

## **1. INTRODUCTION**

Dramatic improvements in air quality have occurred in California's South Coast Air Basin (SoCAB) over the past twenty years, but further improvements are needed for reaching both federal and state ozone and particulate matter air quality standards. One of the principal contributors to fine particulate matter (PM) concentrations, especially during the months of October through January, is particulate nitrate. As is the case for ozone, particulate nitrate forms by means of a series of atmospheric chemical reactions, which are highly nonlinear. To shed light on the effects of VOC and NO<sub>x</sub> emission reductions on particulate nitrate concentrations, we analyzed PM, ozone, and precursor data from monitoring locations in southern California (Los Angeles area, Ventura County, and Mojave Desert). Differences between weekday and weekend concentrations of the measurements were used to characterize the responsiveness of particulate nitrate to changing levels of NO<sub>x</sub> concentrations.

### **Project Objectives**

The objectives of this project are to:

- Characterize weekday and weekend variations of ambient particulate nitrate and precursor concentrations.
- Develop observational evidence supporting or contradicting the hypothesis that lower weekend emissions of NO<sub>x</sub> lead to lower weekend concentrations of particulate nitrate.
- Complement modeling studies and provide information of use for further research on relations among particulate nitrate and its precursors, as well as on the possible side effects of nitrate control strategies on ozone formation.

### **Previous Work**

The principal reports documenting recent work on ozone or PM weekend effects in southern California are a recent CARB staff report (Austin et al., 2001), reviews of that report (Austin et al., 2001, appendices), a report by Desert Research Institute (DRI) (Fujita et al., 2000), and a report prepared by Envair (Blanchard and Tanenbaum, 2000). Long-term (1988 to 1998) trends in PM<sub>10</sub> and PM<sub>2.5</sub> have been analyzed by the California Air Resources Board (CARB) (Dolislager and Motallebi, 1999). The present project expands on the earlier work by focusing on weekend/weekday comparisons of PM nitrate.

## **Structure of Report**

In Section 2, we provide background information on the atmospheric reactions that are responsible for forming particulate nitrate, as well as its precursors. We also summarize previous work on the relation of particulate nitrate to nitric acid and ammonia in California. Section 3 describes the data sets used in this report. In Section 4, we provide statistical descriptions showing differences between the weekday and weekend concentrations of particulate matter mass, nitrate, sulfate, and various gas-phase species. Section 5 analyzes correlations among species. In Section 6, we apply a thermodynamic equilibrium model to recent (1995 - 1996) special-study data, updating the results previously available. Conclusions are discussed in Section 7.