Geophysical Research Abstracts
Vol. 18, EGU2016-14270, 2016
EGU General Assembly 2016

Stable isotopic signatures of hydrothermal vent mollusc shells

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Mollusc shells are composite biomaterials, consisting of carbonate crystals that contain and are surrounded by organic molecules. Shell-bound organic matter (SBOM) may be preserved in the fossil record and its carbon, sulfur and nitrogen stable isotopic signatures may provide insights into the nutrition and ecology of extinct invertebrates. However, there remains some uncertainty about the relationship between the isotopic signatures of SBOM and those of molluscan soft tissues, shell mineral and environmental sources.

Hydrothermal vents are sites on the sea floor where high temperature fluids, rich in dissolved compounds, are expelled into the water column. A limited number of metazoans, including some bivalve and gastropod molluscs, thrive in these environments due to chemosymbiosis. Chemosymbiosis is an unusual nutritional strategy whereby invertebrate animals live in symbiosis with bacteria that oxidise reduced compounds in order to release energy to fix carbon.

Here we present data from a suite of chemosymbiotic molluscs from modern hydrothermal vents. Stable isotopic analysis of soft tissues, shell carbonate and intercrystalline and intracrystalline SBOM from multiple taxa and sites has allowed us to begin to unravel the interplay between environmental sources, chemosymbiosis and biological fractionation.