TITAN'S UPPER ATMOSPHERE RESPONSE TO SATURN'S MAGNETOSPHERIC ENVIRONMENT.

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Introduction: Titan airglow occurs in the upper atmosphere at about 1100 km of altitude. Although solar XUV radiation is known to be the main source of ionization, magnetospheric particle precipitation can also account for about 10% of the ionization process [1,4,5]. Throughout the Cassini mission, Titan has been observed several times in the magnetosheath and around Noon Saturn Local Time (SLT), where the magnetospheric particle precipitation is expected to be the most intense. When in this particular configuration, Titan's upper atmosphere is expected to react to the fluctuating magnetospheric environment of Saturn, especially when closer to the magnetopause.

We report here Titan ionospheric responses to magnetospheric changing conditions, occurring while the spacecraft, and thus Titan, are known to have crossed Saturn's magnetopause and have been exposed to the magnetosheath environnment.

Observations: Using Cassini-UVIS observations of Titan around 12PM SLT as our primary set of data, we present evidence of Titan's upper atmosphere response to a fluctuating magnetospheric environment. In addition, data from the T32 flyby [2] and from the April 17, 2005 [3] from in-situ Cassini instruments are used.

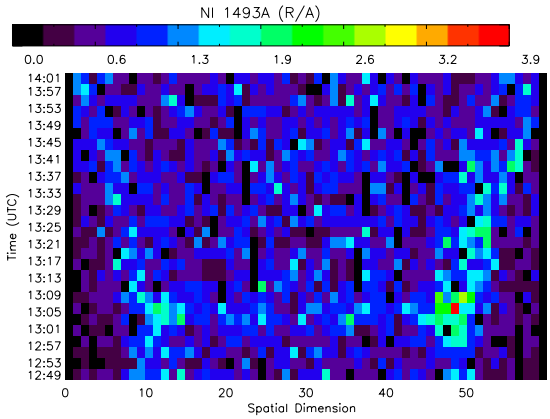

Figure 1: UVIS T32 detector image at 1493Å, a nitrogen atomic line. The figure displays an airglow of intensity ~2R/A occuring at both Titan limbs at about 1100 km of altitude. At about 13:05UTC an enhanced airglow is observed, peaking at slightly lower altitudes. This is an indication of the presence of energetic particles.

Method: 2D UVIS detector images displaying the spatial dimension of the UVIS slit on the x-axis and the time on the y-axis, have been created for each UVIS observation of Titan (Fig. 1). Pattern recognition software has been used to retrieve observations of interest, looking for airglow enhancement of a factor of 2. The emphasis has been put on observations happening while Titan is at its closest to the magnetopause.

Correlations with data from simultaneous observations of in-situ Cassini instruments (CAPS, RPWS and MIMI) has been possible on few occasions and events such as electron burst and reconnections can be associated with unusual behaviors of the Titan airglow.

Results: CAPS in-situ measurements acquired during the T32 flyby are consistent with an electron burst observed at the spacecraft as the cause of the UV emission.

Moreover, on April 17, 2005 the UVIS observation displays a polar airglow at Titan (an aurora?), linked to a very fluctuating magnetospheric environment. CAPS data taken this same day indicates that the spacecraft crossed the magnetopause and provide evidence for possible reconnection events [3].

References:

[1] West R. A. et al. (2012) *GRL, 39,* L18204.
[2] Bertucci C. et al. (2008) *Science., 321,* 1475-1478.
[3] McAndrews H. J. et al. (2008) *JGR,* 113, A04210.
[4] Ågren K. et al. (2009) *Planet Space Sci.*, 57, 1821
[5] Edberg N. et al. (2013) *Geophys. Res. Lett.*, 40, 2879-2883