



Evidence for a seasonal shift in Titan's deep ionosphere: extreme densities during the T83-T88 flybys

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Measurements by the Cassini Radio and Plasma Wave Science/Langmuir probe (RPWS/LP) indicate that the electron density in Titan's deep ionosphere (950-1100 km) has increased by about 20-30% during the last 2 years. Furthermore, the peak ionospheric density is found at lower altitudes, though the flyby geometry often affords only the inference of an upper-limit. Since the T71 flyby in July 2010 there were no deep flybys of Titan until the T83 flyby in May 2012. During this, and all subsequent flybys to date (T83-88, spanning May to November 2012), we observed that the ionospheric peak density was higher than average during all flybys, in a range of solar zenith angles from 30 to 80 degrees. It has recently been discovered that the neutral atmosphere of Titan has finally undergone a seasonal shift following the equinox in late 2009 and the northern hemisphere, where our measurements of high densities were also conducted, moved into summer and some neutral gases were found to increase by a factor of 100 in density [Teanby et al., 2012, Nature]. Our observations might be the ionospheric response to this seasonal shift in the atmosphere. The increase may also be a response to the rising solar cycle with increasing EUV flux. Whether or not the high densities will remain or go back to 'normal' values again remains to be seen over the next coming years. During the T85 flyby we also note that Titan was located in the magnetosheath of Saturn, for at least 2h45 min before the actual flyby. This long-term exposure to magnetosheath plasma might be the reason why the peak ionospheric electron density during T85 rise to the maximum recorded observation of 4300 cm^{-3} .