

ELECTRON IMPACT EXCITATION IN COMETARY COMAS

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Abstract. The role of electron impact excitation in comets is investigated, particularly with regard to recent laboratory measurements of electron impact cross sections.

1. INTRODUCTION AND REVIEW

Molecules, such as water, carbon monoxide and carbon dioxide, vaporise from comet nuclei and are then dissociated or ionised by sunlight. Photoionisation produces photoelectrons which, along with electrons in the solar wind, can produce excitation of atoms and molecules and subsequent emissions. These excitations are considered to be negligible compared to other processes for all but a few transitions (Feldman, 2006). However, with many recent measurements of both cometary spectra and of electron impact excitation cross sections, it is timely to review the role of electron impact excitation in cometary emissions. The particular electron impact excitations which are considered to be important in producing emissions in comets are outlined and evidence for them in observations is reviewed.

2. ANALYSIS

We use recent measurements of electron impact integral cross sections for H₂O (Brunger *et al.* 2008), CO (Kato *et al.* 2007) and CO₂ (Campbell *et al.* 2008), plus literature values for O atom excitation. A statistical equilibrium calculation is performed to find the balance between excitation and various radiative decay paths and so predict emissions. The results are compared with measurements, with particular emphasis on cases where more than one transition of interest is available in a measured spectrum.

References

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