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A new season of Saturn auroral observations by Cassini/VIMS

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Abstract

Cassini Visual and Infrared Mapping Spectrometer (VIMS) observations of Saturn's infrared H_3^+ auroral emissions have revealed insights into solar wind-magnetosphere-ionosphere-thermosphere coupling at Saturn. These observations include:

- Large-scale polar morphology unique to the H_3^+ emissions [1] - e.g. Fig. 1
- Inter-hemispheric differences in emission intensity [2] - e.g. Fig. 2
- Multiple arcs at different latitudes, without consistent UV H and H_2 emission counterparts [3]
- Significant local time asymmetry [4]
- Intensity modulation by rotating field-aligned current systems [4]

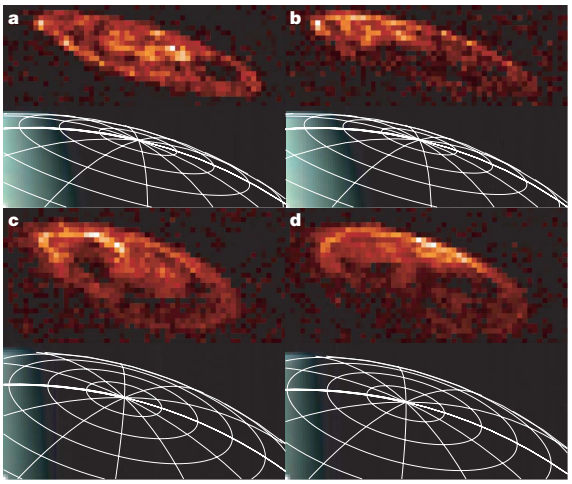

Figure 1: Example images of Saturn's northern H_3^+ aurora observed by Cassini VIMS in 2007. From [1].

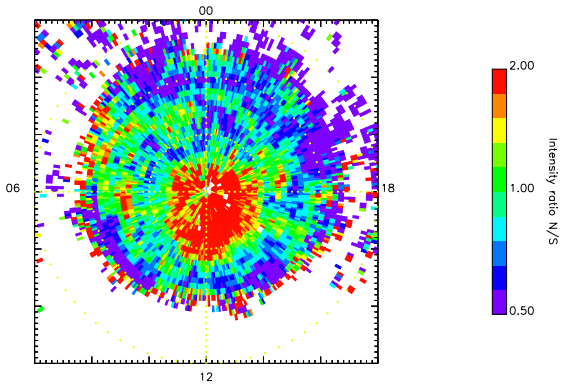

Figure 2: Ratio of average, pre-equinoctial northern and southern auroral H_3^+ intensities as a function of latitude and local time. Modified from [2].

These analyses were performed using data acquired in Cassini's early sequences of inclined orbits (during 2006–2009), while Saturn experienced southern summer.

The intensity of the H_3^+ aurora is strongly dependent on the thermospheric temperature, while the strength of auroral field-aligned current systems depends on the ionospheric conductivity. These parameters can therefore be influenced by solar illumination, i.e. by changing season.

Over summer 2012, Cassini will again increase the inclination of its orbit, affording a new view of the aurora under post-equinox conditions. We will present some highlights of the post-equinox observations acquired so far, with preliminary analysis in comparison to the trends described above.

References

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