PRECISION MEASUREMENTS OF WATER VAPOR SPECTROSCOPY BROADENED BY O_2 FOR ACCURATE DETERMINATION OF POTENTIAL ENERGY SURFACE

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We have investigated collisional broadening and pressure-induced frequency shift for H_2O transitions broadened by O_2. For this, we have obtained one pure and four O_2-mixture spectra of H_2O in the ν_2 region at room temperature using a high-resolution Fourier transform spectrometer (Bruker IFS-125HR) at the Jet Propulsion Laboratory. Using a high-precision spectrum fitting package, Labfit, which adopted non-linear least squares curve fitting algorithm based on a Voigt line shape profile, we have retrieved the two line shape parameters as well as the line positions by fitting all the five spectra simultaneously. It should be noted, however, that their line intensities have been held to the HITRAN values, which improved the precision of the widths and shifts retrieval to a sub% level for most of the transitions. Results from this work have been used to improve the intermolecular potential of the collisional pair, H_2O-O_2, as part of the theoretical model calculations for O_2-broadened H_2O transitions. We will present and discuss the retrieval methodology and the impact of the measurement results on the theoretical model calculations, which are expected to produce more accurate line shape parameters for the entire rovibrational transitions of H_2O in the infrared.[a]

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