MEASUREMENTS OF THE CO_2 15 μm BAND SYSTEM BROADENED BY AIR, N_2 AND CO_2 AT TERRESTRIAL ATMOSPHERIC TEMPERATURES

M. A. H. SMITH, *Science Directorate, NASA Langley Research Center, Hampton, VA 23681*; V. MALATHY DEVI, D. CHRIS BENNER, *Department of Physics, The College of William and Mary, Williamsburg, VA 23187*; T. A. BLAKE and R. L. SAMS, *William R. Wiley Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory, Richland, WA 99352*.

In earth remote sensing, retrievals of atmospheric temperature profiles are often based on observed radiances in infrared spectral regions where emission from atmospheric CO_2 predominates. To achieve improved retrieval accuracy, systematic errors in the forward model must be reduced, especially those associated with errors in the spectroscopic line calculation.

We have recorded more than 110 new high-resolution infrared spectra of the 15-μm band system of CO_2 to accurately determine line intensities, self-, air- and N_2-broadened widths and pressure-induced line shifts, along with their temperature dependences. The spectra were recorded with the Bruker IFS 120 HR Fourier transform spectrometer at Pacific Northwest National Laboratory (PNNL) and temperature-controlled sample cells. Sample temperatures were between 206K and 298K. Maximum total pressures were 15 Torr for self-broadening and 613 Torr for air- and N_2-broadening. Analysis is done using a multispectrum fitting technique[a] to retrieve the spectroscopic parameters. Line mixing and other non-Lorentz, non-Voigt line shapes are also assessed. The resulting line parameters are compared with the HITRAN database[b] and with other measurements.

[a] D. Chris Benner, C.P. Rinsland, V. Malathy Devi, M.A.H. Smith, and D. Atkins, J. Quant. Spectrosc. Radiat. Transfer **53**, 705-721 (1995)

[b] L.S. Rothman et al., J. Quant. Spectrosc. Radiat. Transfer **96**, 139-204 (2005); L.S. Rothman et al., J. Quant. Spectrosc. Radiat. Transfer, in press (2009)