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Physico-Chemical Processes in the Coma of Comet 19P/Borrelly

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Water chemistry is central in understanding the physics and chemistry of cometary comae. Prior to the Deep Space 1 encounter with comet 19P/Borrelly, a rather advanced knowledge of water chemistry had been attained from studies of previous comets via ground-based observations and in situ spacecraft measurements, especially the Giotto encounter with comet 1P/Halley [1]. Photochemistry and the effects of photoelectrons that react via electron impact reactions, ion-molecule reactions, and the interaction with solar wind plasma are important processes that affect the overall ionization. However, initial results from the PEPE instrument onboard Deep Space 1 (DS1) concerning the water-group ions (and others) around closest approach [2] significantly differ from those expected from model results [3], challenging our preconceived notions. We have attempted to reconcile these differences in ion composition between the in situ measurements and model results with an extensive modeling investigation, unique from previous studies. We expect that this work will be relevant to past, on-going, and future spacecraft missions to comets.

Keywords: Photochemistry; Comets – Atmospheric Chemistry and Composition; Comets – Plasma and Ionosphere; Comets – Solar Wind Interaction.

References

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