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Oxgen ion flux variation associated with a substorm on May 6, 1988

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The flux of O+ ions is known to increase in the inner mangetosphere during geomagnetically active periods, but the mechanism for the flux change is not well unerstood. To gain insight into the mechanism we examine the variation of the O+ flux observed with the Charge-Energy-Mass Spectrometer (CHEM) on the AMPTE/CCE spacecraft in association with a substorm on May 6, 1988. The substorm onset occurred at ˜0607 UT during the main phase of a geomagnetic storm that reached the Dst minimum of -160 nT. CCE detected a clear dipolarization (delta-B ˜ 140 nT over delta-T ˜ 60 s) at L ˜ 4.0, magnetic latitude ˜ 6 degrees, and magnetic local time ˜ 20 hr. After the dipolarization, the power spectral density of broadband magnetic field variation in the Pc1 band was ˜1.5 orders of magnitude higher than the pre-onset level. In addition, there was a brief period of narrowband pulsation at a frequency about one half of the local proton cyclotron frequency. Across the dipolarization the O+ flux increased by 0.5-1.0 orders of magnitude at energies below 100 keV. No flux enhancement was observed for O+ at energies above 100 keV and there was no obvious flux change for H+ over the entire energy band, 1-300 keV, covered by the CHEM instrument. We add observations by the nearby satellites GOES-6, GOES-7, and DE-1 to discuss possible mechanism(s) for the O+ enhancement.

Keywords: substorm, oxygen ions, inner magnetosphere