

Saturn's polar auroral emissions

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Abstract

We present images of Saturn's polar auroral region, based on data from the UV imaging spectrograph (UVIS) instrument onboard Cassini. The UVIS dataset reveals several transient features in the auroral region poleward of the main ring of emission. These features consist of bright flashing spots, transient arcs and small-sized spots. We study the properties of these features, such as location, size, power, duration and duty cycle in order to define their origin. We compare them with similar features observed at Earth's and Jupiter's aurora and we discuss possible triggering mechanisms, such as dayside and tail reconnection.

1. Introduction

The main ring of auroral emission at Saturn is suggested to be associated with the open-closed-field line boundary [1]. Only a few studies so far have addressed the aurora located poleward of the main ring of emission. Some of the polar features are: flashing spots at noon, which are suggested to be associated with pulsed reconnection at low latitude dayside magnetopause [2] and transient spots, which might be related to particle injections [5]. Our current knowledge regarding the aurora poleward of the main ring of emission is based on the Hubble Space Telescope (HST) dataset, where these emissions appear quite faint. The present study is based on UVIS dataset, which allows us to identify transient emissions of small size and study their properties such as location, size, power and duration.

2. Observations

We present several transient auroral features located poleward of the main ring of emissions at Saturn. Figure 1 shows some examples of these emissions. They are classified as polar dusk arcs (a), flashing spots at noon (b) and transient small-sized spots at dusk (c) and dawn (d and e). These features appear

regularly on several dates and last between 40 min to 1.5 hour. We will present an extensive analysis of their observed properties among others: size, power and duration. Similar features have been observed in the aurora at Earth and Jupiter, such as the cusp emission at Earth [3] and the polar dawn spots at Jupiter [4]. Taking the terrestrial and jovian paradigm we suggest possible association with reconnection at dayside magnetopause or injected plasma released during tail reconnection.

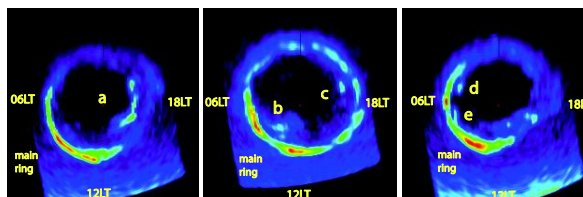


Figure 1: Polar projections of UVIS images of Saturn's northern hemisphere. The images are taken in 2008 on DOY 195, 238 and 195, respectively. Several transient features poleward of the main ring of emissions are marked and labeled with a, b, c, d and e.

3. Summary and Conclusions

Saturn's auroral emissions within the ring of main emission consist of several transient features at all local times such as polar dusk arcs, flashing spots at noon and transient small-sized spots at dusk and dawn. In this study we analyse their properties, we compare them with similar features observed at Earth and Jupiter and we discuss their origin.

Acknowledgements

Authors are supported by the Belgian Fund for Scientific Research (F.R.S. - FNRS) and by the PRODEX Program managed by the European Space Agency in collaboration with the Belgian Federal Science Policy Office.

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