Model of Cameron Band Emission in Comet P/Hartley 2

Susarla Raghuram and Anil Bhardwaj

Space Physics Laboratory, Vikram Sarabhai Space Center, Thiruvananthapuram.

Email: raghuramsusarla@gmail.com

bhardwaj_spl@yahoo.com

Cameron band (1800 – 2600 Å) has been used on comets to trace the distribution of CO_2 in cometary coma, because Cameron is a forbidden transition ($X^1\Sigma$-$a^3\pi$), which cannot be excited by resonance fluorescence. The important production mechanisms of CO ($a^3\pi$) are photodissociative excitation of CO_2, electron impact dissociative excitation of CO_2, electron impact excitation of CO, and dissociative recombination of CO2+ ion. We have developed a model to study the production of Cameron band mission in comet P/Hartley 2, which has been observed by Hubble Space Telescope. The chemistry model incorporates the various production and loss mechanisms of CO ($a^3\pi$). The production rate profiles are used to calculate the brightness profiles along the line sight. Our model calculations show that for relative composition of 4% CO_2 and 0.5% CO with respect to water, the electron impact of CO (relative contribution, 25%) and CO_2 (45%) are dominant processes in producing Cameron band emission, while the contribution due to photodissociation is CO_2 is only about 25%. Thus, about three fourth of Cameron band emission is produced by electron impact and hence the derivation of the abundance of CO_2 on comets based on the assumption that photodissociation is the main source needs to be reconsidered.