Seasonal changes in seawater pH from Boron isotope systematics in a *Porites* coral from the Northern South China Sea

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We report seasonal changes in seawater pH using boron isotopic variations in high and low-density bands from a *Porites lutea* coral from Sanya, in the northern South China Sea. Boron isotopes in coral act as a proxy for seawater pH and were investigated using the method of positive TIMS with $^{309}Cs_2BO_2/^{308}Cs_2BO_2$ species being measured and the results expressed as $\delta^{11}B$ relative to NBS SRM 951. The internal precision is better than 0.2 ‰ (2σ) and the external precision indicated by repeated measurement of a working coral standard is ~0.4 ‰ (2σ), which is about 2-3 times better than that by negative TIMS method, corresponding to an overall uncertainty of less than ±0.03 pH units.

The results indicate that winter seawater pH values, represented by $\delta^{11}B$ in high-density bands, range from 7.31 to 8.15, and from 7.87 to 8.17 for summer pH values determined from the low-density bands. The pH values in winters are generally lower than in summers, which is consistant with increased uptake of CO_2 in seawater during cooler seasons due to increased solubility.

There is generally an increasing trend for seawater pH values in this region from 1992 to 1995, with pH values changing from ~7.8 to ~8.17, which appears to coincide with reduced salinity caused by increased precipitation. This may indicate more alkali (higher pH) input from the runoff into the reef, in which the seawater is significantly influenced by highly modified urban inputs from the Sanya region.

Bacterial tetraether membrane lipids in soils and their application in palaeoenvironmental studies

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Branched Glycerol Dialkyl Glycerol Tetraethers (GDGTs) are membrane lipids synthesized by ostensibly anaerobic bacteria that thrive in soils and peat bogs (Weijers *et al*., 2006). Multiple types of branched GDGTs exist, differing in the amount of methyl branches and cyclopentanyl moieties in their carbon chains. Analysis of branched GDGTs in >150 soils indicated that soil bacteria use these differences to adapt their cell membrane to ambient temperature and soil pH conditions, which is necessary to keep the membrane in an optimal liquid crystalline state (Weijers *et al*., 2007a).

Upon soil erosion, branched GDGTs are transported by rivers to the marine environment. In conjunction with bulk geochemical proxies, the relative abundance of branched GDGTs in a marine sediment core located near the Congo River outflow showed that soil organic matter input varied over the last deglaciation by up to a factor 5. In addition, the degrees of methylation and cyclisation of the branched GDGTs were used to reconstruct a Congo Basin integrated soil pH and temperature record. These records reveal a gradual deglacial warming of 4°C in tropical Africa and a co-variation of soil pH with African humidity over this time interval (Weijers 2007b). This latter result might be explained by enhanced soil leaching processes with increased precipitation and vice versa.

References

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