CONTINUING INVESTIGATIONS OF ORTHO-PARA-DEPENDENT PRESSURE BROADENING IN THE $\nu_1 + \nu_3$ BAND OF ACETYLENE

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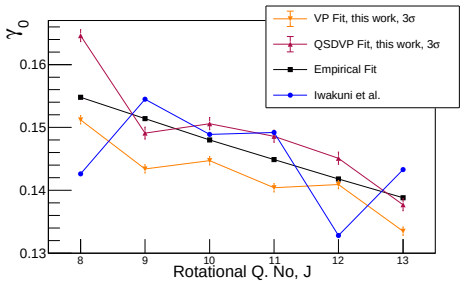

In 2016, Iwakuni et al.[1] measured the $\nu_1 + \nu_3$ vibrational combination band of acetylene using a dual-frequency comb based spectrometer. They reported an alternation in the self-pressure broadening coefficients of even and odd rotational levels, which correspond to the para- and ortho- nuclear spin states. This can occur if relaxation involving resonant energy transfer between molecules with common nuclear spin symmetry is important, because ortho-ortho collisions are statistically more probable than para-para ones. Subsequently several authors[2] [3] have disputed these findings, however there have been no experimental results to investigate the issues. At last year's ISMS meeting[4], we presented some preliminary findings. The work has been considerably extended and refined using a frequency-comb stabilized laser, and no experimental evidence was found for this alternation in the R(8)−R(13) lines of the band, which reportedly showed the largest effects. Careful accounting of weak background absorptions due to hot-band and lower abundance isotopomer lines was included. The apparent alternation observed by Iwakuni et al. was due to the use of a Voigt profile function in fits to transmission representation data with very large peak absorption. Further low temperature measurements are planned to try to limit influence of the hot-band lines. **Acknowledgement:** This material is based upon work supported by the U.S. Department of Energy, Office of Science, Division of Chemical Sciences, Geosciences and Biosciences within the Office of Basic Energy Sciences, under Award Number DE-SC0018950.

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