2.7.P09

Oxygen and carbon isotope ranges in modern and ancient brachiopods

C. KORTE[1], E. GRIESSHABER[1], W.W. SCHMAHL[1] AND J. VEIZER [1, 2]

[1] Institut für Geologie, Mineralogie und Geophysik, Ruhr-Universität, 44801 Bochum, Germany (christoph.korte@ruhr-uni-bochum.de)

[2] Ottawa-Carleton Geoscience Centre, University of Ottawa, Ontario K1N 6N5, Canada (veizer@science.uottawa.ca)

Articulate brachiopods are frequently utilized for deciphering the oxygen and carbon isotopic compositions and temperatures of ancient oceans because their fossil shells are relatively resistant to diagenetic alteration [1]. In addition, they precipitate their shells in, or close to (± 1 permil), isotope equilibrium with ambient seawater [2]. Higher deviations in isotopic signatures were observed only in one sample, collected in an intertidal zone of NW Washington State, USA by Auclair et al. [3]. In the present study we carry out a three-dimensional micro sampling of modern and ancient brachiopods in order to demonstrate the possible ranges of oxygen and carbon isotope values in a single specimen within the context of paleogeography, elemental distributions, cathodoluminescence and crystallographic investigations.

The initial results of sampling along the growth axis of two Permian brachiopods from low and high latitudes, yielded oxygen and carbon isotope values that varied less than 1 permil. Moreover, isotope values along single growth lines that are perpendicular to the growth axis, are within 0.3 permil for both oxygen and carbon. In a variety of Triassic brachiopods, sampling at different points yielded oxygen and carbon isotope values within 0.5 and 0.3 permil, respectively. Additional measurements on modern and ancient brachiopods are currently in progress.

References

[1] Veizer J., Ala D., Azmy K., Bruckschen P., Buhl D., Bruhn F., Carden G. A. F., Diener A., Ebneth S., Goddéris Y., Jasper T., Korte C., Pawellek F., Podlaha O. G. and Strauss H. (1999) *Chem. Geol.* **161**, 59-88.

[2] Carpenter and Lohmann (1995) *GCA* **59**, 3749-3764.

[3] Auclair A.-C., Joachimski M. M. and Lécuyer C. (2003) *Chem. Geol*. **202**, 59-78.

2.7.P10

A high resolution temperature calibration study on the chilean gastropod *Concholepas concholepas*

N. GUZMÁN[1,2], C.E. LAZARETH[2], F. POITRASSON[3], F. CANDAUDAP[3], J.P. CUIF[1] AND L. ORTLIEB[2]

[1] Paleontology Unit, Univ. Paris XI, Orsay (Nury.Guzman@bondy.ird.fr)

[2] UR Paleotropique, IRD, Bondy (Claire.Lazareth@bondy.ird.fr)

[3] LMTG-CNRS, Toulouse

The shell chemistry of the fast growing gastropod *Concholepas concholepas* (Northern Chile) was investigated to calibrate chemical tracers with environmental parameters, with a first focus on water-temperature. Our first aim is to understand shell growth modalities. Subdaily patterns were evidenced in cultured organisms through successive fluorochrom marking combined with microscopic observations. The temperature of the water in which the animal had grown was recorded every 30 minutes by an automated device. For the high-resolution geochemical profiles, the analysis points were based on a chronological framework previously determined. Chemical time-series in the shell can thus be directly compared with temperatures measured during shell formation.

High-resolution trace element profiles were obtained using Laser Ablation ICP-MS (LA-ICP-MS) and electron microprobe (EM). Profiles were done in the external calcitic layer, from the growing edge backwards in a one month time of shell growth. Considering the mean daily growth rate of *C. concholepas* of 100 µm/day and the spatial resolution of the two techniques, we obtained two analyses per day with LA-ICP-MS and around five per day with the microprobe. For both techniques, the homogeneity of a layer deposited at a given time was tested through several analyses along the same growth line. The elements analysed were Mg, Sr, Ba and Mn, plus Fe for the EM. Ba, Mn and Fe were below the detection limits. For both Sr and Mg profiles, the variations were analytically significant for the fragment of shell analysed. The mean LA-ICP-MS Sr concentration of 1140 ppm is similar to that of the EM (1100 ppm). For Mg, the mean EM contents are around 10% different from those obtained with LA-ICP-MS. The EM higher resolution Mg profiles grossly mimic the daily water-temperature fluctuations whereas the LA-ICP-MS Mg results mostly highlight the monthly temperature pattern.

These initial data demonstrate the validity of both techniques for analysing biogenic calcite at high-resolution. Future studies will also include SIMS stable isotope analyses ($\delta^{18}O$). This innovative study, combining precise sclerochronological and high-resolution geochemical analyses in *C. concholepas*, is a new approach to establish a general methodology for the use of mollusc shells as recorders of environmental parameters.