



Search for Methane Group Ions within Saturn's Outer Magnetosphere

E C Sittler Jr, R E Hartle, J F Cooper, R E Johnson, H T Smith, M Shappirio, D G Simpson, J H Waite Jr, and K Szego

NASA/Goddard Space Flight Center, Heliophysics Science Division, Greenbelt, United States (edward.c.sittler@nasa.gov, 301 286 1433)

In Hartle et al. [2006a,b] they presented evidence of CH_4^+ pickup ions within the mass loading region of the magnetospheric interaction with Titan. They also reported that keV water group ions W^+ (i.e., O^+) were present and dominated the magnetospheric heavy ion composition. The presence of methane group ions in outer magnetosphere, were also mentioned. These water group ions probably result from the emission of fast neutrals from the Enceladus torus via charge exchange reactions but still gravitationally bound to Saturn [see Johnson et al., 2005 and Sittler et al. 2006] and then become ionized in the outer magnetosphere where the pickup energies are few keV. Methane ions would come from Titan. Since O^+ and CH_4^+ have similar mass the primary discriminator is the O^- fragment which appears at a different time-of-flight (TOF) than that for mass 16. Other discriminators have since been identified. If there is a methane torus as a consequence of the hydrodynamic model of Strobel [2008], then one expects the methane group ions to have comparable abundances relative to water group ions. Furthermore, CH_3^+ and not CH_4^+ should be the dominant methane group ion, since the methane dissociates to CH_3 before they get ionized. Here we will be reporting on our continuing search for evidence of methane group ions within Saturn's outer magnetosphere.

References:

1. Hartle, R. E., et al., Geophys. Res. Lett., 33, L08201, 2006a
2. Hartle, R. E., et al., Planet. Space Sci., 54, 1211, 2006b
3. Johnson, R.E., et. Astrophys. J. Letts, 644, L137-L139, 2005
4. Sittler, E. C., Jr., et al., JGR, 111, A09223, 2006
5. Strobel, D. F., Icarus, 193, 588, [2008]