ENVIRONMENTAL RECORDS FROM CALCAREOUS MARINE SKELETONS

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The trace element and stable isotope (TEI's) profiles of calcareous skeletons have long been recognized to represent records of environmental conditions, thus carrying potential for reconstruction of climate change. Since the composition of biogenic carbonates is clearly influenced by biological factors the correct interpretation of these TEI archives requires a precise understanding of the processes controlling the incorporation of these proxies, and hence of bio-mineralization. We focused on proxy calibration using different types of marine biogenic carbonates and selected three taxa of potential recorders (sclerosponges, bivalves, and echinoderms) having contrasting characteristics, such as lifetime, growth rate, and mineralization features.

Some highlights of this study are: (i) In all investigated taxa $\delta^{18}O$ is an excellent proxy although the (mostly) unknown value for ambient water (which is related to salinity) can cause severe errors when calculating SST. Therefore, either a salinity proxy or a salinity independent SST proxy would greatly benefit SST reconstructions; (ii) Both, laboratory and field based experiments with bivalves illustrated that the background Ba signal in the shell (i.e. not the Ba peaks in spring) reflects the dissolved Ba in the ambient solution and is thus a potential indicator for barium and salinity in estuarine environments; (iii) For annually resolved archives the problem of transforming data from a growth axis (i.e. distance axis) into a time axis is now partly solved via a nonlinear transformation. This allows for a more accurate comparison of proxy records in calcareous archives with corresponding records of environmental signals.

Our workplan for the near future aims at bringing together a multidisciplinary network, in order to: (i) investigate the effects of time averaging on the signal; (ii) address the mechanisms of proxy incorporation in the biogenic carbonate matrix; (iii) reconstruct past environmental conditions. Based on species/proxy combinations, we will develop multi-proxy transfer functions using different types of marine carbonate skeletons and associated organic matrix. These proxies will include both established proxies and newly developed ones. Analyzing the same proxy in aragonite and calcite, known to record environmental conditions differentially, will allow to deconvolve effects of multiple controls on the proxy (e.g. separate salinity from temperature effects).