Geophysical Research Abstracts
Vol. 15, EGU2013-4150, 2013
EGU General Assembly 2013

Atmospheric and ionospheric outflow from Earth: An update

Mats Andre (1) and Hans Nilsson (2)

(1) Swedish Institute of Space Physics, IRF, Uppsala, Sweden (mats.andre@irfu.se), (2) Swedish Institute of Space Physics, IRF, Kiruna, Sweden (hans.nilsson@irf.se)

Non-thermal escape of ions from the upper Terrestrial atmosphere has been observed by spacecraft and radars for decades. Typical total upflow rates are 10^{25} to 10^{26} ions/s, mainly H^+ and $O^{+,}$ varying with solar and magnetospheric magnetic activity. Recent findings show that the escape, and the plasma in the magnetosphere, often is dominated by low-energy (below about 10 eV) ions. These ions often cannot be detected onboard sunlit spacecraft, which often become positively charged to tens of volts. We discuss how a supersonic flow of low-energy ions cause a wake behind a charged spacecraft and how this can be used to detect the ions. Using observations by the Cluster spacecraft, putting together observations by this wake method, and observations by particle detectors, we find that often (more than 50% of the time) low-energy ions dominate the magnetosphere, while at other times high-energy (keV) ions dominate. At a given time, ions with low and high energies may dominate different regions of the magnetosphere. Using observed electric and magnetic fields, we show that the observed fields are consistent with the simultaneously observed ions, both for ions with low and with high energies. We give an update of the importance of low-energy and high-energy ions for the total upflow and escape of ions from Earth, using observations by Cluster and by other spacecraft. We briefly compare with ion outflow from Mars observed by Mars Express.