

Ion escape from terrestrial planets

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The ionospheres of terrestrial planets -the ionized portion of their upper atmosphere- are in constant interaction with the solar wind, a flow of charged particles continuously emitted by the Sun. In addition to solar photo-emissions, this interaction transfers energy to ionospheric ions, sometimes enough to overcome the gravitational pull of the planet. Therefore, a few kilograms of ionospheric material from terrestrial planets are lost into the interplanetary space every second.

During the last two decades, measurements from ESA probes around Venus (VEX), Earth (Cluster) and Mars (VEX) brought new insight on ionospheric ion outflow challenging some paradigms, such as the protective effect of planetary magnetic field.

After an introduction on the ion outflow mechanisms at play on terrestrial planets, I will review observations at Venus, Mars and Earth. I will focus on observations related to the energy transfer from the solar wind to the ionosphere, the properties of outflowing ionospheric ions, the localization of the main outflow regions, and the fate of outflowing ionospheric ions. Finally I will discuss the impact of ion outflow on the long term evolution of the atmospheres of terrestrial planets.