

Instructor: David Tan (3242 ES&T, 5-1821, dtan@eas.gatech.edu)

Text: *Biogeochemistry: an Analysis of Global Change*, W. H. Schlesinger
Academic Press, 1997

Useful supplemental texts:

Biogeochemical Cycles, W. L. Chameides and E. M. Perdue
Oxford University Press, 1997

IPCC Third Assessment Report: Technical Summaries, www.ipcc.ch

Earth System Science, M. C. Jacobson, R. J. Charlson, H. Rohde, and G. H.
Orians, Academic Press, 2001

This course provides an introduction to biogeochemical cycles in the Earth system -- the cycling and transformation of chemical compounds throughout the Earth system. The role of life in shaping the planet and its coupling to abiotic processes will be extensively explored. Box modeling of various aspects of the Earth system will be performed using Matlab. The global cycles of carbon, oxygen, nitrogen, and sulfur will be examined in detail. The course will finish with a discussion on climate change, including changes in paleoclimate as well as future projections.

I. Introduction

Chemical principles: thermodynamics, pH/pE diagrams
Modeling -reservoirs, fluxes, steady state approximation
Linear systems
Nonlinear systems

II. Earth systems

History and evolution, Earth as a system
Atmosphere
Hydrosphere
Lithosphere
Biosphere -- respiration and photosynthesis
Biogeochemical processes on land, wetlands, marine environments

III. Global cycles

Carbon
Nitrogen, Sulfur, Phosphorus
Oxygen
Coupled cycles

IV. Global change

Climate and paleoclimate
Future projections