



Do ionospheric ions directly feed the inner magnetosphere's ring current?

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There has been much discussion about the ionospheric source for the ring current. Normally, the ionosphere is assumed to populate the ring current via convection and injection from the plasma sheet. There have been some observations that indicate that the ionosphere may provide energetic ions directly to the ring current regions of the inner magnetosphere, for example the observations of Sheldon et al.(1997). We have examined the Polar MICS >1 keV ion angular distributions for evidence that the ionospheric ions may be directly injected into the ring current. In particular we looked for angular distributions which had higher fluxes at small pitch angles than at large pitch angles. For example, during the May 4, 1998 magnetic storm the MICS sensor on Polar observed bi-directional nearly field aligned greater than 10 keV oxygen ions for more than 30 minutes at for L 's less than 6. The ion angular distributions were indicative of energetic ionospheric outflow deep in the inner magnetosphere. We will show examples of such distributions for different activity conditions and compare them to the average angular distributions in those regions. The case studies will be linked to the results of a statistical study on the occurrence of nearly field aligned ion distributions. The occurrence frequencies of these ion distributions and their relative contribution to the ring current will be discussed in the context of direct injection of ionospheric ions into the inner magnetosphere as one component of the ring current source.

(Sheldon, R. B., H. E. Spence and J. F. Fennell, Observation of 40 keV Field-Aligned Subauroral Ion Beams, Geophys. Res. Lett., 25, 1617-1620, 1998.)