

## NEW LABORATORY MEASUREMENTS AND SPECTROSCOPIC LINE PARAMETERS OF INFRARED CARBON DIOXIDE BANDS

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Carbon dioxide (CO<sub>2</sub>) is a strong absorber of infrared radiation. Its continuing increase in the Earth's atmosphere is a strong driver of climate change. CO<sub>2</sub> has a range of absorption bands throughout the infrared that are measured in the Earth's atmosphere by satellite-borne atmospheric sounders. These bands are utilised in a range of applications, for example monitoring the concentration of CO<sub>2</sub> in the atmosphere, and determining atmospheric temperature profiles for numerical weather prediction.

The motivation for this work is to provide experimental non-Voigt line parameters in order to improve the representation of CO<sub>2</sub> in atmospheric radiative transfer codes. It is recognised that the Voigt profile is inadequate in accurately modelling spectra measured at high signal-to-noise ratio.

Measurements of pure and air-broadened CO<sub>2</sub> spectra at 296 K over a wide range of pressures were obtained using a Bruker IFS 125 HR spectrometer at the Physikalisch-Technische Bundesanstalt (PTB) in Braunschweig, Germany. The measurements of sample pressure, temperature, and pathlength are all SI-traceable. A multispectrum fitting analysis has been performed using the LabFit program to derive non-Voigt lineshape parameters for various bands of CO<sub>2</sub>. Line positions and intensities have been constrained using quantum mechanical expressions. Comparisons between the derived parameters and those from the HITRAN2020 molecular spectroscopic database are made.