

Aurora: Comparative Analysis at Earth, Jupiter, and Saturn

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Auroral emissions are a unique and valuable remote-sensing probe of our solar system. For planets which have a strong, internal magnetic field and a dense atmosphere, aurora is used not only as an indicator of atmospheric composition, dynamics, and energetics, but also as a remote-sensing of magnetospheric plasma source and a tracer of magnetospheric regions and processes. Its analysis yields the identification of plasma and momentum sources (solar wind, planet via its rotation, and orbital sources close to the planet's equatorial plane) controlling the magnetospheric plasma flow and composition, and ultimately the aurora. We will focus on three magnetized planets, Earth, Jupiter, and Saturn, which have a dense atmosphere and share a common, geometrical configuration of the magnetosphere in first order. These similarities set an ideal frame for a fruitful comparison of momentum and plasma sources of their magnetospheres. Similar techniques have been applied for the analysis of the aurora at these three planets. We will review those used in ultraviolet and X-rays and discuss similarities and differences in auroral signatures and sources. We will illustrate our findings through the example of a solar eruption event reaching these three planets consecutively. Finally, we will briefly discuss future directions in terms of measurement requirements.