12.810: Dynamics of the Atmosphere

This class discusses the dynamics of the atmosphere, with emphasis on the large scale.

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Meet Tuesday and Thursday 10:30am-12pm in 54-1623  
Class webpage: www.mit.edu/~pog/810.html

Assessment

1. Problem sets (60%)
2. Project written report (20%) and class presentation (20%)

Topics

• Zonally-symmetric circulations: Hadley cells in the inviscid limit, the relation to monsoons
• Internal gravity waves: forcing by mountains, propagation, effect on mean flow
• Rotating stratified dynamics: potential vorticity, quasigeostrophic dynamics, Rossby waves (including vertical and horizontal propagation on the sphere)
• Vertical motion and the omega equation
• Growth of disturbances: wave activity and E-P fluxes, Charney-Stern condition, Eady model for baroclinic instability, non-modal growth
• Available potential energy and its relation to baroclinic instability
• Tropical dynamics: equatorial waves
• The general circulation: eddies, transformed Eulerian mean, downward control

Primary references

An Introduction to Dynamic Meteorology, Holton and Hakim (5th ed.)  
Atmospheric and Oceanic Fluid Dynamics, Vallis (2nd ed.)

Other references and resources

Textbook: Physics of Climate, Peixoto and Oort  
Interactive plotting website: http://www.esrl.noaa.gov/psd/cgi-bin/data/composites/printpage.pl  
Gridded datasets: www.cdc.noaa.gov/data/gridded/