Relation of internal and external pH in tropical and cold-water corals

M. WALL[12], G. M. SCHMIDT[23], J. FIETZKE[1] AND D. DE BEER[2]

[1]GEOMAR, Helmholtz Center for Ocean Research Kiel, Germany (mwall@geomar.de)
[2]Max-Planck Institute for Marine Microbiology Bremen, Germany
[3]Alfred-Wegener Institut, Helmholtz Center for Polar and Marine Research, Bremerhaven, Germany

Knowledge about the ability of corals to control their internal calcifying pH (pH_{cf}) derives from indirect determinations by measuring the skeletal boron isotopic composition ($\delta^{11}B$). Skeletal $\delta^{11}B$ is a proxy for the internal pH_{cf} and clearly showed that pH_{cf} must be elevated at the site of calcification (e.g., [1]). Culturing experiments simulating ocean acidification revealed a linear relationship between external seawater pH (pH_{sw}) and skeletal $\delta^{11}B$ although the internal pH_{cf} decreased less than the pH_{sw} [2]. Direct measurements of pH up-regulation in corals at the site of calcification are limited to two studies on tropical corals [2] [3]. We hypothesize that profound spatial variations in pH regulation and growth within a single coral polyp exist. Our high resolution skeletal $\delta^{11}B$ measurements for both cold-water and tropical corals suggested strong spatial heterogeneity in pH_{cf}. Hence, we still miss a basic physiological understanding of pH regulation in corals, under different pH_{sw} conditions considering the likely high spatial variations within a single individual. We used microsensors to investigate the internal pH regulation in tropical and cold-water corals considering both spatial differences along the coral polyp and different pH_{sw}. We link these data to the high resolution skeletal $\delta^{11}B$ of the corals and their skeletal growth which allows for a better understanding of their highly complex regulation mechanisms.

[1] McCulloch, M., Falter, J., Trotter, J. & Montagna, P. (2012) *Nat. Clim. Chang.* **2,** 623–627. [2] Venn, A. A. *et al.* (2013) *Proc. Natl. Acad. Sci. U. S. A.* **110,** 1634–1639. [3] Al-Horani, F. A., Al-Moghrabi, S. M. & de Beer, D. (2003) *Mar. Biol.* **142,** 419–426.