## Atmospheric Chemistry and Physics

An Interactive Open Access Journal of the European Geosciences Union

#### Home

#### Online Library ACP

- Recent Final Revised Papers
- Volumes and Issues
- Special Issues
- Library Search
- Title and Author Search

### Online Library ACPD

Alerts & RSS Feeds

**General Information** 

Submission

Review

Production

Subscription

#### Comment on a Paper





Volumes and Issues Contents of Issue 12 Atmos. Chem. Phys., 6, 5321-5338, 2006 www.atmos-chem-phys.net/6/5321/2006/ © Author(s) 2006. This work is licensed

under a Creative Commons License.

# Observations of the diurnal and seasonal trends in nitrogen oxides in the western Sierra Nevada

J. G. Murphy<sup>1,\*</sup>, D. A. Day<sup>1,\*\*</sup>, P. A. Cleary<sup>1,\*\*\*</sup>, P. J. Wooldridge<sup>1</sup>, and R. C. Cohen<sup>1</sup>

<sup>1</sup>Department of Chemistry, University of California, Berkeley, USA

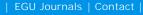
<sup>\*</sup> now at: School of Environmental Sciences, University of East Anglia, Norwich, UK <sup>\*\*</sup> now at: Department of Land, Air, and Water Resources, University of California, Davis, USA

\*\*\* now at: Department of Chemistry, University of Pennsylvania, Philadelphia, USA

Abstract. Observations of speciated nitrogen oxides, namely NO<sub>2</sub>, total peroxy nitrates ( $\Sigma$ PNs), total alkyl nitrates ( $\Sigma$ ANs), and HNO<sub>3</sub> by thermal dissociation laser induced fluorescence (TD-LIF), and supporting chemical and meteorological measurements at Big Hill (1860 m), a high elevation site in California's Sierra Nevada Mountains, are described. From May through October, terrain-driven winds in the region routinely bring air from Sacramento, 100 km southwest of the site, upslope over oak and pine forests to Big Hill during the day, while at night, the site often samples clean, dry air characteristic of the free troposphere. Winter differs mainly in that the meteorology does not favour the buildup of Sacramento's pollution over the Sierra Nevada range, and the urban-influenced air that is seen has been less affected by biogenic VOC emissions, resulting in longer lifetime for NO<sub>2</sub> and a predominance of the inorganic forms of nitrogen oxides.

Summertime observations at Big Hill can be compared with those from Granite Bay, a Sacramento suburb, and from the University of California's Blodgett Forest Research Station to examine the evolution of nitrogen oxides and ozone within the urban plume. Nitrogen oxide radicals (NO and  $NO_2$ ), which dominate total nitrogen oxides ( $NO_y$ ) at Granite Bay, are rapidly converted into HNO3, ZPNs, and ZANs, such that these compounds contribute 29, 30, and 21% respectively to the NO<sub>v</sub> budget in the plume at Big Hill. Nevertheless, the decreasing concentrations of NO<sub>2</sub> as the plume is advected to Big Hill lead to decreases in the production rate of HNO3 and ozone. The data also demonstrate the role that temperature plays in sequestering NO2 into peroxy nitrates, effectively decreasing the rate of ozone production. The important contribution of  $\Sigma$ ANs to NO<sub>v</sub> in the region suggests that they should be considered with regards to export of NOv from the boundary layer. Nocturnal observations of airmasses characteristic of the free troposphere showed lower NO<sub>v</sub> concentrations, which were dominated by HNO3 with a relatively small contribution from the organic nitrates.

■ Final Revised Paper (PDF, 3330 KB) ■ Discussion Paper (ACPD)



## Copernicus Publications

Search ACP	
Library Search	•
Author Search	•

#### News

- Sister Journals AMT & GMD
- Financial Support for Authors
- Journal Impact Factor
- Public Relations & Background Information

#### **Recent Papers**

01 | ACPD, 19 Jan 2009: A two-step scheme for highresolution regional atmospheric trace gas inversions based on independent models

02 | ACP, 19 Jan 2009: Three years of greenhouse gas column-averaged dry air mole fractions retrieved from satellite – Part 2: Methane

03 | ACP, 19 Jan 2009: Effects of regional-scale and convective transports on tropospheric ozone chemistry revealed by aircraft observations during the wet Citation: Murphy, J. G., Day, D. A., Cleary, P. A., Wooldridge, P. J., and Cohen, R. C.: Observations of the diurnal and seasonal trends in nitrogen oxides in the western Sierra Nevada, Atmos. Chem. Phys., 6, 5321-5338, 2006. <u>Bibtex</u> <u>EndNote</u> <u>Reference Manager</u>