

LINE SHAPE PARAMETERS OF WATER VAPOR TRANSITIONS IN THE 3645-3975 cm^{-1} REGION

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A Bruker IFS 120HR Fourier transform spectrometer (FTS) at the Pacific Northwest National Laboratory (PNNL) in Richland, Washington was used to record a series of spectra in the regions of the ν_1 and ν_3 bands of H_2O . The samples included low pressures of pure H_2O as well as H_2O broadened by air at different pressures, temperatures and volume mixing ratios. We fit simultaneously 16 high-resolution (0.008 cm^{-1}), high S/N ratio absorption spectra recorded at 268, 296 and 353 K ($L=19.95 \text{ cm}$), employing a multispectrum fitting technique^a to retrieve accurate line positions, relative intensities, Lorentz air-broadened half-width and pressure-shift coefficients and their temperature dependences for more than 220 H_2O transitions. Self-broadened half-width and self-shift coefficients were measured for over 100 transitions. For select sets of transition pairs for the H_2O -air system we determined collisional line mixing coefficients via the off-diagonal relaxation matrix element formalism^b, and we also measured speed dependence parameters for 85 transitions. Modified Complex Robert Bonamy (MCRB) calculations of the half-widths, line shifts, and temperature dependences were made for self-, N_2 -, O_2 -, and air-broadening. The measurements and calculations are compared with each other and with similar parameters reported in the literature.

^aD. C. Benner, C. P. Rinsland, V. Malathy Devi, M. A. H. Smith, D. Atkins, *JQSRT* **53** (1995) 705-721.

^bA. Levy, N. Lacombe, C. Chackerian, Collisional line mixing, in *Spectroscopy of the Earth's Atmosphere and Interstellar Medium*, Academic Press, Inc., Boston (1992) 261-337.