

# State of the Science of Air Quality in Eastern Texas:

## Major Scientific Findings and Recommendations



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# Executive Summary

Identifying the most effective and efficient approaches to improving air quality in Texas requires a sound understanding of the emissions and atmospheric processes that lead to air pollution. Over the past five years, researchers from universities, state and federal agencies, private industry, and local governments have joined forces to conduct air quality modeling studies and air quality field studies designed to help inform critical air quality management decisions. This document summarizes the findings from these studies. Some of the most critical findings are:

*Emissions* Along the Texas Gulf Coast, emissions of reactive hydrocarbons from industrial facilities can lead to rapid ozone formation and accumulation, causing exceedances of the National Ambient Air Quality Standard for ozone. These emissions exhibit significant spatial and temporal variability and have been significantly underestimated (by factors of 2-10) in previous air quality planning. Throughout all of eastern Texas, emissions of organic compounds from vegetation can play a significant role in ozone formation and accumulation. While these biogenic emissions are not controlled, understanding their magnitude is critical to understanding the balance of controls required on other sources. Changing land use patterns and seasonal changes in drought stress can lead to significant uncertainties in the magnitudes of biogenic emissions.

*Atmospheric processes* Along the southeast Texas Gulf Coast, the highest concentrations of air pollutants tend to be observed during periods of local recirculation. A typical pattern has winds rotating slowly over the course of the day, starting with breezes out of the north to northwest in the morning, and ending with breezes out of the south to southeast in the afternoon. These extreme air pollution events are dominated by local emissions and meteorology and spatially dense meteorological data are needed to accurately model air pollutant formation and accumulation. Throughout the rest of eastern Texas, in contrast, air pollution episodes tend to be multi-day events, strongly influenced by meteorology and emissions over regional (~100-1000 km) scales. During these regional air pollution episodes, intercity, interstate and international transport of air pollutants typically contributes more than half (and sometimes much higher fractions) of local ozone concentrations. Data on the chemical transformations and meteorology over regional scales is required to understand the air pollution controls needed to reduce the severity of these events.

*Air quality models* Current air quality models, which are used to evaluate the effectiveness of air pollution management strategies, are capable of describing the dominant air pollutant formation and accumulation processes in Texas. However, to be effective for Texas conditions, the models must have meteorological and emissions input data that have finer spatial and temporal resolution than the input data used in many other parts of the United States.

On-going and planned research programs are being designed to address critical uncertainties.