

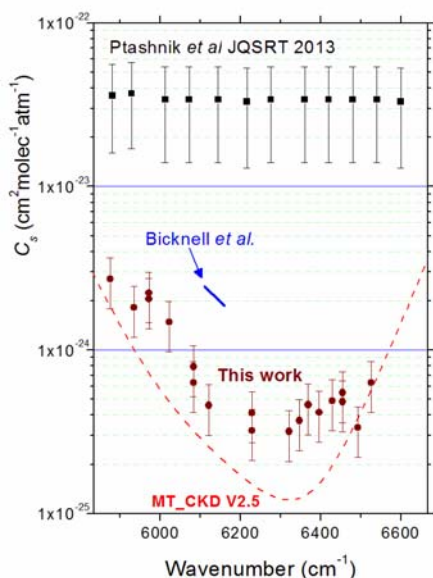
The water vapor self-continuum by CRDS at room temperature in the 1.6 μm transparency window

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The water vapour self-continuum has been investigated by high sensitivity Cavity Ring Down Spectroscopy at room temperature in the 1.6 μm window. The real time pressure dependence of the continuum was investigated during pressure cycles up to 12 Torr for fifteen selected wavenumber values. The continuum absorption coefficient measured between 5875 and 6450 cm^{-1} shows a minimum value around 6300 cm^{-1} and ranges between 1×10^{-9} and $8 \times 10^{-9} \text{ cm}^{-1}$ for 8 Torr of water vapour. The continuum level is observed to deviate significantly from the expected quadratic dependence versus the pressure. This deviation is interpreted as due to a significant contribution of water adsorbed on the super mirrors to the cavity loss rate. The pressure dependence is well reproduced by a second order polynomial. We interpret the linear and quadratic terms as the adsorbed water and vapour water contribution, respectively.

The derived self-continuum cross sections, $C_s(T=296 \text{ K})$, ranging between 3×10^{-25} and $3 \times 10^{-24} \text{ cm}^2 \text{ molec}^{-1} \text{ atm}^{-1}$ are found in reasonable agreement with the last version of the MT_CKD 2.5 model [1] but in disagreement with recent FTS measurements [2]. The FTS cross section values are between one and two orders of magnitude higher than our values and mostly frequency independent over the investigated spectral region. The achieved baseline stability of the CRDS spectra (better than $1 \times 10^{-10} \text{ cm}^{-1}$) level totally rules out water continuum absorption at the FTS level ($1.2 \times 10^{-7} \text{ cm}^{-1}$ at 9 Torr) in the CRDS cell. In order to find the origin of such conflicting results, the differences and possible experimental biases in the two measurement methods are discussed.



Spectral dependence of the self-continuum cross-section, C_s , at room temperature derived from the MT_CKD V2.5 model (red dashed line) and measured by Ptashnik et al. [2] (black squares), Bicknell et al. (blue solid line) and in this work (brown circles). Note the logarithmic scale adopted for the ordinate axis.

[1] E. J. Mlawer, V. H. Payne, J. L. Moncet, J. S. Delamere, M. J. Alvarado, D. C. Tobin, *Philosophical Transaction of the Royal Society A* **2012**, 370, 2520.

[2] I.V. Ptashnik, T. M. Petrova, Y. N. Ponomarev, K. P. Shine, A. A. Solodov, A. M. Solodov, *Journal of Quantitative Spectroscopy and Radiative Transfer* **2013**, 120, 23.