



## On the source and fate of cold ion outflow from the polar ionosphere

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The Earth's atmosphere constantly loses matter to the surrounding space through different outflow processes. One of the most pronounced loss processes, amounting to several thousand tonnes per year, takes place in the form of ion outflow from the polar ionospheres. The importance of ion outflow as a supplier of plasma to the terrestrial magnetosphere has been recognized for decades, and there are suggestions that the ionosphere alone is a sufficient source to account for the observed magnetospheric plasma population. Due to spacecraft charging effects, it has been difficult to measure the very low energy part of the plasma population. Recent advances in instrumentation and methodology, combined with more comprehensive measurements and auxiliary data have provided far better opportunities to access the role of the cold ions, suggesting the cold ions dominate the total population. The results show that the fate of the ions are largely controlled by convection. Strong convection leads to a high supply of ionospheric ions to a fairly limited region in the inner magnetosphere plasma sheet. Slow or stagnant convection, on the other hand, results in lower outflow rates, longer transport times and a more distributed deposition in the plasma sheet at larger tailward distances. The results also reveal a persistent dawn dusk asymmetry, which can partly be explained by interplanetary magnetic field penetration into the plasma sheet.