THE WATER-VAPOR CONTINUUM AND SELECTIVE ABSORPTION IN THE 8 μm TO 12 μm AND 4 μm TO 5 μm WINDOWS AT TEMPERATURES FROM 311 K TO 363 K

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The water-vapor continuum and selective absorption in the atmospheric windows strongly affect the radiative balance of the Earth. We have previously reported preliminary experimental results on the water-vapor continuum absorption[a] between 8 μm and 12.5 μm. About 200 spectra were recorded at 0.1 cm^{-1} resolution for six temperatures between 311 K and 363 K. The spectra were acquired at pathlengths from 76 m to 116 m using a 2 m long White cell coupled to a BOMEM DA8.002 FTIR spectrometer. Water-vapor pressures varied from 2.8 kPa (21 torr) to 15.1 kPa (113 torr). A special spectral processing program calculates, fits, and removes ro-vibrational structure from the spectrum. Regions freed from spectral structure were used to retrieve averaged and smoothed binary absorption coefficients between 8 μm to 12.5 μm and 4.5 μm to 5.2 μm. Our continuum data extrapolated to room temperature are in reasonable agreement with the CKD continuum model[b]. However, at high temperatures the CKD model provides values up to 50% less than experimentally measured. While processing the spectra we have found that the intensities of several ro-vibrational lines in the HITRAN database need to be corrected. Also, at the relatively high vapor pressures mentioned above a self-induced pressure shift of several lines has been detected.

[a] Yu. I. Baranov, W. J. Lafferty and G. T. Fraser. 61^{st} International Symposium on Molecular Spectroscopy, Columbus (2006)
[b] S. A. Clough, F. X. Kneizys, and R. W. Davies, Atmos. Res. **23**, 229, (1989)