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Simultaneous multi-spectral observations of Saturn's aurorae, energy budget and magnetospheric dynamics

L. Lamy and Cassini-RPWS/UVIS/VIMS/INCA teams
Laboratoire d'Etudes et d'Instrumentation en Astrophysique, Observatoire de Paris, Meudon, France (laurent.lamy@obspm.fr)

Abstract

Similarly to other magnetized planets, accelerated electrons entering Saturn's auroral regions generate powerful emissions. They divide into Ultraviolet (UV) and Infrared (IR) aurorae, originating from collisions with the upper atmosphere, and Saturn's Kilometric Radiation (SKR), radiated by an electron cyclotron resonance above the atmosphere up a few Saturn's radii (Rs). Previous studies have identified a large scale conjugacy between radio and UV, as well as IR and UV auroral emissions. Here, we investigate two days of observations of Saturn's aurorae at radio, UV and IR wavelengths, by the Cassini RPWS, UVIS and VIMS instruments, and their relationship with a reservoir of equatorial energetic particles mapped by energetic neutral atoms (ENA), as measured by MIMI-INCA (see Figure **??**). This interval of time reveals a series of regular SKR modulations at the southern SKR phase, and interestingly includes an unusual (while also regular) enhancement of the auroral activity observed simultaneously at all wavelengths. This event is likely to illustrate a (regular) nightside injection of energetic particles, possibly induced by a plasmoid ejection, then co-rotating with the planet at the southern SKR period, while feeding an extended longitudinal sector of intense auroral emissions. We analyze quantitatively complementary informations brought by these different datasets in terms of energy budget transferred to the southern auroral region, as well as magnetospheric dynamics, in order to address the nature and the scheme of the Saturn's southern rotational modulation.

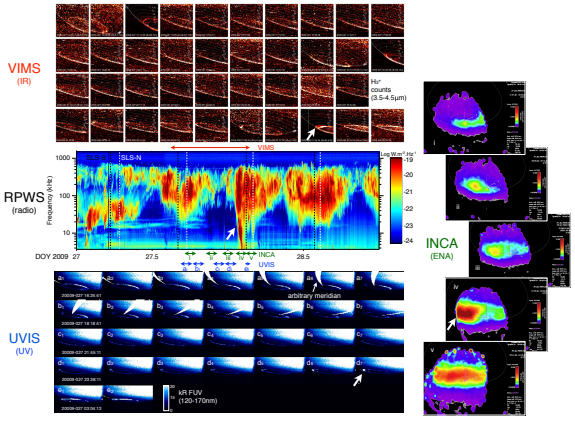

Figure 1: Cassini multi-instrument multi-wavelength observations of Saturn's aurorae.