

Structure and dynamics of the Kronian ionosphere using Cassini LP/RPWS data during the proximal orbits.

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Abstract

Using the latest *in-situ* measurements of the the Radio & Plasma Wave Science (RPWS) instrument package (including a Langmuir probe), we analyse the electron density data for several close Cassini flybys and evidence differences and similarities between them. This on-going work suggests the presence of structures in Saturn's ionosphere giving some insights regarding possible interaction between the rings and the planet's environment.

1. Introduction

After 20 years in space, Cassini spacecraft begins its "Grand Finale", the last chapter of daring exploration. Following several close flybys of Saturn's moon Titan, Cassini has leapt over the planet's icy rings and began a series of 22 spectacular dives between the planet and its rings (even crossing the innermost visible D-ring). Eventually it will performs its last orbits in the upper atmosphere and the ionosphere of Saturn (Figure 1) providing us with unprecedented data.

Notably, the RPWS Langmuir probe will investigate the Kronian ionosphere and study how the rings are connected to the lattitu-

dinal structure of Saturn, in particular close to the equatorial plane. In fact, a planet-to-ring magnetic connection has been previously suggested to be characterized by an influx of water from the rings [Wilson, G. R. & Waite, JGR, 1994]. Moreover, the upcoming *in-situ* measurements of the local magnetic field, plasma and dust conditions allow us to have a better understanding of the ring-ionosphere coupling.

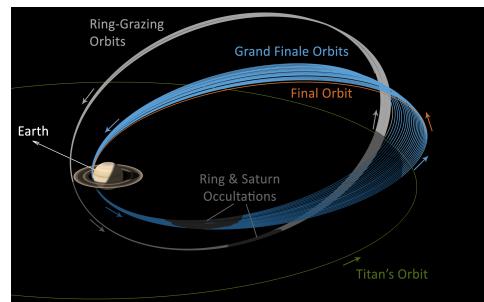


Figure 1: Illustration of Cassini's trajectory during the final two phases of its mission. ©NASA/JPL-Caltech.

2. Preliminary observations

We use the electron density data from the RPWS Langmuir probe measurements to analyse the close flybys of Saturn. In Figure 2

we compare the density profile of the first encounter on 26/04/2017 (a) and the second one on 02/05/2017 (b). One can see that for both case studies, the density measurements (Figure 2) present an asymmetry around the equatorial plane ($Z=0$) (inserted panels in Figure 2). A higher density profile southward the planet ($Z < 0$) can be noted as well for both flybys. However, two clear dips can be observed in the first encounter (green dashed lines, Figure 2-a) but do not form in the second one (Figure 2-b).

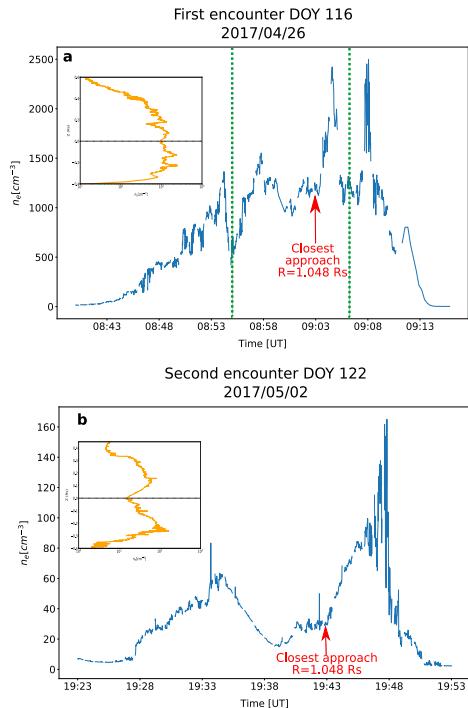


Figure 2: Electron density profiles measured by the Langmuir probe on the first encounter (a) and the second encounter (b).

Detailed analysis is still being performed and will be done on the rest of the proximity flybys in order to explain the differences in

the electron density profiles, its connexion to the geometry of the rings and the ionosphere of Saturn. Moreover, we will compare those results to the profile of the ion number density (from the Langmuir probe sweep mode) to characterize the plasma population in the Kronian ionosphere.