LARGE-SCALE OCEAN-ATMOSPHERE INTERACTIONS
OCN/MET 666
Spring 2008, HIG353, Tues, Thurs, 1:30-3 pm, 3 credits

I. Introduction

- ***Applications in Ocean-Atmosphere Interaction***
- ***Energy Balance of the Earth's Climate System***

II. Basic concepts of ocean-atmosphere coupling

- ***Air-sea exchanges of heat, moisture, momentum, and gases***
- ***Thermodynamics: boundary layers, mixing***
- ***Ocean and Atmosphere Dynamics***
- ***Interaction of dynamics and thermodynamics***
- ***Feedbacks***
- ***Modes of coupled variability***
- ***Interaction of coupled modes***

III. Modes of coupled climate variability: Description, Dynamics and Predictability

- ***Madden-Julian Oscillation***
- ***The Annual Cycle and Monsoons***
- ***El Nino/Southern Oscillation***
  - **Observations**
  - **ENSO theory**
  - **Phase-locking of ENSO to annual cycle**
  - **Numerical Modeling and prediction**
  - **Dynamical Systems Theory--Chaotic Oscillation of tropical climate**
  - **Interaction of Monsoon and ENSO**

- ***Extratropical Air-Sea Interaction-Decadal Variations***
  - **Ocean as an integrator/heat reservoir**
  - **Ocean to atmosphere feedback, large scale**
  - **Ocean to atmosphere feedback, observations/modeling**
  - **Decadal climate variability in the North Pacific**
  - **The North Atlantic Oscillation**
- ***The Thermohaline Circulation (THC) problem***

Student Learning Outcomes for
Large-scale Ocean-Atmosphere Interaction
OCN/MET666

Upon successful completion of the course, students are expected to:

- Understand concepts on how the ocean and atmosphere are coupled by momentum, heat, moisture and buoyancy fluxes
- Understand the basic physics of surface boundary layers in the atmosphere and ocean
- Understand the basic large-scale dynamics of the ocean and atmosphere underlying the major modes of coupled ocean atmosphere variability
- Describe the statistical and dynamical approaches to discovering modes of coupled ocean-atmosphere variability
- Know the essential features of the dominant modes of coupled ocean-atmosphere variability
- Understand the key dynamics related to the dominant modes of coupled ocean-atmosphere variability
- Understand the key thermodynamics and air-sea coupling mechanisms of the dominant modes of coupled ocean-atmosphere variability
- Understand the physics governing predictability and predictive methods for modes of coupled ocean-atmosphere variability
- Be able to critically evaluate knowledge of the major modes of coupled ocean atmosphere variability