Instrument: Aero-Laser 5002 G-V Carbon Monoxide Instrument (RAF_CO)
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Precision: 2 ppbv for a 10-second averaging time
Resolution: 1-second
Overall Uncertainty: ± (2 ppbv + 5 %) for a 30 ppbv ambient mixing ratio

Principle of Operation: The NCAR/NSF G-V vacuum UV resonance fluorescence instrument is a commercial version of the instrument published by Gerbig, et al.(Journal of Geophysical Research, Vol. 104, No. D1, 1699-1704, 1999). The source is a flowing RF discharge gas lamp emitting in the VUV. An optical filter provides a narrow band of source radiation centered at 151 nm with a 10 nm bandpass. CO fluorescence is detected using photon counting. The internal data system can accommodate sampling rates from 1-18 samples/second. The instrument was integrated into the HAIS ozone instrument rack and shared a pressure-controlled inlet.

Calibrations: In-flight calibrations are conducted using a working standard and a catalytically scrubbed zero trap for background subtraction. A series of NOAA ESRL/GMD primary standard compressed gases are used in lab measurements to quantify the concentration of the working standard cylinder. Two to three replicates of these standardizations are conducted prior to and after the intensive field phase of the experiment. Additional characterizations are performed as needed upon replacement or re-filling of the working standard cylinder.

Performance during START-08: The instrument acquired usable data during all research flights. Intercomparison with the Harvard University quantum cascade laser measurement of CO showed very good agreement during the entire experiment. Correlation plots of data from the two sensors provide some evidence that the NCAR measurement did not accurately measure mixing ratios below approximately 20-25 ppbv.

Data Set Details: The START-08 data files have been archived in comma-delimited flat ascii and NASA Ames formats. An identical copy of the final CO data set are also merged into the final release of the NCAR RAF netcdf data files. Calibrations, zero measurements, and known bad data have been removed from the final data files. These values have been replaced by -32767.