

An intercomparison of measured pressure-broadening and pressure shifting parameters of carbon dioxide

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An intercomparison of measured pressure-broadening and pressure-shifting coefficients for carbon dioxide absorption lines was done. The work focuses on collision systems where significant numbers of data can be found (CO₂-N₂, CO₂-O₂, CO₂-air, and CO₂-CO₂) and yield information important to applications to Earth's atmosphere. A search of the literature for measured data for these parameters for the broadening molecules mentioned above revealed 82 papers from 1968 to 2012. Most of the work focused on measurements of the pressure-broadened half-width with 32, 12, 22, and 45 papers reporting data on N₂-, O₂-, air-, and self-broadening of CO₂. Fewer papers report measurements on the line shift and the temperature dependence of the half-width. From this work databases with the ro-vibrational transition as the key were created for each perturbing gas. Using these databases intercomparisons of the measurements of half-widths, their temperature dependence, and line shifts were made. The data allow the investigations of trends in the data with respect to the vibrational and the rotational quantum numbers, various line shape models, and isotopologue effects.

The data sets are evaluated with respect to the need of the spectroscopic and remote sensing communities. Based on these studies recommendations for new measurements are made.