



Welcomes

**MSCI Seminar Guest Speaker:**

*Dr. Gary Hemming, Associate Research Scientist  
Lamont-Doherty Earth Observatory,  
Columbia University*

**Time:** Friday, April 15, 2011 @ 3:00pm

**Location:** PSC Bldg., Room 002

**Title:** Crystal structural controls on boron incorporation in Calcium Carbonate: Implications for the B-isotope paleo-pH proxy.

The boron isotope composition of marine carbonates has been shown to vary with pH of seawater, and thus offers a powerful tool for understanding past ocean chemistry and ocean-atmosphere interactions. As with any isotope proxy, the better we understand the system, the more confident we are in applying it. Details of the co-precipitation of the isotopes of interest with the host mineral can help in understanding the crystal-chemical processes involved, which allows a better understanding of mass-dependent, coordination-dependent, and kinetic fractionation. Unlike conventional stable isotopes such as oxygen and carbon, boron isotope fractionation between aqueous fluids and carbonate minerals is primarily dependent on the pH of the parent fluid. Although the systematic offset from fluid compositions provides convincing evidence that the tetrahedrally coordinated aqueous borate species is exclusively involved in boron uptake in carbonates, recently published estimates of the aqueous fractionation factor are greater than the empirical fractionation factor based on measured isotopic compositions of carbonates. Because of this and other factors, it is still not clear exactly how boron is incorporated, the coordination in the minerals, and the crystallographic site in which it resides. NMR studies can shed light on this question, but to date results have not been definitive.

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