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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical Note: A new mechanism of 15 µm emission in the mesosphere-lower thermosphere (MLT)" *by* R. D. Sharma

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Reply to Anonymous Referee #3 1. The referee is correct. The results from photo-acoustic studies and fluorescence study pointed out by the referee make the near-resonant VR process involving thermal N2 unlikely. The manuscript has been revised to reflect that. 2. While the N2 molecule undergoes $\Delta J = +8$ rotational transition the CO2 molecule undergoes $\Delta J = \pm 3, \pm 2, \pm 1, 0$ rotational transitions. Accounting for the rotational transitions of CO2 will certainly change the energy mismatch (the amount of energy transferred from vibrational and rotational degrees of freedom to translation) and hence the energy transfer rate coefficient. However, since the CO2 rotational

transitions may both increase and decrease the energy mismatch and because CO2 has a much smaller rotational constant ($\approx$ 0.39 cm-1) than N2 ($\approx$ 1.99 cm-1), the contributions of the CO2 rotational transitions to the energy mismatch in the rough estimate given were neglected. A thorough calculation takes all rotational transitions into account [Sharma and Brau, 1969].

Sharma, R. D., and C. A. Brau, "Energy Transfer in Near-Resonant Molecular Collisions due to Long-Range Forces with Application to Transfer of Vibrational Energy from v3 Mode of CO2 to N2", J. Chem. Phys. 50, 924-930, (1969).

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 25083, 2014.