



EPSC Abstracts

Vol. 14, EPSC2020-791, 2020

<https://doi.org/10.5194/epsc2020-791>

Europlanet Science Congress 2020

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Density spikes in Titan's upper ionosphere

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Titan, the largest moon of Saturn, has a dense and nitrogen-rich atmosphere, which is similar to that of early Earth before life evolved. Solar EUV radiation and energetic particles ionize the atmosphere and thereby form a layer of plasma, the ionosphere, in the uppermost part of the atmosphere. The Cassini spacecraft flew past the moon Titan 127 times during its 14-year mission in the Saturn system. During most of these close flybys Cassini entered the ionosphere and some reached the ionospheric peak, located at some 1400 km above the moon surface. With the Langmuir probe instrument, we could study the plasma properties, e.g. ion and electron density, temperature etc., and a very dynamic ionospheric structure was found. In particular, significant and apparently sporadic density spikes in the upper ionosphere were found. These density peaks are manifested as a sudden increase in the measured density by some $10\text{-}100\text{ cm}^{-3}$ over a time period of roughly minutes. These have so far been left unattended in our studies of Titan. We will present some statistics on their appearance and initial results on the mechanism forming them.