EXPERIMENTAL AND THEORETICAL STUDY OF WATER-VAPOR CONTINUUM ABSORPTION IN THE THZ REGION FROM 0.3 TO 2.7 THZ.

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Experimental results and theoretical calculations of the continuum absorption by water vapor in the far-IR region from 10 to 90 cm^{-1} (0.3 to 2.7 THz) are presented for the temperature range from 293 to 333 K. The contributions to absorbance resulting from both structureless H_2O-H_2O and H_2O-N_2 continua have been measured over a wide pressure range with a spectral resolution of 0.04 to 0.12 cm^{-1}. The presentation will include the analysis of the experimental broadband THz technique (Fourier transform spectroscopy) and enhanced absorption in a temperature-controlled multipass cell[a]. The resonant water vapor spectrum was modeled using the HITRAN04 data base and VVW lineshape. After subtracting local contributions from the raw absorbance data, the H_2O-H_2O (self) and H_2O-N_2 (foreign) continua were derived both by fitting the entire frequency region based on an assumed quadratic frequency dependence and by fitting to each of the THz windows individually. From experiment, the absorption coefficients of 3.83 and 0.185 (dB/km)/(kPa THz)^2 and temperature exponents of 8.8 and 5.7 were found for the self- and foreign-gas continuum, respectively. Experimental absorption coefficients and temperature exponents of the foreign-continuum obtained from individual THz widows were compared to theoretical calculations based on the modified Lanczos method[b].

[a]V. B. Podobedov, D. F. Plusquellic and G. T. Fraser, JQSR Transfer 91, 287 (2005).
[b]Q. Ma and R. H. Tipping. J. Chem. Phys. 117, 10581 (2002).