The absorption spectrum of water near 750 nm by CW-CRDS: contribution to the search of water dimer absorption.

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Abstract

The absorption spectrum of natural water vapour around 750 nm has been recorded with a typical sensitivity of 3×10^{-10} cm^{-1} using a CW-Cavity Ring Down Spectroscopy set up based on a Ti: Sapphire laser. The 13312.4-13377.8 cm^{-1} spectral interval was chosen as it corresponds to the region where water dimer absorption was recently measured (*K. Pfeisticker et al, Science 300 (2003) 2078-2080*).

The line parameters (wavenumber and intensity) of a total of 286 lines of water vapor were derived by a one by one fit of the lines to a Voigt profile. For the main water isotopologue, 276 lines were measured with line intensities as weak as 5×10^{-29} cm/molecule *ie* 50 times smaller than the weakest $H_2{}^{16}O$ line intensities included in the 2004 edition of the HITRAN database. On the basis of the predictions of Schwenke and Partridge, all but 16 lines could be assigned to different isotopologues of water ($H_2{}^{16}O$, $H_2{}^{18}O$, and $HD^{16}O$) present in natural abundance in the sample. A total of 272 energy levels of $H_2{}^{16}O$ were determined and rovibrationally assigned to 18 upper vibrational states. Half of them are newly determined.

The importance of the additional absorbance resulting of the observation of many new weak lines is discussed in relation to the detection of water dimer absorption and compared to the absorbance predicted by Schwenke and Partridge. The quality of the line parameters of water monomer is showed to be of crucial importance to evidence the absorbance of the water dimer in the considered region.

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