SELF- AND CO_2-BROADENED LINE SHAPE PARAMETERS FOR THE ν_2 AND ν_3 BANDS OF HDO

V. MALATHY DEVI, D. CHRIS BENNER, *Department of Physics, College of William and Mary, Williamsburg, VA, USA*; KEEYOON SUNG, LINDA BROWN, *Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA*; ARLAN MANTZ, *Department of Physics, Astronomy and Geophysics, Connecticut College, New London, CT, USA*; MARY ANN H. SMITH, *Science Directorate, NASA Langley Research Center, Hampton, VA, USA*; ROBERT R. GAMACHE, *Department of Environmental, Earth, and Atmospheric Sciences, University of Massachusetts, Lowell, MA, USA*; GERONIMO L. VILLANUEVA, *Astrochemistry, NASA Goddard Space Flight Center, Greenbelt, MD, USA*.

Knowledge of CO_2-broadened HDO widths and their temperature dependence exponents are required to interpret atmospheric spectra of Mars and Venus. We therefore used nine high-resolution, high signal-to-noise spectra of HDO and HDO+CO_2 mixtures to obtain broadening coefficients for selected transitions of the ν_2 and ν_3 vibrational bands located at 7.13 and 2.70 μm, respectively. The gas samples were prepared by mixing equal amounts of high-purity distilled H_2O and a 99% enriched D_2O sample. Spectra at different temperatures (255-296 K) were obtained using a 20.38 cm long coolable cell[a] installed in the sample compartment of the Bruker 125HR Fourier transform spectrometer at the Jet Propulsion Laboratory, in Pasadena, CA. The retrieved parameters included accurate line positions, intensities, self- and CO_2-broadened half-width and pressure-shift coefficients and the temperature dependences of CO_2 broadened HDO. The spectroscopic parameters for many transitions were obtained simultaneously by multispectrum fitting[b] of all nine spectra in each band. A non-Voigt line shape with speed dependence was applied. Line mixing was also observed for several transition pairs. Preliminary results will be compared to other recent measurements reported in the literature.[c]

[a] K. Sung, A.W. Mantz, M.A.H. Smith, L.R. Brown, T.J. Crawford, V.M. Devi, D.C. Benner. J. Mol. Spectrosc. 162 (2010) 124-134.

[b] D.C. Benner, C.P. Rinsland, V. Malathy Devi, M.A.H. Smith, and D. Atkins. JQSRT 53 (1995) 705-721.

[c] Research described in this paper are performed at the College of William and Mary, Jet Propulsion Laboratory, California Institute of Technology, Connecticut College and NASA Langley Research Center under contracts and cooperative agreements with the National Aeronautics and Space Administration.