

Air Pollution Physics and Chemistry EAS 6790

Fall 2010
Monday, Wednesday, Friday 10:05 to 10:55
ES&T L1175

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Course Objective: To provide an introduction to the physics and chemistry of tropospheric air pollution.

Reference Books:

Atmospheric Chemistry and Physics, From Air Pollution To Climate Change, J.H. Seinfeld, S. N. Pandis, John Wiley and Sons, 1998.
Introduction to Atmospheric Chemistry, D. Jacob, Princeton University Press, 1999.
Atmospheric Pollution, History, Science, and Regulation, M. Z. Jacobson, Cambridge University Press, 2002.
Air Pollution Meteorology and Dispersion, S. P. Arya, Oxford University Press, 1999.

Syllabus

Organizational/Background

- Air Pollution History/Disasters, Regulations/Sources/Effects, Air Pollution/Climate
- 1. Air Pollution Meteorology (large to small scales)
 - Coriolis, Geostrophic Flow and Global Circulation
 - Barometric Law/ Atmospheric Stability; P and T variation with alt.
 - The PBL, Turbulence
 - Pollutant Dispersion (Gaussian Plume Equation)
- 2. Tropospheric Ozone Formation
 - Photochemistry/Oxidizing Atm/Radicals
 - Ozone Chemistry in Clean Trop.: NO_x /CO/CH₄; Day/Night Chem.
 - Ozone and Photochemical Smog: NO_x/Hydrocarbon Chemistry; Limiting Cases
 - Ozone, OH, radicals and aerosol production (link between O₃/PM)
- 3. Atmospheric Aerosols
 - Aerosol Physics: A Summary (size distributions, forces, mobility, coagulation)
 - Sources: Primary
 - Sources: Secondary: homogeneous nucleation; gas-to-particle conversion (condensation/evaporation rates, equilibrium, enrichment factors, role of atmospheric water, secondary inorganic and organic aerosol formation)
- 4. Modeling; Box/Receptor (CMB/PMF)

Grades: 30% Midterm, 30% Final Exam, 30% Homework, 10% Class participation.