

Atmos. Meas. Tech. Discuss., author comment AC1
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Reply on RC1

Qing-Ying Yang et al.

Author comment on "Cavity ring-down spectroscopy of water vapor in the deep-blue region" by Qing-Ying Yang et al., Atmos. Meas. Tech. Discuss.,
<https://doi.org/10.5194/amt-2022-139-AC1>, 2022

Response to reviewers:

We would like to thank both reviewers for their careful reading of the manuscript and their positive feedback and constructive criticism. It certainly helped us to improve the manuscript. We addressed the reviewers' comments in detail.

Reviewer#1□

The manuscript "Cavity ring-down spectroscopy of water vapor in the near-UV region" is well written and structured and addresses the important question of water vapour absorption in the near-UV region from about 33000-24000 cm⁻¹ or 300-420nm. These absorption are typically not used to obtain water vapour concentrations in the atmosphere or in experiments, but may overlay other absorbers and thus introduce systematic biases in measurements of various trace gases as mentioned in the manuscript. Water vapour is not the only absorber where work needs to be done for further advances in remote sensing applications, but often one of the strongest interferences in the near UV region. For other gases important progress was reported e.g. in Finkenzeller and Volkamer 2022 in the same spectral range.

RE:

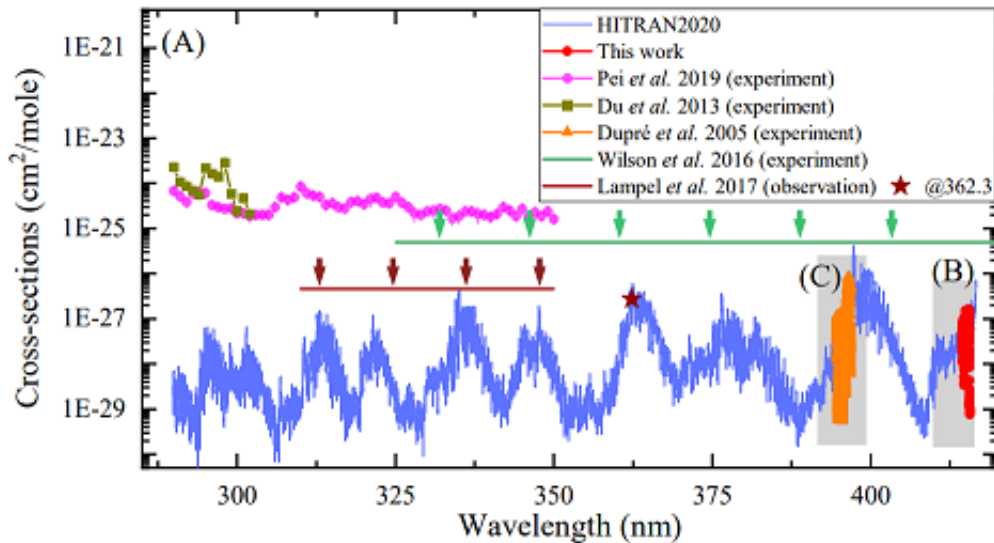
Thanks for the positive comments. The detailed responses to the reviewer's comments are provided in the following part, which is presented in regular font whereas our responses are given in blue, and when the text from the paper is quoted in blue italics.

Only a few comments follow:

- Figure 5: The line colour might be chosen differently to distinguish the upper limits by Wilson et al and Lampel et al better. Lampel et al 2017 reported the upper limit only up to 350nm, this is wrong in the plot. The same publication also estimated the actual absorption cross-section around 363nm at a lower spectral resolution, which might also

be included in the plot. The reported discrepancy there between observations and POKAZATEL was explained later in Conway et al 2020.

RE:



Thanks for pointing out the mistake in Figure 5. The color of those two upper limits by Wilson et al. and Lampel et al. have been changed to different colors now as shown in revised Figure 5. And we fixed the reported limits by Lampel et al. 2017 in the region of 310-350nm at a 0.7 nm resolution. The absorption cross-section around 362.3nm was also added to the plot at a 0.5 nm resolution.

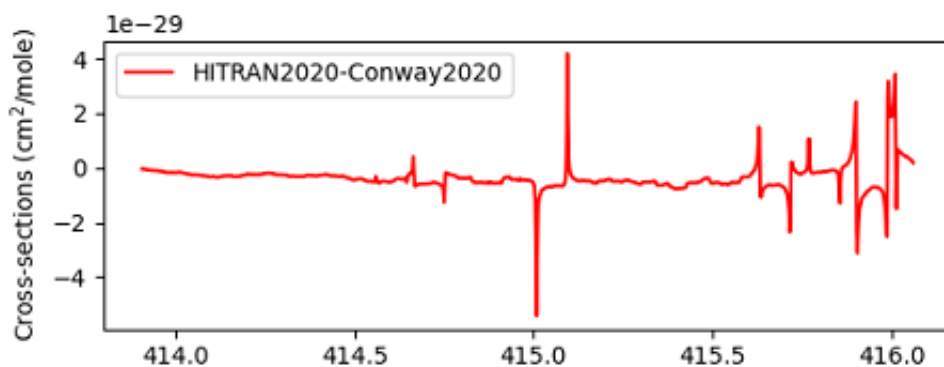
- Lampel et al 2015 estimated scaling factors for older HITRAN versions also for the spectral range around 400 and 415nm, but this might be difficult to include in the figure, and no dominating scaling factor for individual water vapour absorption lines listed in Table 1 between modelled and measured intensities can be seen.

RE:

We agree with the reviewer not to include Lampel et al. 2015 in our plot, since the scaling factor was estimated from older HITRAN. And we already presented the direct comparison of the line-by-line spectral simulations of the most two recent HITRAN versions to our experimental results. Besides, the line parameters of both positions and intensities were listed in Table 1.

- Maybe also Conway et al 2020 or a recent line list could be included in the plot, as HITRAN based absorption cross sections were underestimating the actual absorptions especially in the UV due to a relatively large line-cutoff value.

RE:



As mentioned in our paper, the linelist for HITRAN2020 actually came from Conway et al.2020 (with some empirical corrections) with the intensity cutoff at 1E-30. And the intensity cutoff for Conway et al.2020 is 1E-32. So we have compared the simulated cross-sections in the range from 414-416nm at a resolution of 5cm⁻¹(~0.05nm). The maximum difference is below 4E-29 cm²/mole which is much smaller than the precision of our experiment, so we decide not to include Conway et al.2020 in our plot.

- Henning Finkenzeller, Rainer Volkamer, O₂-O₂ CIA in the gas phase: Cross-section of weak bands, and continuum absorption between 297–500 nm, *Journal of Quantitative Spectroscopy and Radiative Transfer*, Volume 279, 2022, 108063, ISSN 0022-4073, <https://doi.org/10.1016/j.jqsrt>.

RE:

Thanks for the comment. The reference is included in the revised manuscript.