REVISING THE LINESHAPE PARAMETERS FOR AIR- AND SELF- BROADENED CO_2 LINES AT A SUB-PERCENT LEVEL

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Characterizing and modelling the atmospheric CO_2 with a sub-percent accuracy necessitates high-quality spectroscopic lineshape parameters. For this goal, we collected the best experimentally and theoretically measured lineshape coefficients of CO_2 lines broadened by air and CO_2 to create sets of semi-empirical models for updating all the transitions of the HITRAN database [1]. Based on the available data, we estimated the air- and CO_2- broadening coefficients, their associated temperature exponents, and the speed dependence of the broadening together with its temperature dependence for every transition in HITRAN. Furthermore, the semi-empirical approach proposed by Hartmann 2009 [2] (trained by most reliable experimental data) is used to calculate the line shifts of air- and self- broadened CO_2 absorption lines. The updated data will be provided on www.hitran.org and will be used in the next edition of HITRAN. It is notable that thanks to the relational structure of the HITRAN database we provide separate consistent and complete sets of parameters in Voigt and speed-dependent Voigt parametrizations. Finally, the updated lineshape parameters are used for calculating the first-order line mixing using the program developed by Lamouroux et al. [3] which will also be provided in HITRAN 2020. For verifying the semi-empirically calculated lineshape parameters, the laboratory spectra measured by Dr. Keeyoon Sung at the Jet Propulsion Laboratory (JPL) is used to compare with the calculation of the absorption coefficient by HITRAN Application Programming Interface (HAPI) [4] which is now equipped with necessary functionality. [1] JQSRT, 203 (2017) 3-69. [2]JQSRT, 110 (18) (2009) 2019-2026. [3] JQSRT, 151 (2015) 88-96. [4] JQSRT, 177 (2016) 15-30.