Sediment Proxies for Chemical Paleo-Oceanography
SIO 245, Spring 2015 - General Outline

The main goal of the course is to understand how marine sediment chemical and isotopic compositions record the history of seawater chemistry and how sediment diagenesis impacts these important paleoceanographic proxies. A brief introduction on each of the following topics will be presented, followed by discussions. In addition to a few problem sets, a brief oral presentation and a written term paper will be required. There will be no final exam. It is assumed that all students took the course: Introduction to Isotope Geochemistry, taught by D. Hilton.

This 4-unit class will meet twice a week on Tuesdays and Thursdays, at 3:30 – 5:00 PM in Vaughan Hall 300.

Topics that will be discussed
1. A brief introduction on Deep Sea Sediments, sources and distribution, and their potential as paleo-proxies;

2. Types of paleo-proxies, criteria for establishing paleo-proxies;

2. Sediment pore fluid chemical profiles - indicators of biogeochemical and inorganic diagenetic reactions, diffusion-advection;

3. The impact of sediment diagenesis on the reliability of the paleo-proxies;

4. Oxygen isotope ratios as a proxy for paleo-temperatures; additional paleo-temperature proxies: Mg/Ca, Sr/Ca, and clumped isotopes;
    The history of seawater oxygen isotopic composition – evidence and controversies;

5. Proxies for weathering and sediment sources; seawater Sr, Li, and Os concentrations and isotope ratios;

6. Boron isotope ratios as a proxy for Seawater pH and B concentration as indicator for fluid flow;

7. Seawater and pore-fluid Cl isotopes, a proxy for the interaction between fluids and hydrous phases (emphasis on clay minerals and other micas), at moderate to high-temperatures, and implications for the global Cl cycles;

8. Redox proxies: the REE and Mo and its isotopes;

9. Seawater Mg isotopes and the oceanic Mg cycle; on the origin of dolomites;

10. Gas hydrates-Clathrates- and environmental implications; methane C isotopes;

11. Student presentations