Temperature Dependent Collisional Energy Transfer of N_2 (a, $v = 0$ and 1): The Upper State of LBH-Emission

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Lyman-Birge-Hopfield (LBH) emission of molecular nitrogen has been a rich source of information on the planetary atmosphere of nitrogen-abundant planets and moons. An accurate modeling of the altitude-dependent LBH emission in airglow and aurorae of the Earth would be an important step prior to reaching the same degree of accuracy in understanding the atmospheres of other planets and satellites in our solar system, like Titan and Triton [1].

Observations of Budzien et al [2] showing that the LBH emission intensity is a factor of 1.6 more in the Earth's airglow than predicted by previous models have been well reproduced by the recent model of Eastes [3], which incorporated collisionally-induced electronic transitions (CIET) among the three nested singlet electronic states a, a' and w. However, Eastes needed to estimate several rate constants due to the lack of laboratory experimental data.

Experimentally derived rate constants are crucial to improving the accuracy of the models. With this aim we have conducted two-color pump-probe resonance-enhanced multiphoton ionization (REMPI) experiments on the $N_2(a)$ state. The rate constants extracted from our experiments agree with the estimates of Eastes for N_2 and O_2 colliders, but show significant deviations from these estimates for collisions with atomic oxygen. Additional results for N_2 and O_2 colliders will be presented for the temperature range 150 to 300 K.

References:

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