

PROGRESS ON THE FT-IR MEASUREMENTS OF WATER CONTINUUM IN THE FAR-INFRARED REGION AT 252 – 296 K

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Water is the strongest greenhouse gas in the Earth atmosphere, which plays a critical role in the energy balance of the earth atmosphere. It has long been observed particularly in the far-infrared that there is significant longwave continuum absorption due to water vapor (dimers or multimers), not attributable to the Lorentz line contribution within 25 cm^{-1} from the line center for individual water vapor lines. The MT_CKD model offers the water vapor continuum predictions, which are to be validated by a laboratory study in the far infrared. In order to directly measure this water vapor continuum absorption, we have obtained a series of spectra of water vapor broadened by Self, N_2 , and O_2 in the $50 - 500\text{ cm}^{-1}$ ($200 - 20\text{ }\mu\text{m}$) at temperatures between 251 and 296 K. For this, we used a coolable White cell system (whose optics are optimized for the far-infrared spectrometry) with passive temperature control, configured to the Fourier transform spectrometer, Bruker IFS-125HR at the Jet Propulsion Laboratory (JPL). We have been analyzing the spectra to make direct measurement of the far-infrared water continuum in two steps; (1) we obtained their transmission spectra by ratioing the sample spectrum to their corresponding background spectrum, (2) we obtained the continuum part of the transmission by dividing the measured spectrum by a synthetic spectrum of the resonant lines calculated using the HITRAN database. As shown in Figure 1, it has revealed the underlying water-water, water- O_2 , and water- N_2 continua in the temperature range, depending on the spectrum type. The preliminary results from this on-going analysis are presented along with their comparison with the MT_CKD (ver.3.5) model predictions. Temperature dependence of the water vapor continuum will be discussed as part of future work.^a

Far-infrared H₂O continuum at 296.2 K

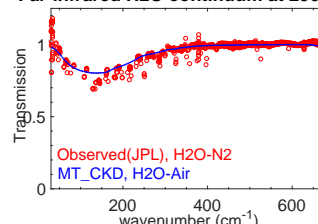


Figure 1. The H₂O continuum spectrum after removal of spectral line contribution using HITRAN. The sample pressure is 2 Torr for H₂O and 699 Torr for N₂ pressure at 296.2 K.

^aGovernment sponsorship acknowledged