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Aurora on the Earth and on Solar System Bodies

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Auroral emissions and their morphology contain information on atmospheric composition, plasma interactions, magnetic field configuration, and magnetosphereionosphere coupling processes. Defining an aurora as any optical manifestation of the interaction of extra-atmospheric energetic electrons, ions, and neutrals with an atmosphere, we will review the large inventory of auroral emissions observed throughout the solar system. The physical and chemical processes that result in optical emissions in aurora, from IR to X-ray, are as varied as the observing tools – from ground based photometers to interferometers to space based spectral imagers. While these interactions are governed by the same underlying physics, the spatial, temporal and magnitude scales, and energetics vary enormously because the energy source and magnetic field geometry are often unique to the object. Thanks to such rich and diverse auroral processes the comparative approach can be fruitfully applied to develop a comprehensive understanding of one of the complex interactions in the solar system. In this paper we will first present a summary of observations of aurora in the solar system. We will then offer a strategy for the future in the field based on systematic and long-term spectroscopic observations. Finally, we will present a review of ultraviolet instrumentation for future auroral exploration.

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