HEAVY ION ENERGIZATION, TRANSPORT AND LOSS IN THE EARTH'S MAGNETOSPHERE

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The magnetic field of the Earth acts like a shield against the solar wind, leading to a magnetopause position many planetary radii away from the planet, in contrast to the situation at non or weakly magnetized planets such as Mars and Venus. Despite this there is significant ion outflow from the cusp and polar cap region of the Earth's ionosphere. Effective interaction regions form, in particular in the ionospheric projection of the cusp, where ionospheric plasma flow up along the field-lines in response to magnetospheric energy input. Strong wave particle interaction at altitudes above the ionosphere further accelerate the particles so that gravity is overcome. For the particles to enter a direct escape path the particles must be accelerated along open magnetic field lines so that they cross the magnetopause or reach a distance tailward of the tail reconnection point. Else the Earth's magnetic field will transport the particles back towards the Earth. This return flow may also be either lost to space or returned to the atmosphere. Throughout this transport chain the heating and acceleration experienced by the particles will have an influence on the final fate of the particles, as well as determine which populations can be measured by particle instruments. We will present quantitative estimates of centrifugal acceleration and perpendicular heating along the escape path from the cusp, through the high altitude polar cap / mantle. We will see what factors determines the observed number flux, and present some preliminary results based on fluxes observed further downstream in the tail, including both outflow and return flow.

Oxygen ion outflow

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