Geophysical Research Abstracts, Vol. 9, 10105, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10105

Ion composition at Titan's magnetosphere-ionosphere transition region

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Using Cassini Plasma Spectrometer (CAPS) Ion Mass Spectrometer (IMS) ion composition data, we describe the compositional variation in the transition region between Saturn's flowing magnetosphere and Titan's upper ionosphere. Scavenging of Titan's upper ionosphere can occur in this region, where it is carried away by the flowing magnetosphere, adding cold plasma to Saturn's magnetosphere. Plumes may be formed from the scavenged plasma, as originally proposed [1] during the Voyager 1 epoch. The source of the cold plasma may have a unique compositional signature such as the methane group ions. Water group ions observed in Saturn's outer magnetosphere [2] are relatively hot and probably come from the inner magnetosphere, where they are born from fast neutrals escaping Enceladus [3] and picked up in the outer magnetosphere as hot plasma [4]. This scenario will be complicated by pickup methane ions within Titan's mass loading region, as originally predicted [5] using Voyager 1 data, and observationally confirmed [2, 6] using CAPS IMS data. However, CH_4^+ ions or their fragments can only be produced as pickup ions from Titan's exosphere, which is extended beyond the transition region considered here, while CH_5^+ ions can be scavenged from Titan's ionosphere. These and similar possibilities will be discussed.

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