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Development of a Fast, High-Precision Analyzer for N2O and CO Measurements in Field Applications

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Accurate and precise measurements of both nitrous oxide and carbon monoxide concentrations are important in understanding global atmospheric chemistry. Because atmospheric mixing ratios of these species are small (< 0.5 PPM), an analyzer designed to probe these species must have high sensitivity and high precision to make meaningful measurements. We report here the development of an analyzer based on our patented off-axis integrated cavity output spectroscopy (Off-Axis ICOS) which measures both CO and N2O concentrations with a 1-sigma precision of less than 0.3 ppb in 1 second. Without calibration the instrument is accurate to better than 1% over the temperature range of 15- 35C. Data rates of up to 10 Hz are achieved to allow for eddy flux correlation measurements. The instrument is low-power ($\sim$150 watts) and requires no liquid nitrogen, allowing for easy measurements in the field.