OCN/GG 638: Earth System Science and Global Change

Fall 2015
MSB 305. We, Thu 1:30-2:45 pm
(Room and time flexible if necessary)

Instructor:
Richard E. Zeebe

Description:
This graduate course presents a global view of the planet, including its origin and building blocks, the components of the climate system, biogeochemical cycles, and an analysis of natural and human-induced environmental change. Starting with the formation of the solar system and ending with anthropogenic greenhouse gases and 21st-century climate change, the course provides a survey of key aspects of Earth System functioning. The chemical history of the ocean-atmosphere-sediment system is examined. Critical tools for understanding the global carbon cycle such as seawater carbonate chemistry and isotope fractionation are introduced. The fundamental components of Earth’s climate system are investigated, while most recent developments in our understanding of past, present, and future climate change are also highlighted. Effects of anthropogenic carbon dioxide emissions on present and future climate, as well as on ocean chemistry (ocean acidification) are discussed.

Grading:
Final paper and oral presentation in class. Topics to be announced.

Readings:
“A Compendium of Geochemistry: from Solar Nebula to the Human
"Climate Change 2007: Climate Change 2007: The Physical Science
Basis”. IPCC, Solomon, S. et al. (Eds.), Cambridge University Press,
”Tracers in the Sea”. Broecker, W.S. and T.-H.Peng, Eldigio Press,
Lamont-Doherty Geological Observatory, Palisades, New York, pp.
690, 1982.

+ “Paper(s) of the week” (recent Nature/Science articles).

Tentative Schedule:

1. Solar System

2. Isotopes

3. Earth’s History (Deep Time)

4. Climate System

5. Greenhouse Effect and Gases

6. Seawater Carbonate Chemistry

7. Long-Term Carbon Cycle

8. Proxy Archives

9. Past Climate Events

10. Anthropogenic Greenhouse Gases

11. Ocean Acidification

12. Present and Future Climate Change