

Atmospheric Sciences Program
Department of Marine, Earth and Atmospheric Sciences (MEAS)
(<http://www.meas.ncsu.edu>)
North Carolina State University

WHY YOU SHOULD JOIN MEAS/NCSU

- MEAS is one of the largest interdisciplinary environmental sciences departments in the nation's universities.
- The atmospheric sciences program is among the select programs in the nation that support integrated field/laboratory measurements and numerical modeling.
- Nearly all graduate students receive financial support. Starting in their 2nd year, undergraduate students can receive career training with pay.
- U.S. EPA, NOAA, and RTP (which hosts hundreds of corporations and governmental agencies) are located within commuting distance.

- The Raleigh-Durham-Chapel Hill area was ranked as the best place to live in the U.S. in 2003 by CNN and MONEY Magazine.



THE CAMPUS

North Carolina State University, a land-grant university founded in 1887, offers 92 undergraduate fields of study, 101 master's degrees, and 58 doctoral degree programs. Total enrollment is about 29,637, of which about 20% are graduate students. The university has more than 6,000 employees, including approximately 1,685 faculty and extension field faculty. The campus (2,110 acres) is located in Raleigh, the state capital (population 250,000), and is within commuting distance of Duke University, the University of North Carolina at Chapel Hill and the Research Triangle Park.

DEPARTMENT OF MARINE, EARTH AND ATMOSPHERIC SCIENCES

MEAS includes approximately 50 faculty, 100 graduate students and 200 undergraduates involved in basic and applied studies in the earth sciences. The department offers B.A., B.S., M.S., and Ph.D. degrees. Our principal concentrations include weather prediction, air quality, air-sea interactions, storm and climate modeling, hydrology, geochemistry, oceanography, surface processes and regional geology.

ATMOSPHERIC SCIENCES PROGRAM

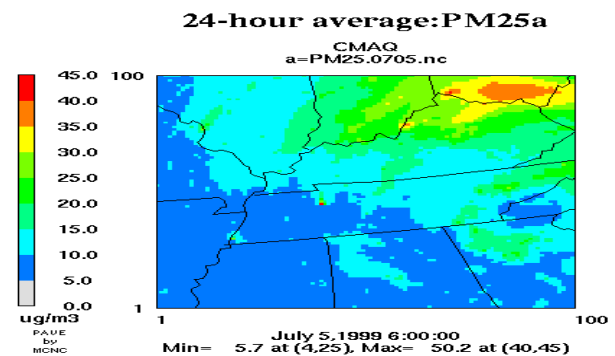
The undergraduate meteorology program at NCSU began in 1969 within the former Department of Geosciences. Graduate-level courses were introduced and the M.S. degree in meteorology was authorized in 1976. The Ph.D. degree program in atmospheric sciences was initiated with the establishment of the Department of Marine, Earth and Atmospheric Sciences in 1981. The atmospheric sciences program at NCSU has grown significantly and the total research grants and contracts currently amount to several million dollars. There are currently 11 full-time tenure-track faculty members and 14 adjunct and visiting faculty in atmospheric sciences. The number of graduate students enrolled is about 60, of which over one-third are Ph.D. students. Research areas include atmospheric chemistry/air quality, boundary layer and air pollution meteorology, climatology, cloud physics, mesoscale meteorology, numerical weather prediction, radar meteorology, synoptic-dynamic meteorology and forecasting, storm structure and dynamics, tropical meteorology, and wake vortex dynamics.

ATMOSPHERIC CHEMISTRY/AIR QUALITY

Our research on atmospheric chemistry/air quality involves both field/laboratory measurements and modeling studies. The measurements and analytical investigations include atmospheric-biospheric interactions, cloud chemistry, atmospheric photochemical oxidants, chemical characterization of aerosols and the natural flux of nitrogen compounds. The modeling studies span urban/regional air quality to global climate. These studies cover a broad range of issues such as ozone, particulate matter, visibility degradation, atmospheric deposition/transport, aerosol radiative forcing, chemistry-meteorology-climate feedback and regional-global interactions. The research areas on modeling are described below.

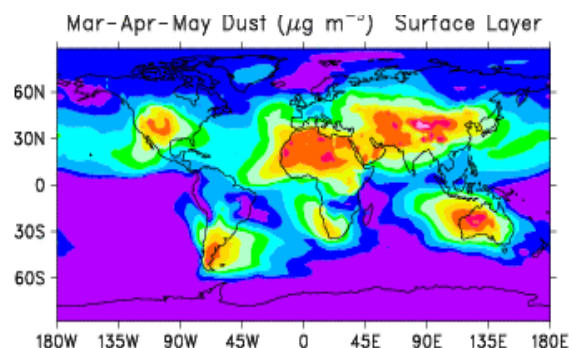
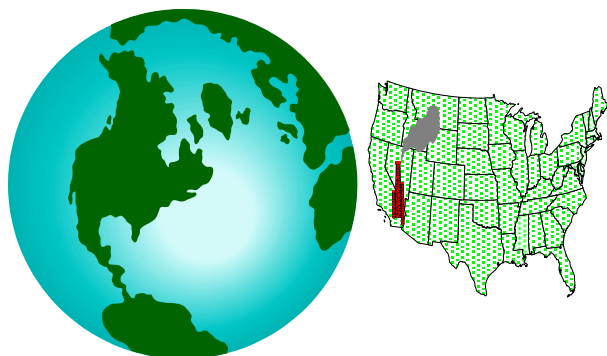
INTEGRATED MODELING OF MULTIPLE AIR POLLUTANTS AT URBAN AND REGIONAL SCALES

Our atmosphere is a complex system with important nonlinear interactions among multiple pollutants. Particulate matter (PM) and tropospheric ozone (O₃) are air pollutants of special concern because of their health and climatic impact. An integrated research program will embrace the development, improvement, application and evaluation of air quality models at urban and regional scales, with a focus on the improvement of model capability to reproduce the observations.



GLOBAL CHEMISTRY, AEROSOL, CLOUD AND CLIMATE MODELING

The uncertainty in the radiative forcing by anthropogenic aerosols has been identified as a major research area by the National Research Council (NRC). The state-of-the-science global modeling system is being applied to simulate interactions among various atmospheric components and processes, and to estimate the direct and indirect radiative forcing by anthropogenic aerosols as well as the associated uncertainties.

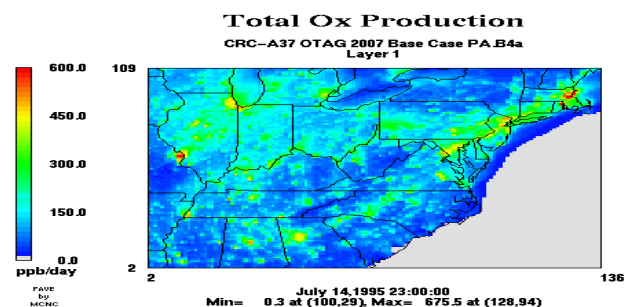
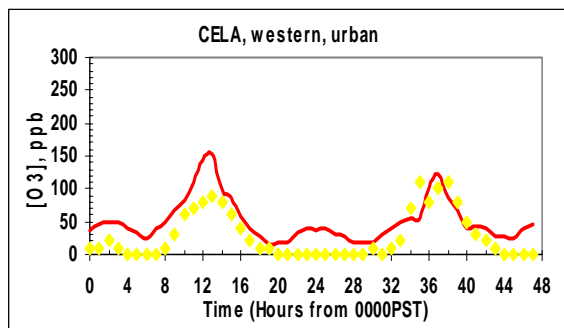


IMPACT OF GLOBAL CLIMATE CHANGE ON REGIONAL AIR QUALITY AND VICE VERSA

This is an emerging research area and represents an important research direction for the next several decades. The impact of air pollutants on the global environment cannot be adequately addressed without understanding issues at smaller scales and vice versa. A fully-coupled urban/regional/global modeling system is being developed to predict the impact of global change on air quality and the feedback of changing air quality on global climate.

PROBING TOOLS FOR AIR QUALITY MODELS

A number of analysis tools have been developed to provide diagnostic, sensitivity and uncertainty analyses for air quality models. These tools enable a deeper understanding of the model than is available from typical model outputs. The use and evaluation of these tools in air quality research are being examined.



AIR QUALITY FORECASTING (AQF)

The “discipline of forecasting” has been identified by NRC as a necessary next step to advance the state of the atmospheric-environmental sciences in the new millennium. NOAA and EPA have recently teamed up to develop AQF capability and to implement a nationwide routine AQF program, with an initial target on O₃ and PM. AQF using a complex chemical transport model is still in its infancy and represents significant research opportunities.

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