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Title: VELOCITY DISTRIBUTIONS OF HYDROGEN-ATOMS AND HYDROXYL RADICALS PRODUCED THROUGH SOLAR PHOTODISSOCIATION OF WATER

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Abstract: The calculated velocity distributions of hydrogen atoms and hydroxyl radicals produced through solar photodissociation of gaseous water molecules are presented. Under collisionless conditions, the calculation has been carried out using (1) the most recently available absolute partial cross sections for the production of H and OH through photodissociation of H<sub>2</sub>O from its absorption onset at 1860 angstrom down to 500 angstrom, (2) the newly available vibrational and rotational energy distributions of both the excited and ground state OH photofragments, (3) the calculated cross sections for the total dissociation processes, and (4) the integrated solar flux in 10 angstrom increments from 500 to 1860 angstrom in the continuum regions and the specific wavelength and flux at the bright solar fines, e.g., the H Lyalpha, Lybeta, Lygamma, O VI, C III, He I. Because of the lack of data in several dissociation processes or in certain spectral regions, we can only obtain upper and lower bound velocity distributions. In terms of quantum yields, the lower bound case is set by assuming that all the undetected neutral products are something other than H and OH fragments and an upper bound is set by assuming the undetected neutral products are all H and OH fragments. In terms of internal energy distributions of the OH fragments the upper bound is set by neglecting them and a lower bound is set by taking the available or the best estimated values. The calculated results show that the H atoms and the OH radicals produced exhibit multiple velocity groups. Since most of the current cometary modeling uses a single velocity of 20 km/s associated with the photodissociation of H<sub>2</sub>O, the present results may be useful in interpreting the many peaks observed in the velocity distributions of the H Lyalpha and Halpha of comets.

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