Geophysical Research Abstracts, Vol. 9, 06895, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06895

Geochemical proxies in vent mussel shells as indicators of environmental conditions at hydrothermal vents

J. Libertinova, L. J. Clarke, H. Kennedy, P. R. Dando, and C. A. Richardson
School of Ocean Sciences, University of Wales Bangor, Menai Bridge, Isle of Anglesey, LL59 5AB, UK
(oss205@bangor.ac.uk / Fax: +44-1248-716367 / Phone: +44-1248-382874)

Bivalve shells potentially are valuable high-resolution archives of past oceanographic conditions and are widely spread throughout the global oceans, from coastal environments to mid-ocean ridges. Robust utilization of such archival materials requires testing of the veracity of relationships between elemental and stable-isotope ratio proxies and ambient environmental variables.

Deep-sea hydrothermal vent mussels live in continuous darkness, close to vents that discharge hot ($\leq$10-350˚C) fluid enriched in various metals, methane and sulphide. The mussels are thought to live in waters between 5 to 15˚C and can experience rapid temperature fluctuations on the timescale of seconds to days. The incremental manner in which vent mussel shells are deposited thus could allow for high temporal resolution reconstruction of temperature and chemistry of the environment through measurement of shell isotope and elemental composition.

In this preliminary study we have examined the geochemical composition of the outer shell calcite layer milled from two different deep-sea hydrothermal vent mussel species, *Bathymodiolus azoricus* and *Bathymodiolus puteoserpentis* that were sampled from five contrasting hydrothermal vent fields (Menez Gwen, Lucky Strike, Rainbow, Snake Pit and Logachev) situated along the Mid-Atlantic Ridge in the central Atlantic Ocean. Our geochemical data indicate that *Bathymodiolus* shells record statistically significant variable elemental compositions between the different vent fields that likely reflect their different environmental settings. The majority of variation in elemental concentrations (i.e. Mn, Ba, La, Ce, Eu) is most significant ($p<0.05$) between vent fields, rather than within individual shells. Within individual shells, some elements also exhibit a marked decrease in concentration with increased distance measured from the shell umbo. One interpretation of these elemental patterns would be that through ontogeny the animals migrated away from the vent fluids, to regions where elemental concentrations are less enriched and more like normal seawater; this inference of ontogenetic migration in habitat is supported by δ^{18}O data that exhibit more positive values (cooler temperatures) towards shell margins. Such a geochemical proxy-based interpretation of variable *Bathymodiolus* habitat during ontogeny is interesting, since submersible observations at the Lucky Strike vent field have indicated that small mussels occupied waters of 5.5 to 6.6ºC, whereas large mussels were found in waters of 5.2-14.4ºC. Consequently, field observations and geochemical data remain contradictory at present, such that we analyses a larger number of different sized specimens from all vent field localities to test whether migration to waters of different chemical composition and temperature occurs during ontogeny.