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MAPPING BIOSPHERE STRONTIUM ISOTOPE RATIOS ACROSS MAJOR LITHOLOGICAL BOUNDARIES

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ABSTRACT

Strontium isotope analysis has provided archaeologists with an unprecedented opportunity to study the mobility of humans and animals in the past. However, a lack of systematic environmental baseline data has seriously restricted the full potential of the analytical technique; there is little biosphere data available against which to compare measured skeletal data.

This thesis examines the extent to which geographic variation in biosphere $^{87}Sr/^{86}Sr$ composition can be spatially resolved within the lowland terrain of England, in a geographically and geologically coherent study area. Systematically collected samples of vegetation, stream water and surface soils, including new and archived material have been used. The potential of these sample media to provide reliable estimates of the $^{87}Sr/^{86}Sr$ composition of bioavailable strontium are evaluated under both high-density and low-density sampling regimes, and against new analyses of local archaeological material.

Areas lying south of the Anglian glacial limit, display a pattern of geographic $^{87}Sr/^{86}Sr$ biosphere variation (0.7080–0.7105) controlled by solid geology, as demonstrated by high-density biosphere mapping. Data collected at a wider geographic scale, including above superficial deposits, indicate the dominant influence of re-worked local rocks on the biosphere. These methods have enabled a reclassification of the archaeologically important Cretaceous Chalk domain. Analysis of rainwater and other indicators of atmospheric deposition show that, in this setting, local biosphere variation is not significantly perturbed by atmospheric inputs.

Time-related data from archaeological cattle and sheep/goat tooth enamel suggest that the modern biosphere data can be used to understand livestock management regimes and that these are more powerful than using an average value from the enamel. A more complete understanding of possible patterns of mobility in a group of humans has been achieved through analysis of material from Winchester and comparison with the Chalk biosphere domain.

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