The NCAR NOxyO3 instrument is a 4-channel chemiluminescence instrument for the measurement of NO, NO2, NOy, and O3. NOx (NO and NO2) is critical to fast chemical processes controlling radical chemistry and O3 production. Total reactive nitrogen (NOy = NO + NO2 + HNO3 + PANs + other organic nitrates + HO2NO2 + HONO + NO3 + 2*N2O5 + particulate NO3- + …) is a useful tracer for characterizing air masses since it has a tendency to be conserved during airmass aging, as NOx is oxidized to other NOy species.
NOx (NO and NO2), NOy (total reactive nitrogen), and O3 are measured using the NCAR 4-channel chemiluminescence instrument. NO is measured via addition of reagent O3 to the sample flow to generate the chemiluminescent reaction producing excited NO2, which is detected by photon counting with a dry-ice cooled photomultiplier tube. NO2 is measured as NO following photolytic conversion of NO2, with a time response of about 3 sec due to the residence time in the photolysis cell. NO is measured with an identical time response due to use of a matching volume. NOy is measured via Au-catalyzed conversion of reactive nitrogen species to NO, in the presence of CO, with a time response of slightly better than 1 sec. O3 is measured using the same chemiluminescent reaction but with the addition of reagent NO to the sample flow. Time response for the ozone measurement is slightly better than 1 s. All 4 measurements are reported at 1 s in the standard archival.

Ambient air was routinely sampled from a tower at 3 different heights (0.6m agl., 2m agl., 6m agl., marked by appropriate data suffixes). Occasionally the instrument sampled from a balloon carrying three sampling lines to approximately 50m, 100m, and 150m agl., marked by data suffixes). The ground level at the field site is approx. 5m asl. All mixing ratios are reported in parts per trillion by volume (pptv)
Errors for 1-s mixing ratios are calculated for each reported value. The precision error (_errPrec) is determined by counting statistics. The bias error (_errBias), or systematic error, is determined by contributions from errors in the sensitivity calibration (calibration gas standard uncertainty, flow controller uncertainty) as well as "baseline" uncertainty (artifact and zero). The total error (_err) is obtained by combining the precision and bias errors in quadrature.
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