CAVITY ATTENUATED PHASE SHIFT-BASED MONITORING OF ATMOSPHERIC SPECIES

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We are developing compact instruments for the monitoring of ambient atmospheric species, specifically nitrogen dioxide and particles, using cavity attenuated phase shift spectroscopy. The sensor, which detects the optical absorption of nitrogen dioxide within a 20 nm bandpass band centered at 440 nm, comprises a blue light emitting diode, an enclosed metal measurement cell (26 cm in length) incorporating a resonant optical cavity of near-confocal design and a vacuum photodiode detector. An analog heterodyne detection scheme is used to measure the phase shift in the waveform of the modulated light transmitted through the cell induced by the presence of nitrogen dioxide and/or particles within the cell. The entire apparatus is encased within a standard 19-inch rack-mounted enclosure. Levels of detection (1 s, 3 σ) for nitrogen dioxide of 0.2 ppb and for aerosols of 3.5 Mm^{-1} have been achieved. Examples of high resolution field measurements and comparisons with other instrumentation will be presented.