Atmos. Chem. Phys. Discuss., 8, S3435–S3437, 2008
www.atmos-chem-phys-discuss.net/8/S3435/2008/


Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Methane spectroscopy in the near infrared and its implication on atmospheric retrievals" *by* C. Frankenberg et al.

**Anonymous Referee #1**

Received and published: 6 June 2008

General Comments:

This paper presents laboratory measurements of N2-broadened half widths and pressure shifts for the Q- and R-branches of the 2nu3 methane band. The parameters reported here have not been available previously. Current linelists approximate the half widths and pressure shifts for the Q- and R-branches of the 2nu3 band using measurements from other methane bands. The measurements reported in this manuscript are useful for constraining both satellite and ground-based retrievals from the methane 2nu3 band.

Major Comments:

- One major weakness is that the manuscript does not report the N2-broadened half



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widths or pressure shifts for the 2nu3 P-branch. The authors do not mention why they have chosen to ignore the P-branch, although they cite previous atmospheric retrievals that used the 2nu3 P-branch. Since the authors already have the necessary high-quality spectra, I would suggest that they include the complete 2nu3 band in their analysis.

Minor Comments:

- Define acronyms when they are first introduced (FTIR, SCIAMACHY, etc).

- Units should be consistently presented as wavenumbers, nanometers, or micrometers. It becomes confusing to keep track of the different methane bands when they are referred to in several different wavelength units.

- Line 91. How was the pressure measured and calibrated?

- Line 155. The authors determine the absolute methane concentration by fitting the R0 and R1 lines using published linestrengths from Margolis [1988]. Is the stated accuracy of 1% a random or systematic error? How well known are the R0 and R1 linestrengths?

- Line 161 - 163. Is there a theoretical explanation for different |m| dependence?

- Line 208. "The exponent of the temperature dependence of broadening as been reset to 0.85 for all lines." This is an important detail. How well known is the temperature dependence? Do the authors have spectra at different temperatures that would allow them to make an improved estimate of this parameter?

- Lines 278 - 291. This paragraph contains some vague statements, such as: "Hardly any seasonal variation in methane can be seen any more." "[...] observed an additional biasing factor for SCIAMACHY retrievals that is taken into account in this study." The paragraph is missing a meaningful discussion of the remaining sources of retrieval error for the 2nu3 methane linelist.

- This paper would benefit from a more specific title. Similar work for the methane nu3



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band [Pine, 1997] was named "N2 and Ar broadening and line mixing in the P and R branches of the nu(3) band of CH4."

Technical Corrections:

- Figure 2. Difficult to see the colors in the lower panel.

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 10021, 2008.



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Interactive Comment