to the interpretation of compositional data. In Vermont, geological processes have produced many different formations, but only a limited number of them contain chert. Vermont cherts formed by two distinctly different geological processes: 1) silicification of deep-sea radiolarian sediment; and 2) precipitation of silica in a dolomite matrix. The differences between these two formational processes are likely reflected in chert composition.

Samples were collected from the four known Native American chert quarries in Vermont's Champlain Valley: Mount Independence, Thompsons Point, Lazy Lady Island, and Brooks Farm. Between eight and 30 samples were collected from each quarry.

Two analytical samples were prepared from each quarry sample. The first sample was irradiated for five seconds, allowed to decay for 25 minutes, and counted for 750 seconds. The second sample was irradiated for 24 hours, and counted twice. The first count was conducted after a seven day decay, and the second took place three weeks after irradiation.

RESULTS

NAA provides compositional data sufficient to characterize the chert sources analyzed in this study. The resulting data permit discrimination between cherts formed by different geological processes (Figure 1). NAA is also capable of providing geochemical fingerprints for each of the known quarry sites within Vermont's Champlain Valley (Figure 2).

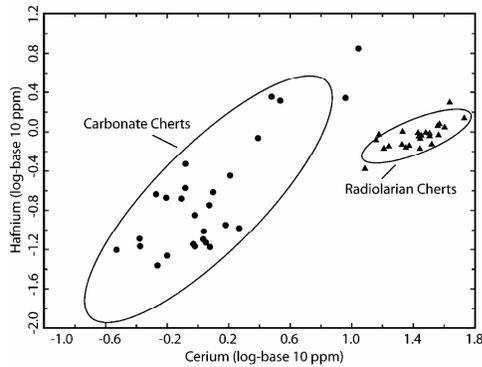


Fig. 1. Plot of logged Ce and Hf values for carbonate (dolomite) and radiolarian cherts.

The source database produced by these analyses demonstrates that NAA is capable of distinguishing between chert-bearing formations as well as individual quarries. This database is an important resource for regional archaeologists who have long debated the presence of Vermont chert at sites throughout New England, particularly those sites belonging to the earliest inhabitants of the region. [3] It is now possible for archaeologists to reliably assign artifacts to these particular sources, thereby gaining a better understanding of New England's prehistoric populations.

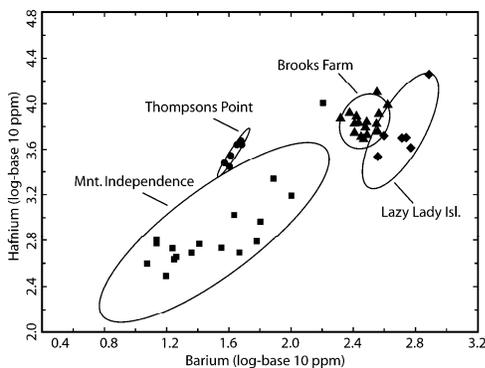


Fig. 2. Plot of logged Ba and Hf values for samples from the four Champlain Valley chert quarries.

REFERENCES

1. B. E. LUEDTKE, *An Archaeologist's Guide to Chert and Flint*, UCLA Institute of Archaeology, Los Angeles, (1992).
2. B. E. LUEDTKE, Lithic Source Analysis in New England, *Bulletin of the Massachusetts Archaeological Society*, **54**, 2, 56, (1993).
3. A. F. SPIESS, D. B. WILSON, AND J. W. BRADLEY, Paleoindian Occupation in the New England-Maritimes Region: Beyond Cultural