Geophysical Research Abstracts Vol. 17, EGU2015-7189-1, 2015 EGU General Assembly 2015 © Author(s) 2015. CC Attribution 3.0 License.



On Ion Drifts and Neutral Winds in Titan's Thermosphere

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Saturn's largest moon Titan hosts an atmosphere with complex organic chemistry initiated in the ionosphere. The nightside chemistry may be influenced by the ion transport from the dayside ionosphere. In turn, ion transport (ion drifts) may be affected by the neutral winds, which cannot be measured directly by Cassini. In this study we derive the ion drifts along the spacecraft trajectories based on analysis of in-situ measurements of electron and ion fluxes, positive and negative ion masses and the magnetic field. Data from Titan flybys TA to T100 was included (Oct 2005 - Apr 2014), of which 55 flybys were below 1400 km and 48 below 1200 km altitude. From the electron and ion flux measurements three regions were observed: 1) above 1600 km, ions are ExB-drifting (frozen into the fields), 2) 1100-1600 km altitudes, dynamo-region, ions drift in opposite directions (perpendicular to B) and 3) 880-1100 km altitude (upper limit depends on convection electric field strength), ions are following neutrals and ion drifts translate to neutral winds of 0.5-2.5 km/s with weaker winds on the dayside of Titan's ionosphere.