CLIMATE RECONSTRUCTION BASED ON ARCHAEOLOGICAL BIVALVE SHELLS

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Several years of biogeochemical research on bivalve shells yielded in clear proxy-records carrying potential for reconstruction of paleoseasonal trends in coastal environments. However, the interpretation of the proxy signals is still often problematic. Proxy concentrations can be influenced by several environmental parameters and by physiological processes. With more complex models these problems can be tackled. Two strategies are followed; (1) a statistical black-box model is being developed in parallel with (2) a physiological white-box model.

The statistical black-box model can be described as a non-linear multi-proxy model. It is based on chemical measurements in modern bivalve shells and consists of the construction of a curve in a multi-dimensional space. The model describes the variations in the chemical signature of the shell during a full year cycle. The shortest distance from any other data point (e.g. a fossil shell) to the model will give a time point estimation in the annual cycle, which can further be linked to environmental parameters. At present our model approach achieves quite accurate SST reconstructions.

A white box model is crucial for understanding the physiological processes and for an unambiguous interpretation of the proxy records. We investigated, in a first phase, *in situ* the influences of environmental parameters and physiology on the incorporation of proxies in *Mytilus edulis* at a well documented wave breaker site. In a second phase, *in vitro* culturing experiments under controlled laboratory conditions were carried out. Experiments were carried out at 8°C and 16°C and at salinities of 18‰ and 28‰. During these experiments mussels were fed under high and low supply regimes. By combining these *in situ* and *in vitro* approaches a white box multi-proxy model is generated for the reconstruction of SST and SSS.