Geophysical Research Abstracts,
Vol. 10, EGU2008-A-10316, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-10316
EGU General Assembly 2008

δ^{18}O vital effects and cell physiology: link to species-specific response to ocean acidification

P. Ziveri (1,2), S. Thoms (3), G. Langer (3), I. Probert (4), B. Rost (3)

(1) ICTA, Autonomous University of Barcelona (UAB), Bellaterra, Spain (patrizia.ziveri@uab.es), (2) Department of Paleoclimatology and Geomorphology, FALW, Vrije Universiteit Amsterdam, The Netherlands (patrizia.ziveri@falw.vu.nl) (3) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany, (4) Sation Biologique de Roscoff, Evolution du Plancton et PaleoOceans, Roscoff, France

In order to understand the impact of ocean acidification and ocean [CO_3^{2-}] on the planktonic calcifying organisms such as coccolithophores and foraminifera we developed a process-based understanding of the $^{16}O/^{18}O$ -[CO_3^{2-}] relationship.

For coccolithophores, laboratory studies have revealed not only a species specific but also a possible clone-specific (within the same species) calcification response to predicted ocean acidification scenarios.

Experimental results on common coccolithophore species, *Calcidiscus leptoporus* and *Coccolithus braarudii*, show the $^{16}O/^{18}O$ dependence on [CO_3^{2-}]. Furthermore we provide a model to explain these carbonate ion effects on both planktonic forminifera and coccolithophores.

The proposed mechanism will possibly work for all unicellular, vesicle-based calcifiers. The cellular pH-homeostasis keeps the pH inside the vesicle constant to an alkaline value, which is favourable for calcite precipitation. Hence, the values for seawater pH and vesicle pH differ which means that the equilibrium of the carbon-dioxide system also differs.

We test several coccolithophore species and show the link between cell physiology and isotope fractionation (i.e. “vital effects”) in these major marine carbonate producers. We propose a possible physiological explanation for the species-specific coccolithophore oxygen isotope fractionation response to acidification. We will also discuss

implications of this and how it may be exploited in the fossil record.