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Observations of NO_x, ΣPNs, ΣANs, and HNO₃ at a Rural Site in the California Sierra Nevada Mountains: summertime diurnal cycles

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Abstract. Observations of NO, NO₂, total peroxy nitrates (ΣPNs), total alkyl nitrates (ΣANs), HNO₃, CO, O₃, and meteorological parameters were obtained from October 2000 through February 2002 at 1315 m a.s.l., 38.9° N, 120.6° W on Sierra Pacific Industries land, adjacent to the University of California Blodgett Forest Research Station (UC-BFRS). We describe the data set with emphasis on the diurnal cycles during summertime 2001. We show that transport of the Sacramento urban plume is a primary factor responsible for diurnal variation in total reactive nitrogen mixing ratios as well as in NO_x, ΣPNs and ΣANs, all of which exhibit a late afternoon/early evening peak. In contrast, HNO₃ has a peak just after local noon indicating that HNO₃ is in near steady state during the day with production due to photochemistry and removal by deposition and mixing with the background free troposphere. Boundary layer dynamics influence mixing ratios of all species in the early morning. Analysis of the morning feature suggests that higher mixing ratios of NO_x and HNO₃ persist in the residual layer than in the nocturnal boundary layer indicating the presence of nocturnal sinks of both species. Nighttime observations also indicate large HNO₃ and ΣANs production through oxidation of alkenes by NO₃.

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