

Peroxy Radical Measurements using PeRCIMS aboard the C-130

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We report measurements of HO₂ and RO₂ made onboard the NSF/NCAR C-130 using our Peroxy Radical Chemical Ionization Mass Spectrometer (PerCIMS) during the MIRAGE-Mex and INTEX-B field campaigns in the spring of 2006. Both campaigns were established to study the chemical and physical transformations of gases and aerosols in polluted air masses, with the focus of MIRAGE being to examine the local and regional fate of the Mexico City outflow, while INTEX-B was established to investigate rapidly-transported Asian outflow as it crossed into North America. During these campaigns, HO₂ + RO₂ were measured simultaneously by conversion of RO₂ to HO₂, and subsequent conversion of HO₂ to gas-phase sulfuric acid molecules via reaction with NO and SO₂ followed by chemi-ionization by gas-phase nitrate ions and quantification with mass spectrometry. To separate the HO₂ and RO₂ concentrations, the conversion of RO₂ to HO₂ in the PerCIMS inlet was controlled by alternating every 30 seconds between high and low [NO]/[O₂]. This was achieved by diluting the inlet sample flow by half with either pure oxygen or pure nitrogen, while simultaneously alternating between high and low flows of NO and SO₂ reagent gas mixtures. Under the low [NO]/[O₂] condition, 90% of the RO₂ is converted to HO₂, while under the high [NO]/[O₂] condition, only 15% of the RO₂ is converted to HO₂. This rapid separation of HO₂ and RO₂ allows for better estimates of [HO₂]/[RO₂] ratios for comparison with photochemical models.