LABORATORY MEASUREMENT OF THE CO CAMERON BANDS AND VISIBLE EMISSIONS FOLLOWING VUV PHOTODISSOCIATION OF CO_2

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The CO($a^3\Pi - X^1\Sigma^+$) Cameron bands are one of the most important emission features in the UV dayglow of the CO_2 planets, as demonstrated in the case of Mars by the measurements performed by Mariner and Mars Express missions. One of the mechanisms to produce electronically excited CO($a^3\Pi$) is photodissociation of CO_2 at wavelengths shorter than 108 nm. At wavelengths below 100 nm, new CO_2 photodissociation channels open leading to formation of higher energy triplet states of CO. These states cascade into the lower triplet state by emission in the visible spectral region before radiating in the Cameron system.

This two step relaxation pathway was demonstrated by Lee and Judge[a] for the 90-93 nm photodissociation of CO_2. We have further investigated this process using the 85-110 nm tunable synchrotron radiation at the Advanced Light Source facility at Lawrence Berkeley Laboratory. The experimental results confirmed that once a triplet state excitation threshold is exceeded, a fraction of the Cameron band emission is accompanied by visible emission.

These results indicate that the emission corresponding to the CO(a'-a, d-a, e-a) triplet bands must be part of the visible Mars / Venus dayglow. The same is true for CO_2 photoexcitation in cometary atmospheres.

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[a] D. L. Judge and L. C. Lee, J. Chem. Phys., **58**, 104 (1973)