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Rotational modulation and local time dependence of Saturn's infrared H_3^+ auroral intensity

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Abstract

Planetary auroral emissions reveal the configuration of magnetospheric field-aligned current systems. In this study, Cassini Visual and Infrared Mapping Spectrometer (VIMS) observations of Saturn's pre-equinox infrared H_3^+ aurorae were analysed to show (a) rotational modulation of the auroral intensity in both hemispheres and (b) a significant local time dependence of the emitted intensity. The emission intensity is modulated by the 'planetary period' rotation of auroral current systems in each hemisphere. The northern auroral intensity also displays a lesser anti-phase dependence on the southern rotating current system, indicating that part of the southern current system closes in the northern hemisphere. The southern hemisphere aurorae were most intense in the post-dawn sector, in agreement with past measurements of auroral field-aligned currents, UV aurora and SKR emitted power. A corresponding investigation of the northern hemisphere auroral intensity reveals a broader dawn–noon enhancement, possibly due to the interaction of the southern rotating current system with that of the north. The auroral intensity was reduced around dusk and post-midnight in both hemispheres. These observations can be explained by the interaction of a rotating field-aligned current system in each hemisphere with one fixed in local time, which is related to the solar wind interaction with magnetospheric field lines.

References

[1] Badman, S. V., et al. (2012), Rotational modulation and local time dependence of Saturn's infrared H_3^+ auroral intensity, J. Geophys. Res., submitted.