MEA 593J: Air Quality Modeling and Forecasting
MEA 793J: Advance Air Quality Modeling and Forecasting
Department of Marine, Earth and Atmospheric Sciences
Fall 2004

Class Time: Tuesday/Thursday, 1:05-2:20 pm   **Instructor**: Dr. Yang Zhang
Class Location: Room 1109 Jordan Hall   **Office**: Room 5151 Jordan Hall
Office Hours: 1:30-3:00 pm Fridays   **Phone**: 919-515-9688
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Objectives

This graduate level course in air quality modeling and forecasting describes the chemistry and physics of the atmosphere, numerical methods and computational techniques required for studying air pollution and meteorology. It offers a comprehensive examination of contemporary numerical/computational techniques for simulating/forecasting important gas and aerosol processes. It is targeted for students from atmospheric science, engineering, mathematics, statistics, and computer sciences who would like to learn about air quality modeling and who are prospective air quality modelers and forecasters. Upon completion of this course, the students should have a knowledge of important atmospheric chemical processes and numerical methods to simulate them in air quality models and should be able to conduct model simulations (box and 3-D) and develop their own computer codes to simulate one or more atmospheric processes. Students who are interested in pursuing an environmental/air quality position upon graduation are highly recommended to take this course to acquire air quality background required for such positions.

Textbook

Fundamentals of Atmospheric Modeling, M.Z. Jacobson, Cambridge University Press, New York, 1999, 656 pp, reprinted 2000 edition.

Course Description

The course provides the fundamentals of numerical modeling of urban, regional, and global air quality. It covers the chemistry, physics, and transport required for the understanding, development, application and evaluation of air quality models. It will review history and current status of air quality modeling and forecasting and provide students with hands-on computer practicing. Different computer modeling techniques for solving major atmospheric processes used in current air quality models will be reviewed and discussed. Course topics will include:

- **Atmospheric thermodynamics/structure**
- **Numerical solutions to ODEs and PDEs**
- **Atmospheric chemical kinetics**
- **Urban, tropospheric/stratospheric chemistry**
- **Modeling gas-phase chemistry**
- **Modeling radiation transfer**
- **Modeling chemistry of clouds**
- **Modeling dynamics and chemistry of aerosols**
- **Model design, applications and evaluation**
- **Air quality forecasting**
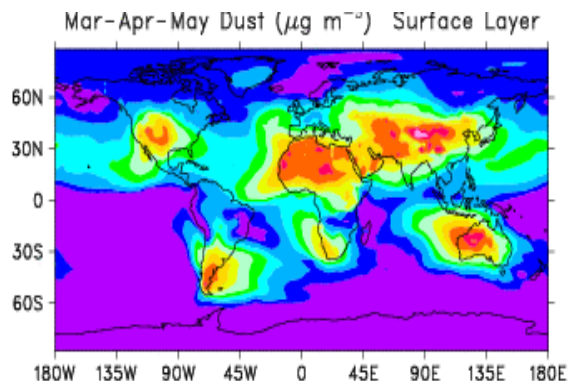
Prerequisites: CE/MEA 479/579, FORTRAN77/90 or consent of instructor.