

# Molecular Ion **Up-flows** and Hot Oxygen Atoms in Magnetosphere-Ionosphere-Thermosphere Coupling

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The CASSIOPE Enhanced Polar Outflow Probe (e-POP) has been in operation since its launch into a polar orbit in September 2013. In the present study, we use the high-resolution in-situ data from e-POP to investigate a specific magnetosphere-ionosphere-thermosphere (MIC) coupling process: the acceleration and up-flows of molecular ions in the auroral ionosphere and the subsequent production of hot neutral oxygen atoms. Specifically, we present observations of enhanced molecular  $\text{NO}^+$  and possibly  $\text{O}_2^+$  ion densities in the F-region and topside ionosphere (up to  $\sim 1000$  km altitude), and density and temperature estimates of the hot oxygen atoms resulting from the dissociative recombination of the observed ions: we obtain these estimates by solving the Boltzmann equation for the collisional relaxation between the non-thermal nascent and ambient oxygen atoms, and compare them with previous observations and theoretical model predictions

Keywords: magnetosphere, ionosphere, thermosphere, molecular ions, oxygen