LINE SHAPE CALCULATIONS FOR THE H_2O-O_2 COLLISION SYSTEM

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Modified Complex Robert-Bonamy (MCRB) calculations were made for the H_2O-O_2 collision system using an intermolecular potential comprised of dipole-quadrupole, quadrupole-quadrupole, atom-atom component expanded to 20^{th} order and rank 4, induction and London dispersion terms. The intermolecular potential was refined using the high-precision measurements of half-widths and line shifts made in this work. The final potential gives results that compare very well with the measurements; average percent difference of 0.052 and a standard deviation of 5.108 percent. With previous data sets the agreement was never better than $\sim$15 percent standard deviation. Calculations employing this intermolecular potential were then made for some fourteen thousand water vapor transition in the 5680-9090 cm^{-1} range and for the temperature range 200-3000 K for the H_2O-O_2 collision systems. These data were combined with H_2O-N_2 data to produce line shape data for H_2O-air. The temperature dependence of the half-widths and line shifts were determined with the Double Power Law model of Gamache and Vispoel[1]. The final line shape data were added to a HITRAN-like line list for use in modeling tellurics features toward extreme precision radial velocity measurements made by the Palomar Radial Velocity Instrument (PARVI), which is a near infrared fiber-fed diffraction limited high resolution spectrograph built for Doppler measurements of the host stars of extrasolar planets.

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