Intra-test variation in the trace element composition of planktonic foraminifera: Implications for biomineralization processes

ED C. HATHORNE[1*], RACHAEL H. JAMES[2] AND RICHARD LAMPITT[3]

[1]DFG-Research Center Ocean Margins (RCOM), University of Bremen, Bremen, Germany (ehathorne@marum.de) *previously at[2]

[2]Department of Earth Sciences, The Open University, Milton Keynes, U.K. (R.H.James@open.ac.uk)

[3]National Oceanography Centre, Southampton, U.K. (R.Lampitt@noc.soton.ac.uk)

The trace element chemistry of the calcite shells (tests) of planktonic foraminifera is a prime source of palaeoenvironmental information. Trace element partition coefficients are usually determined empirically, yet it is clear that calcification is biologically controlled. Better interpretation of the chemistry of foraminiferal calcite thus requires an understanding of the fundamental processes of mineralization and their influence on the resulting mineral chemistry.

To this end we have analysed the intra-test variation of a number of trace elements in the planktonic foraminifera species *Gr. inflata*, *Gr. scitula* and *O. universa*. Samples were recovered from a deep sediment trap (3km water depth) in the N. Atlantic (48.6N, 16.3W). The chemical and physical characteristics of the water column at this site are monitored, so the conditions under which calcification took place can be assessed. Measurements were made by laser ablation (LA) indictively-coupled plasma mass spectrometry (ICP-MS). A 193nm ArF Excimer laser was used to ablate through the test walls and time resolved signals from the quadrapole ICP-MS provide depth profiles of trace elements. Internal standardisation was performed using Ca and signals were calibrated using a calcite powder pellet and NIST 612 glass.

All three species display a 100- 200% increase in Mg/Ca through the test wall which is far greater than expected as a result of vertical migration of the foraminifera and associated changes in water temperature. Other light trace elements (Li/Ca and B/Ca) show similar behaviour, but Sr/Ca ratios show no variation greater than the analytical uncertainty (~10% RSD). The change in Mg/Ca, Li/Ca and B/Ca through the test wall is most likely due to biomineralization processes. The implications of these data for foraminifera calcification models will be discussed.

Hydrogeochemical Properties of Ladik Hot Water Spring (Samsun, Turkey)

E. HATIPOĞLU, F. GÜLTEKIN AND A. FIRAT ERSOY

Karadeniz Technical University, Department of Geological Engineering, 61080, Trabzon Turkey (esrahatipoglu@ktu.edu.tr)

In this investigation Ladik (Samsun) hot water spring has been studied from the point of geology, hydrogeochemistry and discharge. The study area is located around middle-north of Turkey. The geology of the study area and its vicinity consist of Permian aged recristallized limestone, Jurrasic-Cretaceous limestone, Eocene- Neogene aged sandstone and claystone and Quaternary aged alluvium.The North Anatolian Fault (NAF) is situated near the hot water spring. Ladik hot water is come out to the surface where cross cut the NS and NW-SE directed fault, which is parallel to the NAF. Spring has 18 l/s discharge rate and 36.7 ^{0}C temperature. Hot water is analysed by Hacettepe University, Hydrogeochemistry Laboratory. According to the analyse results total dissolved ion matter for Ladik spring 339 mg/l, Hamamayağı River 192 mg/l and Kocapınar cold water spring 378 mg/l are obtained. The hot spring are classified according to the following criterias:

-according to the structural properties “fault spring”

-according to the temperature “medium hot water”

-according to the geothermal energy “low entalphy geothermal system”

-according to the hot water analyse result cation and anion trend of the springs are;

for Ladik hot water spring, Kocapınar cold water spring and Hamamayağı River

$rCa^{+2}>rMg^{+2}>rNa^{+}>rK^{+}$ and $rHCO_3^{-}>rSO_4^{-2}>rCl^{-}$

Saturation indexes of the hot and cold water springs have been calculated in PHREEQC Programe. Springs are not saturated with respect to the calcite, dolomite and aragonite. According to the Schoeller and Pipper Diagrame, springs and river waters have similar chemical properties but Ladik hot spring has high Mg^{+2}, Na^{+} and K^{+} ion values. The reason of these high concentrations have been assumed that the hot water add the ions of the recristallized limestone and limestone.

References

MTA, (2005) *Envanter of the Geothermal Springs of the Turkey*, Ankara (in Turkish).

Pipper, A.M., (1944), *Trans. Amer. Geophys. Union*, **25**, pp.914-923.

Schoeller, H., (1962), *Les Aus Souterraines, Mason et Cie Eturs.*