DYNAMIC SPECTROSCOPIC MEASUREMENTS OF THE PRESSURE AND TEMPERATURE CYCLES IN A MOPITT PRESSURE MODULATED GAS CELL

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A high-resolution infrared difference-frequency laser spectrometer has been used to determine the temperature and pressure cycles inside an oscillating pressure modulated gas cell (PMC) of the design used aboard the Measurements Of Pollution In The Troposphere (MOPITT) satellite instrument. Line shapes for the R(0) and R(18) lines in the fundamental band of carbon monoxide were measured at 100 intervals along the PMC piston cycle, and the data were fit to theoretical models to obtain strengths and widths, which were used in turn to calculate temperatures and pressures. This spectroscopic measurement technique gives agreement with the PMC's on-board pressure transducer and allows for determination of temperature and pressure fluctuations with a time resolution of 200 microseconds. Furthermore, it is possible to study the spatial distribution of temperature and pressure in the cell by probing different areas of the cell with the infrared laser beam.