EVALUATION OF THE EXPERIMENTAL AND THEORETICAL INTENSITIES OF WATER-VAPOR LINES IN THE 2 μm REGION USING SOLAR-POINTING FTS SPECTRA

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The HITRAN spectroscopic database contains water-vapor absorption lines in a wide spectral range (0-25 000 cm^{-1}). The precision and accuracy of the transition intensities are diverse and strongly depend on the spectral region and dynamic range. Now, a significant volume of new experimental and theoretical studies must be evaluated region by region prior to inclusion in the next update of HITRAN. For this presentation, we examine the quality of water absorption parameters at 2 μm because they overlap spectral features of prominent CO_2 bands that are important to ongoing and future missions (such as GOSAT and OCO-2) designed to monitor the carbon cycle globally from orbit.

The accurate knowledge of water-vapor spectral parameters is important not only for accounting for water transitions in spectra, but also for evaluating how pressure broadening of the CO_2 lines by water affect atmospheric retrievals.

It was determined (using different air-mass retrievals from the solar-pointing Fourier transform spectrometer at Park Falls, WI) that the new $ab\ initio$ intensities calculated at the University College London[a] have proven to be an improvement over currently tabulated HITRAN intensities, which in the 800-8 000 cm^{-1}region are based on the semi-empirical values from the SISAM database[b]. In addition, it was found that these new $ab\ initio$ intensities provide better consistency between the bands in this region (namely $3\nu_2$, $\nu_2+\nu_3$ and $\nu_1+\nu_2$) with respect to previous theoretical attempts.

It was also determined that many SISAM experimental intensities are superior to the SISAM semi-empirical values that are now in HITRAN.

[a] Lodi L.,Tennyson J., Polyansky O. L., J Chem Phys, 135, 034113-10 (2011).

[b] http://mark4sun.jpl.nasa.gov/h2o.html.