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Auroral emissions in the solar system magnetospheres

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Planetary FUV aurora is the most spectacular signature of the electrodynamic coupling between the solar wind, the planet's magnetic field, and its atmosphere. Auroral emissions result a series of processes involving plasma energization and inelastic collisions of auroral particles with the upper atmospheres. We will describe recent results collected the Hubble Space Telescope, ground-based observations and in situ plasma measurements on Jupiter's and Saturn's aurora. Comparisons with terrestrial counterparts indicate auroras on the three planets are significantly different. High-resolution images of the Jovian main oval and the Io footprint and trailing tail suggest that they are relatively independent of solar wind conditions. Instead, diffuse emissions inside the main oval are more responsive to solar wind changes. These different auroras appear to be linked to different regions of the Jovian magnetosphere and imply various acceleration processes. Global images of Saturn's south pole FUV auroral emission were obtained in January 2004, concurrent with in situ measurements of the solar wind parameters made on board Cassini. The global morphlogy was seen to partly co-rotate with the planet, similar to the Jovian aurora. Noon intensifications located on or poleward of the main oval were observed, mostly during a minor compression period. Occasionally, the oval displays a spiral structure, or reduces to a bright, concentrated spot. These variations apparently occur as a response to varying solar wind dynamic pressure or IMF. These characteristics can be compared with predictions of recent models describing the global current system coupling the magnetosphere and the ionosphere. In particular, the latitude of the oval, departure from co-rotation and the longitudinal brightness distribution can be used to test the paradigm that the main auroral oval maps to a region of enhanced field-aligned current and to improve current models.