Instrument: Aero-Laser 5002 G-V Carbon Monoxide Instrument (RAF_CO)

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Instrument Precision:	2 ppbv for a 10-second averaging time
Resolution:	1-second
Overall Uncertainty:	± (2 ppbv + 5 %)

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.

Data Set Details: The CO mixing ratio in ppbv is displayed on the analyzer in real-time. Real-time in flight data are transmitted to the Aircraft Data System (ADS) and can be displayed at any station in the aircraft or on the ground using Aeros. Users can connect remotely with the analyzer's internal Windows-based PC and control it through a standard Remote Desktop connection or with similar remote login software. Post-processing of data is necessary but field data typically is delivered real-time to the RAF data system and is typically accurate to better than 20%. These data (containing signal background measurements and calibrations) are typically available within hours of the end of a flight as part of the RAF data release.

Installation: For SEAC4RS, the VUV CO analyzer will be integrated into one standard GV rack together with the Picarro CO2/CH4 instrument and the fast-ozone instrument, with the NO/NO2 analyzer integrated into a second rack. These racks need to be mounted immediately adjacent to one another because there are shared components (data system, pumps, gases). This configuration is currently flown on the GV for the DC3 mission. One calibration gas clinder (shared with Picarro CO2/CH4) is required on the aircraft. The instrument also requires N2 for purging and CO2 in Ar as lamp gas. These two small cylinders typically are part of the rack installation.