AURORA AT EARTH, JUPITER AND SATURN: A COMPARATIVE VIEW

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The interaction of the solar wind with the magnetospheres of the giant planets is different from that with the terrestrial magnetosphere in several respects bearing consequences on the morphology and dynamics of the aurora:
- the magnetospheres of the outer planets are dominated by the planetary rotation that can provide much of the energy for the processes acting within these magnetospheres.
- the circulation of plasma may be driven by mass loading of the giant magnetospheres by moons and rings rather than by reconnection with the IMF.
- the magnitude and orientation of the interplanetary magnetic field plays a key role in controlling the Earth's auroral dynamics whereas the solar wind dynamic pressure appears as a key factor in triggering auroral intensification on Saturn.
- The combination of imaging and spectral techniques indicates the characteristic energy of the auroral electrons is comparable on Earth and Saturn, but higher energies are associated with the Jovian aurora.

As a consequence, Jupiter's aurora appears relatively shielded from solar wind influences, except inside the auroral oval where transient bright emission has been observed following sudden compressions of the magnetosphere. The size and brightness of the main oval shows only a week dependence on solar wind conditions. By contrast, Saturn's aurora is quite responsive to solar wind perturbations, as was observed during campaigns of concurrent observations between HST and Cassini. Auroral intensification events that are reminiscent of shock-induced Earth aurora appear to be triggered by sudden increases of the solar dynamic pressure more than by changes in the IMF orientation. However, simultaneous HST-Cassini observations indicate that localised auroral brightenings and ENA acceleration events may be observed under quiet solar wind conditions. The occurrence of substorms is a key characteristics of the Earth's auroral dynamics. Localized auroral enhancements have also been observed on Jupiter and Saturn. They have been associated to reconnection events causing events similar to substorms.

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