Abstract Submitted
for the GEC11 Meeting of
The American Physical Society

Calculations of electron impact excitation in planetary atmospheres MICHAEL BRUNGER, LAURENCE CAMPBELL, SUDHAGHAR JAYA, ARC Centre for Antimatter-Matter Studies, Flinders University, Australia — High-energy electrons from the Sun enter planetary atmospheres and interact with atoms and molecules to produce ions and lower-energy electrons. Photoionization by sunlight produces photoelectrons, which can similarly produce further ionization and lower-energy electrons. In both cases the lower-energy electrons produce excitation of atoms and molecules, leading to radiative emissions (aurora, dayglow and nightglow) which are measured and analyzed as a means of remote sensing of planetary atmospheres. The analysis often requires comparisons with computational models, in which the electron spectrum is multiplied by the electron impact excitation cross sections to predict excitation rates. A statistical-equilibrium calculation is then applied to determine the fraction of excitations that produce radiation (rather than the energy being lost in collisions). This radiation rate, multiplied by the density of the atoms or molecules, gives a prediction of the emitted radiation. We are making such computations, with particular emphasis on applying recently measured or improved electron impact cross sections. Several examples will be presented, including calculations of electron impact excitation of carbon monoxide in the atmospheres of Mars and Venus.

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Date submitted: 02 May 2011 Electronic form version 1.4