

INVESTIGATION OF REFERENCE SPECTROSCOPIC PARAMETERS OF WATER VAPOR IN APPLICATION TO ATMOSPHERIC OBSERVATIONS IN THE 22 230 - 22 721 cm^{-1} REGION

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An analysis of theoretical and experimental H_2^{16}O line shape parameters and line intensities in the 22 230 - 22 721 cm^{-1} window is presented. This visible region is often used in the retrieval of water vapor in the terrestrial atmosphere as there is minimum interference from other molecules and it is therefore vital to have highly accurate water parameters available.

The HITRAN2016 database (Gordon *et al.* (2017)) is an important resource for performing such retrievals and for H_2^{16}O , the visible section of the database contains data from numerous sources, both theoretical and experimental. We compute two sets of cross sections, one using only theoretical sources, the other using data only from HITRAN2016. Both sets are compared to the cross-sections generated based on the atmospheric observation of this visible region by Harder *et al.* (1997). Neither set modeled the entire observed spectrum better than the other, however, each set did provide lower residuals than the other for particular regions.

Despite using only approximate broadening parameters in the first set of theoretical cross sections, an inter-comparison with HITRAN2016 allowed us to identify in-accurate broadening parameters from a common source. This region of HITRAN2016 combines both the theoretical intensities of Barber and Tennyson (2006), also known as BT2, with experimental measurements of Tolchenov *et al.* (2005). Inconsistencies between the theoretical line intensities were clearly apparent. Replacing both the incorrect line shape parameters and line intensities with values from alternative sources or estimated using different approaches has improved the overall residual on the HITRAN cross sections. This will be important for the future retrievals of atmospheric water vapor.