NON-LINEAR GROWTH RATES OF MARINE CALCAREOUS ORGANISMS AND THE PROBLEM OF DECODING THE RECORDED ENVIRONMENTAL CHANGE SIGNAL

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For specific biota the record of a feature (i.e. a proxy) along a growth axis can reflect (changing) environmental conditions experienced during lifetime of the organisms. To reconstruct the time base one has to assume a constant growth rate. This poster presents a method to avoid this assumption, which leads to a better matching between the proxy and the environmental conditions.

In order to predict future climate changes accurately, a much longer retrospect needs to be considered compared to the directly measured meteorological and environmental data. Such long-term information is continuously recorded in many marine calcareous skeletons at various contrasted time resolutions.

For example, the magnesium concentration in the modern bivalve *Isognomon ephippium* specimen is related to ambient environmental conditions, like temperature. Such a proxy was collected by David Gilliken[2] in Tudor Creek (Mombasa, Kenya) and analysed by Claire Lazareth (Lazareth *et al.*). It was attempted to partly reconstruct these environmental conditions by analysing the Mg-concentration along the growth axis. In a first attempt a constant growth rate of the shell was assumed. This led to a correlation between the Mg-concentration and the temperature of 65 %. However, a significant error is present, because of the changing growth rate during the lifetime of this bivalve.

To overcome this problem we have estimated the non-linear growth rate based on methods used to characterize time base distortions in high frequency sampling scopes. Instead of assuming a linear growth rate, we have assumed that the Mg-profile is harmonic. Non-harmonically related frequencies are used to reconstruct the time base distortion.

Finally, the corrected time base is used to match the Mg-concentration against temperature. This time, a correlation coefficient of 85 % is found. Annual and bi-annual variations in the Mg-concentrations can now be separated from the noise.

In this specific case of *Isognomon ephippium* the fitting of Mg with SST is remarkable, stressing the usefulness of Mg in biogenic marine carbonates for reconstructing past SST.

Reference

Lazareth C.E., E. Vander Putten, L. André and F. Dehairs. High-resolution trace element profiles in shells of a mangrove bivalve (*Isognomon ephippium*): a record of environmental spatiotemporal variations? Chemical Geology (in press).