Combined contribution of solar illumination, solar activity, and convection to ion upflow above the polar cap

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By analyzing a 5-year period (2010-2014) of DMSP plasma data, we investigated ion upflow occurrence, speed, density, and flux above the polar cap in the northern hemisphere under different solar zenith angle (SZA), solar activity (F10.7), and convection speed. Higher upflow occurrence rates in the dawn sector are associated with regions of higher convection speed, while higher upflow flux in the dusk sector is associated with higher density. The upflow occurrence increases with convection speed and solar activity, but decreases with SZA. Upflow occurrence is the lowest when the SZA>100o and the convection speeds are low. While, the upflow velocity and flux show a clear seasonal dependence with higher speed in the winter and higher flux in the summer during low convection conditions. However, they are detected for the first time to be both higher in summer during high convection conditions. These results suggest that ion upflow in the polar cap is controlled by the combination of convection, solar activity, and solar illumination.

Keywords: Ion upflow above polar cap region , upflow occurrence increases with increasing solar zenith angle , A sesosnal diffrence in upflow velocity and flux is observed for low convection speeds but not for high convection speeds