



On the source region of cold ions escaping from Earth's polar caps

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Every day, the Earth's atmosphere loses a significant amount of mass through ions escaping from the polar cap area. Cold ions escaping along magnetic field lines constitute a significant part of the total ion outflow. In order to find out more about the source, we have traced cold ions observed by the Cluster spacecraft in the magnetosphere down to the ionosphere. In the tracing work, we take into account convection, centrifugal acceleration, gravity and field aligned acceleration due to magnetic field magnitude change. Preliminary results suggest that field aligned acceleration due to change in the magnetic field value is most pronounced at lower altitudes, but is not articulate very important in the altitude range $8 \sim 11R_e$, where most of the observations are taken. Furthermore, our preliminary results indicate that the day-side ionosphere, and in particular the cusp/cleft area is the primary source region for cold outflowing ions.