Geophysical Research Abstracts
Vol. 19, EGU2017-8941, 2017
EGU General Assembly 2017

Perspectives on land snails – sampling strategies for isotopic analyses

Ola Kwiecien, Annika Kalinowski, Jessica Kamp, and Anna Pellmann
Ruhr-University Bochum, Sediment & Isotope Geology, Geosciences, Bochum, Germany (ola.kwiecien@rub.de)

Since the seminal works of Goodfriend (1992), several substantial studies confirmed a relation between the isotopic composition of land snail shells (d18O, d13C) and environmental parameters like precipitation amount, moisture source, temperature and vegetation type. This relation, however, is not straightforward and site dependent. The choice of sampling strategy (discrete or bulk sampling) and cleaning procedure (several methods can be used, but comparison of their effects in an individual shell has yet not been achieved) further complicate the shell analysis.

The advantage of using snail shells as environmental archive lies in the snails' limited mobility, and therefore an intrinsic aptitude of recording local and site-specific conditions. Also, snail shells are often found at dated archaeological sites. An obvious drawback is that shell assemblages rarely make up a continuous record, and a single shell is only a snapshot of the environmental setting at a given time. Shells from archaeological sites might represent a dietary component and cooking would presumably alter the isotopic signature of aragonite material. Consequently, a proper sampling strategy is of great importance and should be adjusted to the scientific question.

Here, we compare and contrast different sampling approaches using modern shells collected in Morocco, Spain and Germany. The bulk shell approach (fine-ground material) yields information on mean environmental parameters within the life span of analyzed individuals. However, despite homogenization, replicate measurements of bulk shell material returned results with a variability greater than analytical precision (up to 2‰ for d18O, and up to 1‰ for d13C), calling for caution analyzing only single individuals. Horizontal high-resolution sampling (single drill holes along growth lines) provides insights into the amplitude of seasonal variability, while vertical high-resolution sampling (multiple drill holes along the same growth line) produces replicable results. This reproducibility enables not only sequential testing of isotopic changes in shells exposed to artificially elevated temperatures, but also systematic assessment of different cleaning methods.

Goodfriend, 1992. The use of land snail shells in paleoenvironmental reconstruction, EPSL 11, 655-685