Archaeological and Climatic data from elemental ratios using rapid analysis of shell carbonate

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Abstract

The chemical composition of carbonate shell from palaeoecological and archaeological assemblages is laborious to analyse, yet the information that is locked within the tens of thousands of shell deposits worldwide contains valuable insights on past environments and human ecology. At present, studies struggle with the acquisition of sufficient amounts of data to make robust interpretations. Large amounts of information is inaccessible due to costly and time-intensive techniques, resulting in small, unrepresentative studies and a lack of comparability between them. Here we apply Laser Induced Breakdown Spectroscopy (LIBS) in an automated setup to map the Mg/Ca composition of whole shell sections with an acquisition speed of over 4,000 data points per hour and at a resolution of 40–50μm. By assessing the spatial variability of Mg/Ca ratios, this method has the potential to mitigate distorted results while increasing the resolution of derived palaeoenvironmental information. We have successfully tested method on various molluscan species (among others: *Patella* sp., *Ostrea* sp., *Mytilus* sp.) around the world, to develop a rapid and affordable method and to globally advance the reconstruction of climate change.

Keywords: Shell midden, sclerochronology, geochemistry, climate change

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