MPO 731: Air-Sea Interactions
Fall 2016,
Tu/Th 3:00-4:20,
MSC 329

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Description:

Oceanic and atmospheric mixed layers including fluxes of heat, momentum, moisture and salt between the ocean and atmosphere; vertical distribution of energy sources and sinks at the interface including the importance of surface currents; forced upper ocean dynamics, the role of surface waves on the air-sea exchange processes and ocean mixed layer processes.

1. Introduction: Basic Processes (Week 1)
   A. Definitions
   B. Governing Equations/Laws

2. Instabilities (Week 1-2)
   A. Atmospheric
   B. Oceanic

3. Reynolds Decomposition (Weeks 2-4)
   A. Generating turbulence
   B. Approximations and Consequences
   C. TKE Equations

4. Oceanic Mixed Layers (Weeks 5-8)
   A. Bulk Treatments
   B. Kraus-Turner/PRT
   C. Deardorf
   D. TKE
   E. Surface Wave Effects on OPBL dynamics
   F. Langmuir Cells

5. Atmospheric Boundary Layer (Weeks 8-10)
   A. Friction velocity and surface layer
   B. Log layer
   C. Methods of determining wind stress
   D. Surface Wave Effects on APBL fluxes
   E. Nondimensional Scaling/Buckingham Pi Theorem

6. Heat Fluxes (Weeks 10-12)
   A. Bulk aerodynamic formulas
   B. Obukhov Length Scales
   C. Approximations
   D. Role of SSTs
   E. Precipitation and Evaporation
   F. Methods of determining heat fluxes
7. Forced Upper Ocean Response (Weeks 13-15)
A. Ekman Dynamics
B. Projection of wind stress onto baroclinic modes
C. Near-inertial (fronts, tropical and extratropical cyclones)
D. Wind Forced Equatorial Kelvin Waves

Books: On Reserve


Selected manuscripts as assigned.

Grading:

1. Homework assignments: 50%
2. Mid Term Exam: 25%
3. Final Exam: 25%