CASPER

Baylor University and CASPER present:

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Escape of Neutral Gas and Plasma from the Earth's Upper Atmosphere

At high latitudes, the Earth's upper atmosphere is subjected to electric fields, precipitating particles, currents, and both plasma (O+, H+) and neutral (O, H) outflows. As the plasma drifts horizontally through the different high-latitude regions in response to the electric fields, the ionosphere-atmosphere system and particle outflows become spatially structured and highly time-dependent. There are stationary and propagating plasma jets, large-scale H+ blowouts, counter-streaming O+ and H+ vertical flows, bite-outs in the outflow with altitude, plasma outflow pulsations, and during storms O+ can be the dominant ion to altitudes as high as several Earth radii in the polar region. The ion outflows interact in a complex way with acceleration mechanisms that operate at high altitudes over the polar region, including mechanisms associated with escaping photoelectrons, hot precipitating electrons and ions, electromagnetic and electrostatic wave turbulence, centrifugal acceleration, and anomalous resistivity associated with field-aligned currents. These acceleration mechanisms can result in non-Maxwellian velocity distributions, including ion beams, conics, double-humped, bi-Maxwellian, toroidal and others. Some of the escaping ions can charge exchange with the background neutrals (thermal and hot exospheric neutrals), which leads to an outflow of neutral particles. An overview of the relevant escape processes will be presented.

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