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Influence of trans-Pacific pollution transport on acyl peroxy nitrate abundances and speciation at Mount Bachelor Observatory during INTEX-B

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Abstract. We present month-long observations of speciated acyl peroxy nitrates (APNs), including PAN, PPN, MPAN, APAN, and the sum of PiBN and PnBN, measured at the Mount Bachelor Observatory (MBO) as part of the INTEX-B collaborative field campaign during spring 2006. APN abundances, measured by thermal dissociation-chemical ionization mass spectrometry (TD-CIMS), are discussed in terms of differing contributions from the boundary layer (BL) and the free troposphere (FT) and in the context of previous APN measurements in the NE Pacific region. PAN mixing ratios range from 11 to 3955 pptv, with a mean value of 334 pptv for the full measurement period. PPN is linearly correlated with PAN ($r^2=0.96$), with an average abundance of 6.5% relative to PAN; other APNs are generally <1% of PAN. Diurnal cycles and relationships of APNs with ozone reveal a gradient in hydrocarbon chemistry between the BL and the FT. On average, levels of APNs, ozone and PPN/PAN are substantially higher in FT air relative to BL air, suggesting that this site is strongly influenced by distant pollution sources. To estimate the impact of long-range transport of Asian pollution on atmospheric composition at MBO, we perform a detailed analysis utilizing HYSPLIT back trajectories. This analysis suggests that trans-Pacific transport of Asian pollution leads to substantial increases in APN and ozone mixing ratios at MBO, especially when transport occurs via the free troposphere. The ensemble of trajectories indicate that Asian-influenced free tropospheric air was sampled in ~16% of our data and contained a median PAN mixing ratio double that of the full dataset.

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