

**EARTH & ENVIRONMENTAL SCIENCE W4008**  
**INTRODUCTION TO ATMOSPHERIC SCIENCE**  
**COURSE OUTLINE**

1. Introduction: atmospheric length and time scales, terrestrial atmosphere and ocean composition, thermal structure and nomenclature.
2. Thermodynamics: ideal gas law, laws of thermodynamics, thermodynamics of atmospheric water, adiabatic processes in dry and moist saturated air, hydrostatic equilibrium, dry and moist convection.
3. Cloud physics: condensation and evaporation, collisional growth of droplets, precipitation, ice phase microphysics, cloud structural types, cumulus dynamics.
4. Radiation: nature of electromagnetic radiation, molecular absorption, blackbody radiation, remote sensing, scattering, radiative transfer, radiative and radiative-convective equilibrium, global energy balance.
5. Dynamics: conservation laws, pressure coordinates, scale analysis, geostrophic balance, thermal wind, baroclinic instability, mean meridional circulation, heat and moisture budget.

Applications where appropriate (usually in homework sets): natural climate changes (solar variability, volcanoes, ENSO), anthropogenic climate change (carbon dioxide and other trace gases, aerosols), planetary atmospheres (Mars, Venus, Titan, Jupiter, Saturn).

Instructor:

Tony Del Genio  
640 Armstrong Hall  
(NASA/GISS, 112th at Bway.)  
212-678-5588  
adelgenio@giss.nasa.gov

Class meetings: TTh 11:30-12:45, GISS 7<sup>th</sup> Floor

Office hours: M 10:00-2:00; TTh 10:15-11:15,  
1:00-2:00; F 10:00-11:00; these are guidelines -  
call first to make sure I'm in

T.A.: Peng Xian (212-678-5579)  
536 Armstrong Hall  
pxian@giss.nasa.gov

Grading: Midterm exam (~11/4) 30%,  
final exam 40%, 4 homework sets 30% (10% each  
taken from 3 best homework grades)

Assigned text: Murry L. Salby, Fundamentals of Atmospheric Physics, Academic Press, 1996,  
627 pp., ISBN 0-12-615160-1 (at Labyrinth Books)

Prerequisites: Advanced calculus and general physics. Exposure to the basics of vector calculus and differential equations is helpful, but a full course in these subjects is not required.

Course information can also be found by clicking on "W4008" at  
<http://www.giss.nasa.gov/edu/grad/courses.html>