

4.1.P09**Interstitial water geochemistry,
Southeast Pacific Paleooceanographic
Transects (ODP Leg 202)**

M.L. DELANEY

Ocean Sciences/Institute of Marine Sciences, University of
California, Santa Cruz, California 95064, U.S.
(delaney@ucsc.edu)

Interstitial water geochemical profiles are powerful tools for exploring sedimentary alteration processes and redox state. The Southeast Pacific Paleooceanographic Transects expedition (Ocean Drilling Program [ODP] Leg 202) sampled an array of 11 sites in the southeast and equatorial Pacific. The oceanographic and geographic settings of Leg 202 sites influence their biogeochemical environments, as reflected in the interstitial water geochemistry. The latitudinal range for Leg 202 from ~41°S to ~7.5°N is significantly larger than those for sites from the California Current region (~30-40°N, ODP Leg 167) or for sites from the Benguela Current region (~4-32°S, ODP Leg 175), legs also focused on the productive regimes of major eastern boundary currents. Leg 202 sites cover a range of site water depths from 489-4072 mbsf, with site water depth affecting the delivery of organic matter to the sediment-water interface. Linear sedimentation rates range over at least two orders of magnitude, from <1 cm/kyr to >100 cm/kyr.

The oxidation of organic matter is the major influence on interstitial water geochemistry for Leg 202 sites, with resulting effects on volatile hydrocarbon geochemistry and on authigenic carbonate mineralization reactions. In addition to the prevailing influence of organic matter degradation, two sites are affected by methane hydrates (Sites 1233 and 1235), and a third site shows the signature of fluid flow in the underlying basement (Site 1240). Dissolved silicate profiles show the influence of geothermal gradients on opal solubility in some sites, but site to site differences also must be controlled by sediment source material differences. Sulfate and dissolved barium profiles have an interplay consistent with control by barite solubility.

4.1.P10**The $\delta^{11}\text{B}$ record in coral**J. J-S SHEN¹, G-S WANG², K.Y. WEI²

¹ Institute of Earth Sciences, Academia Sinica, Taiwan
(mountain@earth.sinica.edu.tw)

² National Taiwan University, Taiwan (weiky@ntu.edu.tw)

The ocean has played a major role in controlling the variation of the CO₂ content in the atmosphere. The partial pressure of CO₂ (Pco₂) is moderated by the CO₂ concentration in oceans. The pH of seawater is governed by carbonate equilibration, so for a given pH value, it is possible to calculate the aqueous CO₂ concentration and, thus, to make quantitative estimates of atmospheric Pco₂. We were able to estimate pH of ancient seawater by measuring the boron isotope composition in the calcium carbonate ($\delta^{11}\text{B}_{\text{cc}}$) that was precipitated from it. This is because boron in seawater occurs as two species, B(OH)₄⁻ and B(OH)₃, and their relative proportions are a function of pH. Boron isotopes are fractionated between these two species and the fractionation is highly pH dependent over the natural acidity range of seawater, such that $\delta^{11}\text{B}$ in marine carbonates record the pH of the seawater from which they precipitated.

We have developed a new technique for boron isotope measurement using negative-TIMS which overcomes the instrumental mass fractionation effect during measurements for two-isotope elements (1). We then applied this technique to measure isotopic shifts of B in coral samples. We found that the variation of B isotope ratio in coral was a function of several variables, including vital effect, deep-water upwelling, freshwater inflows, and some unknown seasonal effects. This information allows us to question if the B isotope fractionation obtained from planktonic-foraminifera does reflect the real pH of seawater.

References

- [1] Shen J. J.-S., and You C.-F. (2003) *Anal. Chem* 75, 1972-1977.