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Measuring CO, CH4, CO2 & H2O Simultaneously; Using New CM-CRDS Technology to Characterize Urban Plumes & the Well-Mixed Atmosphere

Gloria Jacobson, Chris Rella, and Eric Crosson
Picarro, Sunnyvale, California, United States (gjacobson@picarro.com)

Cavity Ring-Down spectroscopy is becoming a gold standard for atmospheric monitoring. High sensitivity and precision coupled with low drift characteristics ensure optimal operation even in remote field stations or on aircraft and ships. However, current platforms have been limited to two or three species simultaneous observation. Research and development at Picarro have been focused on incorporating the fast optical switching and other technologies required to enable four or more species without compromising the precision and drift that make these instruments valuable to atmospheric scientists.

In addition to carbon dioxide and methane, carbon monoxide is widely recognized as an important tracer gas for characterizing anthropogenic emissions. The ability to take inventory of these three critical gases and quantify their sources and sinks is essential for understanding atmospheric change. We have developed a field-deployable analyzer which can measure all three greenhouse gases plus water simultaneously in a single device, while maintaining high levels of precision. The novel 4-species analyzer is able to measure carbon dioxide (CO2) concentration to a precision (5 second, one sigma) of 150 parts-per-billion (ppbv), methane (CH4) concentration to a precision of 1 ppbv, and carbon monoxide (CO) to a precision of 30 ppbv.

Analyzer performance is guaranteed over a wide concentration range to allow precise atmospheric characterization in both well-mixed and urban environments. The ability to measure all four species simultaneously in a single instrument with automatic water correction simplifies data collection and enables precise measurements of the dynamic interplay of anthropogenic and biogenic emissions. The added ability to use the instrument for making measurements in the field, in labs, on manned & unmanned vehicles, including planes and ships, and in remote monitoring stations, greatly increases the quantity and quality of the data which can be obtained by a single researcher. Built-in networking capabilities coupled with guaranteed precision and drift specs enable the analyzer to easily integrate into any global network. Current application work using this instrument include: ground-based urban networks, remote atmospheric monitoring, mobile source identification, and flight-based atmospheric cross-sections.