12CO2 TRANSITIONS IN THE 2.0 MICRON REGION, WITH THEIR TEMPERATURE DEPENDENCE

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The 20013-00001 and 20012-00001 bands of $^{12}C^{16}O_2$ in the 2 μm region are used by many instruments on-board satellites and in ground-based networks to monitor the CO_2 column-averaged dry air mole fraction in the Earth's atmosphere. An accurate knowledge of the corresponding spectroscopic parameters and their temperature dependence is thus needed to map sources and sinks of carbon dioxide. In this work[1], we retrieve the line-shape parameters and their temperature dependence exponents/coefficients for the P(16) and P(28) transitions of the 20012-00001 band, and the R(24) and R(30) transitions of the 20013-00001 band. These parameters are obtained from a multi-spectrum fit procedure using a speed-dependent Nelkin-Ghatak profile including the line-mixing effect in its first-order approximation. High signal-to-noise spectra (quality factor between typically 3000 and 6000) are recorded at different conditions of pressure (from 50 to 750 Torr) and temperatures (from 245 to 330 K) for mixtures of CO_2 in air using a comb-assisted cavity ring down spectrometer with a temperature stabilized high finesse cavity. Air-broadening coefficients are measured with an estimated uncertainty better than 0.1% and absolute frequencies of the transitions are obtained with uncertainty better than 100 kHz. The determined line-shape parameters are consistent with previous values derived in the 1.6 μm region[2] confirming the absence of significant vibrational dependence (except for the air-pressure shift coefficient). The retrieved parameters agree well with literature values by Fourier transform spectroscopy and classical molecular dynamic simulations. The parameters of the speed-dependent Voigt profiles provided by the HITRAN2020 database[3] are mostly validated. The comparison to the CO_2 line parameters adopted for the OCO missions is discussed.

[1] doi:10.1016/j.jqsrt.2023.108485, D. Mondelain, A. Campargue, H. Fleurbaey, S. Kassi, S. Vasilchenko, *J. Quant. Spectrosc.Rad. Trans.*, **298**, 108485, (2023).

[2] doi : 10.1016/j.jqsrt.2022.108267, D. Mondelain, A. Campargue, H. Fleurbaey, S. Kassi, S. Vasilchenko, *J. Quant. Spectrosc.Rad. Trans.*, **288**, 108267, (2022).

[3] doi : /0.1016/j.jqsrt.2021.107949, I.E. Gordon, L.S. Rothman, R.J. Hargreaves, R. Hashemi, E.V. Karlovets, *et . al*, *J. Quant. Spectrosc.Rad. Trans.*, **277**, 107949, (2022).