Geophysical Research Abstracts,
Vol. 10, EGU2008-A-03122, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-03122
EGU General Assembly 2008

Development of a mechanistic understanding of trace elements incorporation into biogenic calcite (benthic foraminifera).

D.Dissard (1), G. J. Reichart (1,2) and J. Bijma (1)

(1) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany, (2) Faculty of Geosciences, Utrecht University, The Netherlands.

The trace element composition of calcitic foraminiferal tests has become an important tool by which paleoceanographers deduce past oceanic conditions. On timescales shorter than the shortest residence time the elements, strontium and magnesium, occur in seawater with nearly constant ratios to calcium. Variation in Sr/Ca and Mg/Ca in benthic foraminiferal tests can then be explained as a function of environmental parameters that control their incorporation into the tests. These functions are known as proxy relationships. An ideal proxy relationship depends only on a single environmental (target) parameter (e.g. temperature, salinity, pH). In reality, however, it turns out that the relationship is also sensitive to physiological processes such as respiration, photosynthesis by symbionts, as well as to the biomineralization process itself. For benthic foraminifera, temperature appears to be the dominant parameter controlling the incorporation of Mg into the tests but variations in the seawater chemistry (pH, carbonate ion concentration, salinity) also play an important role. To quantify this effect benthic foraminifera were grown in chemostats, where they calcify under controlled conditions. The elemental composition of the newly formed calcite is analysed with laser ablation inductively coupled mass spectrometry (LA-ICPMS). These culture experiments will allow to deconvolve the effects of temperature and carbonate chemistry and hence contribute to increased accuracy of element ratio proxies. Several experiments have been carried out with the shallow water species *Ammonia tepida*. They were maintained at 1) variable temperature (T = 10-20˚C) and constant salinity and pH (S = 33; pH = 8); 2) variable S (20-40) and constant T and pH (10,15˚C; 8);

3) at variable pH (7.5-8.5) and constant T and S, and 4) variable Mg concentrations at constant, pH, T and S.