The Electronic Rydberg and Valence Structures of Molecular Oxygen

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The spectra and electronic structures of molecular oxygen play dominant roles in many terrestrial and astrophysical processes. This includes the absorption of solar radiation, the observed emission spectrum of the airglow and aurora, as well as processes involving reactions and recombination of atomic oxygen. The details of these processes are governed, in turn, by the details of the molecular potentials of the electronic states involved in these phenomena. As part of a comprehensive review of the electronic structure of molecular oxygen currently nearing completion, data on all known valence and Rydberg states is being compiled and corrected. This presentation emphasizes both a summary of our current understanding of the valence electronic states as well as the complex electronic potentials which arise from the interaction between the Rydberg-Rydberg and Rydberg-valence states. We will present a discussion of the application of these electronic structures to typical problems of atmospheric interest.

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