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Ionospheric ion acceleration and transport

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The acceleration and transport of high-latitude ionospheric ion outflows, both bulk ion flows and suprathermal ion outflows, play a fundamental role in magnetosphere-ionosphere coupling. Bulk ion flows consist mainly of the polar wind and auroral bulk up-flows (with flow energies up to a few eV) in the topside polar ionosphere, which are the primary sources of low-energy H+ and O+ ions, respectively, for various ion acceleration processes at higher altitudes. These include perpendicular and parallel acceleration in the mid ($\sim$1000-5000 km) or high-altitude auroral zone, which produce suprathermal ($\sim$10 eV to $\sim$10 keV) ion outflows such as transversely accelerated ions, ion conics and ion beams; and centrifugal acceleration in regions of curved or changing magnetic field at high altitudes (above $\sim$3-4 RE). A significant fraction of ion outflows remains cold in the magnetosphere, where their transport is strongly influenced by the interplanetary magnetic field (IMF) and the prevailing convection electric field. This results in a preferential feeding of the dusk plasma sheet under duskward IMF, and a stronger transport to the plasma sheet compared to the magnetotail at times of strong convection.