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Energetic oxygen precipitation into Titan's atmosphere

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The CAPS (Cassini Plasma Spectrometer) instrument aboard Cassini measured a $\sim$0.5 to 2 keV O^+ loss rate to Titan's atmosphere of approximately 9×10^{23} s^{-1} (Hartle *et al.*, GRL, 33, L08201, 2006). These ions are a large source of oxygen and may affect the chemistry of Titan's atmosphere. We calculate stopping cross sections for O^+ in an N_2 atmosphere. These cross sections are used to determine that the oxygen is deposited at an altitude of approximately 1000 km Titan's atmosphere. We predict their final charge and energy state, which is particularly important because the O(^{3}P) and O(^{1}D) states participate in different chemical reactions. Chemical models show that the observed O^+ fluxes are more than sufficient to explain the CO abundance on Titan.