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Air Pollution: The Long-Distance Traveler?

A wide-ranging study in Texas is gathering data on emissions that affect air quality, particularly the pollutants that arrive here from out of state.

Study is expected to yield insights into the movement of pollutants

In this story:

Ozone continues to be the No. 1 air quality issue for many urban areas in Texas. Regional haze has become a concern at national parks. Both must be addressed under the federal Clean Air Act.

The state has made progress in reducing ozone levels, and is beginning to plan control strategies to deal with regional haze. But ongoing research suggests the need to take a closer look at this question: How often do pollutants found in Texas flow from one region of the state to another, from other states, or even from outside the United States?

A comprehensive study is under way to research air pollution patterns affecting Texas. The 2005-2006 Texas Air Quality Study (TexAQS II) began this summer with the mission of examining the formation and movement of ozone, as well as the composition and movement of regional haze.

The National Oceanic and Atmospheric Administration has agreed to send its largest vessel, the Ronald H. Brown, to assist with the Texas Air Quality Study II. The research platform and a crew of 20 will cruise the upper Texas Gulf Coast in August and September of 2006./*Photo by NOAA*

The 16-month study, which concentrates on the eastern half of the state, will draw on scientific expertise from around the country and a growing phalanx of air quality monitors. Teams of experts and an array of high-tech equipment, aircraft, and even a ship will track how air pollution travels and interacts with meteorology.

One of the goals is to document "transport," which is the movement of pollutants over long distances. Ozone, regional haze, and the emissions that lead to their formation can cause problems far from the original sources.

"Until a few years ago, air pollution was considered to be primarily a local issue," says Commissioner R.B. "Ralph" Marquez. "But recent research has demonstrated that emissions can travel long distances. In fact, some of what we receive here may actually come from the East Coast in the summer and fall and from Mexico in the spring."

Marquez said that data gathered during the study will be used to assess the amounts of ozone and regional haze that can be attributed to transport from outside Texas and to regions within the state.

"The results may well prove the importance of taking a regional approach to air quality management," he adds.

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Air Study Redux

The current research project is the latest large-scale study of air pollution conducted here. In 2000, a one-month study focused on Houston-area ozone with a broad-based team that involved more than 250 scientists and engineers from the TCEQ and 35 other state and national research organizations.

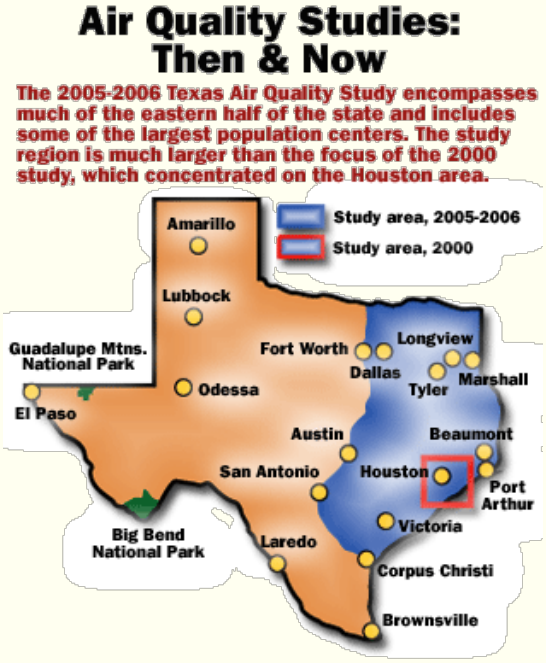
The TCEQ was joined by the National Oceanic and Atmospheric Administration (NOAA), the Brookhaven National Laboratory, and other organizations and universities that invested substantial resources in analyzing the extensive data obtained from fixed monitors and research aircraft. The detailed analysis, which took more than two years, led

to a more effective plan to reduce ozone concentrations in the Houston area—as seen in the attainment demonstration adopted by the TCEQ in 2004.

In the 2005-2006 study, observations and data collection will last longer—16 months. And a much larger region will be covered to better understand pollution transport. The study region includes the areas of Houston-Galveston, Dallas-Fort Worth, Beaumont-Port Arthur, Tyler-Longview-Marshall, Austin, San Antonio, Corpus Christi, and Victoria.

Monitoring for ozone and regional haze over this large a region requires a significant expansion of the air monitoring network into rural areas to monitor transport. The TCEQ is adding surface monitors, aircraft data, and air quality forecast modeling.

During July, a helicopter equipped with a high-tech camera made regular flights between Houston and Beaumont. An onboard infrared camera scrutinized refineries, pipelines, and chemical plants for emissions of volatile organic compounds, which are invisible to the human eye.



The most concentrated period of air quality sampling will occur in August and September of 2006, when advanced research aircraft fly missions from the Gulf of Mexico to Oklahoma and between the Interstate-35 and -37 corridor and Louisiana.

NOAA will make available the largest vessel in its fleet, the Ronald H. Brown. This oceanographic and atmospheric research vessel, with a crew of 20, travels worldwide providing scientific support for various research studies.

The TCEQ also is receiving assistance from the Science Coordinating Committee, whose representatives from universities, research consortiums, and private industry have suggested more than 100 field study projects.

"We hope this broad-based approach will allow us to develop a three-dimensional picture of ozone formation and transport in the eastern part of the state," says Marquez. "With regional haze, we want to be able to document the heaviest concentrations and the composition of the haze flowing into and through Texas."

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Submissions Due

The Environmental Protection Agency (EPA) has set deadlines for Texas to submit air quality improvement plans: attainment plans for the 8-hour ozone standard are due in mid-2007, and rules that address regional haze must be filed in late 2007.

Based on the anticipated results of the TexAQS II, the TCEQ expects to better understand and document the transport of ozone and regional haze into and within Texas. The study will check the accuracy of modeling that calculates the impact of distant emission sources on ozone concentrations in Texas' urban areas.

Also, the initial findings could lead to more effective control strategies for dealing with federal air quality requirements.

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TexAQS II Participants

In addition to local governments, contractors, and industry, these entities also plan on taking part in the 2005-2006 air quality study.

Federal agencies: National Oceanic and Atmospheric Administration, Department of Energy, and Environmental Protection Agency.

Institutions of higher education: Baylor University, University of Houston, Lamar University, Rice University, University of Texas, Texas A&M University, Texas Tech University, University of Alabama-Huntsville, University of Colorado, Georgia Tech University, North Carolina State University, and University of North Carolina.

Nongovernment research institutions: Texas Environmental Research Consortium, Houston Advanced Research Center, Texas Air Research Center, and Houston Regional Monitoring Network.

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On a Not-So-Clear Day

The primary component of urban smog is ozone, which is created when volatile organic compounds (VOCs) and nitrogen oxides (NOx) react with other chemicals in the atmosphere, especially on hot, sunny days. VOCs are a product of a variety of sources, such as motor vehicles and petrochemical refining. NOx is a product of combustion, such as burning coal in a power plant or gasoline in a car engine. NOx can travel long distances before reacting to form ozone.

Ozone is usually invisible, but can be accompanied by smoggy conditions.

Another kind of pollution—regional haze—is more likely found in remote areas, such as the Big Bend or Guadalupe Mountains national parks in West Texas.

Regional haze is caused when sunlight encounters tiny pollution particles in the air. Some light is absorbed or scattered by the particles. More pollutants mean more absorption, and that affects clarity.

Haze-forming pollution comes from both natural and man-made sources. Windblown dust and soot from wildfires contribute to haze, as do motor vehicles, electric utilities, industrial fuel burning, and manufacturing operations.

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Lessons Learned

The 2000 Texas Air Quality Study centered on Houston and its sprawling industrial complexes. That research led to a number of breakthrough findings, which have provided a better scientific basis for the region's ozone control strategy. Much of the findings focused on highly reactive volatile organic compounds (HRVOCs), which are found in industrialized areas.

Among the results were:

- The rate of ozone formation from industrial emissions in the Houston-Galveston area is considerably faster than that from typical urban emissions—in Houston or any other U.S. city.
- High concentrations of HRVOCs are the main cause of rapid ozone formation as well as the unusually high ozone concentrations in industrial areas and downwind of these areas.
- Emission levels of HRVOCs had been previously underestimated.
- A control strategy that reduces HRVOCs as well as NOX would be effective for reducing ozone in the Houston area and would be less costly than reducing only NOx to meet the ozone standard.

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