Cold (eV) ions of ionospheric origin dominate the number density of most of the volume of the magnetosphere during most of the time. Supersonic flows of cold positive ions are common and can cause a negatively charged wake behind a positively charged spacecraft. The associated induced electric field can be observed and can be used to study the cold ions. We present observations from the Cluster and MMS spacecraft showing how a charged satellite, and also individual charged wire booms of an electric field instrument, can be used to investigate cold ion populations. Ionospheric ions affect large scales, including the Alfvén velocity and thus energy transport with waves and the magnetic reconnection rate. These ions also affect small-scale kinetic plasma physics, including the Hall physics and wave instabilities associated with magnetic reconnection. Concerning large scales, we summarize observations from several spacecraft and show that a typical total outflow rate of ionospheric ions is $10^{26}$ ions/s and that many of these ions stay cold also after a long time in the magnetosphere. Concerning small scales, we show examples of how cold ions modify the Hall physics of thin current sheets, including magnetic reconnection separatrices. On small kinetic scales the cold ions introduce a new length-scale, a gyro radius between the gyro radii of hot (keV) ions and electrons. The Hall currents carried by electrons can be partially cancelled by the cold ions when electrons and the magnetized cold ions ExB drift together. Also, close to a reconnection X-line an additional diffusion region can be formed (regions associated with hot and cold ions, and with electrons, total of three).