Oxygen isotopic composition in deep-sea coral, *Lophelia pertusa*

C. ROLLION-BARD [1], D. BLAMART[2], J.-P. CUIF[3], A. MEIBOM[4], A. JUILLET-LECLERC[2] AND Y. DAUPHIN[3]

[1]CRPG-CNRS, Nancy, France (rollion@crpg.cnrs-nancy.fr)
[2]LSCE, CEA-CNRS, Gif-sur-Yvette, France
[3]Univ. Paris XI, Orsay, France
[4]Museum National d'Histoire Naturelle, Paris, France

The deep-sea coral *Lophelia pertusa* is a scleractinian coral (azooxanthellate) found mainly in Atlantic Ocean. The stable isotopic compositions of their skeleton are frequently used to reconstruct paleoceanographic conditions, including sewater temperature. However, microanalytical techniques, i.e. microdrill and SIMS, have shown that the $\delta^{18}O$ in lines of centres of calcification (LCC) are strongly depleted relative to the surrounding fibrous skeleton. These large amplitude, small length scale isotopic variations cannot be driven by changes in environmental parameters. Several models have been proposed to explain the observed variations, including models based on pH variations of the hypothetical extracellular calcifying fluid (Adkins *et al.*, 2003, Rollion-Bard *et al.*, 2003).

To document clearly the oxygen isotopic behaviour against the structure and the pH, we have performed ion microprobe $\delta^{11}B$ and $\delta^{18}O$ profiles cross-cutting the two main structures of *Lophelia pertusa* (the $\delta^{11}B$ values are discussed in an abstract by Blamart *et al*. (this conference)). The $\delta^{18}O$ data range from -2.61 to 3.41 ‰, which is in the range of variation obtained by microsampling. The LCC $\delta^{18}O$ values range from -2.61 to -1.17 ‰, with a mean value of -1.93 ‰ (n=13). The $\delta^{18}O$ values for the surrounding fibres are systematically heavier, ranging from 0.45 to 3.37 ‰, with a mean value at 2.41 ‰ (n=19). So the $\delta^{18}O$ values appear strongly correlated to the microstructure of the coral skeleton.

It was thought that this different behaviour of the $\delta^{18}O$ between fibres and COC was principally driven by variations of pH. The $\delta^{11}B$ data performed in parallel profiles demonstrate that there is no correlation between $\delta^{18}O$ and $\delta^{11}B$, and therefore no correlation with pH. Moreover, it was presumed from $\delta^{18}O$ data that LCC should have a higher pH than surrounding fibres and it is the contrary. This implies that the LCC and surrounding fibres do not derive from the same calcifying fluid. Therefore LCC and surrounding fibres are precipitated by different mechanisms, most likely which are controlled by specialized domains of the calicoblastic layer.

References

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Lamproite-hosted xenoliths of Vestfjella: Implications for lithospheric architecture in western Dronning Maud Land, Antarctica

I. ROMU AND A. LUTTINEN

Department of Geology, P.O.Box 64, FI-00014 University of Helsinki, FINLAND (ilona.romu@iki.fi, arto.luttinen@helsinki.fi)

Lamproite-hosted xenoliths from Kjakebeinet (73º47’ S, 14º53’ W), south Vestfjella, represent unique samples of the unexposed continental crust at the rifted margin of western Dronning Maud Land. The xenolith suite indicates 1) heterogeneity of the crust, 2) granulite facies metamorphic conditions, and 3) mainly igneous protoliths. Two leucocratic tonalite gneiss samples yielded U-Pb SHRIMP zircon ages of ~1.0–1.3 Ga (J. Jacobs, personal communication, 2006). Interpretation of mineral–whole-rock Sm-Nd isotope data on mafic granulites is complicated by lamproite overprint. The results imply compositional affinity to Proterozoic lower crustal xenoliths from Lesotho, South Africa (Rogers and Hawkesworth, 1982) and equilibration of the Sm-Nd -system during Grenvillean and Jurassic magmatic events. Overall, the lamproite-hosted xenoliths indicate extension of the Proterozoic Maud Belt crust to Vestfjella. These results and the presence of basalt-hosted Archean xenoliths at the nearby Muren (Luttinen & Furnes, 2000) imply that the Kjakebeinet lamproites erupted probably just at the Archean-Proterozoic lithospheric boundary.

References

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