Strontium tomography of experimentally grown scleractinia (stony corals) used to clarify growth structures in variable environmental conditions

N. Fruchter, J. Fietzke, T. Hansteen, J. Erez[1], A. Eisenhauer, K. Appel[2] and F. Böhm

GEOMAR Helmholtz-Zentrum für Ozeanforschung, Wischhofstr. 1-3, 24148 Kiel, Germany

[1] Institute of Earth Sciences, The Hebrew University of Jerusalem, 91904 Jerusalem, Israel

[2] HASYLAB at DESY, Notkestr.85, 22607 Hamburg, Germany

The aim of the project is to better understand the calcification mechanisms in the stony coral *Acropora* sp. and to contribute to a discussion on the usability of *Acropora* as a paleo-environmental archive We performed 3D Synchrotron Micro-XRF measurements of strontium (Sr) distribution in skeletons of two *Acropora* specimens, using a spatial resolution of 25 µm.

Sr is a trace element that normally incorporates into the coral's aragonite skeleton in concentrations of about 8000 ppm. Sr/Ca in corals has been found to correlate well with the surrounding sea surface temperature (SST). Together with a typical axial growth pattern of corals' skeleton, Sr/Ca in corals is used as a proxy for paleo-temperature, and is used to reconstruct SST on annual, seasonal and even daily resolution scales (e.g. Beck et al., 1992).

In the current experiment we used two corals' skeletons that were cultured in the laboratory for several weeks in different temperatures (19 and 25 degrees centigrade). Prior to the culturing experiment, the specimens grew in a Sr depleted environment (one third of the seawater Sr concentration). The difference in Sr concentrations between the two periods enabled us to distinguish in the measurement between pre-experiment and experiment skeleton, and to trace the growth pattern of the corals' skeleton.

Few studies have already noticed in the past that the skeleton of *Acropora* sp. is becoming denser in deeper and older parts of the skeleton (e.g. Gladfelter, 1982). We show, for the first time, a colored map that proves the existence of the patchy behavior of *Acropora* sp. skeleton.

We are working on a calibration of the Sr concentrations at depth in the samples, which will take into account the sample inhomogeneity. Following the new calibration, we will compare the results of the samples that were cultured at the two different temperatures.

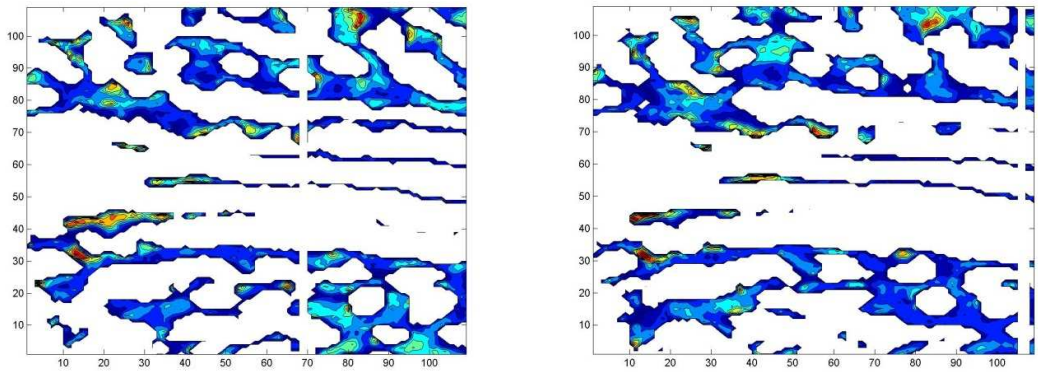

Figure 1 Microchemical map showing the uncorrected Sr counts at 300 µm depth (left) and at 325 µm depth of *Acropora* sp. skeleton from the current study. We measured the skeleton on a vertical section. In the pictures above, the left side faces the outer part of the coral, where the polyp was situated .The blue colours represent the low Sr concentration of the pre-experiment condition. The red colours represent the high Sr concentrations from the experimental conditions. The two adjacent measured layers show a patchy growth pattern, which with time reduces the porosity of the skeleton.

References

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