



## **A study of polar cusp ion outflow and transport using Cluster data and particle simulation**

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This paper presents Cluster observation of ionospheric ion beams over the polar cap at altitudes of the order of 5-8 Re. During periods of southward IMF, the Cluster multi-satellite system detects nearly field aligned proton and oxygen ions with energies differing by a factor of about 4. Using particle simulations we investigate the characteristics of the source region. We show that they are consistent with the cusp/cleft being the source region and that the properties of the ions are determined by: i) The spatial extension of the source. ii) The latitudinal energy repartition of ions at the source. iii) The ion energy gain during their transport. During those events we also observe rapid variations in the outflowing ion energy that are linked with modifications of the measured electric field. Using different convection electric field patterns we characterize the convection electric field that can produce the observed variations of the particles energy.