



Ion dynamics in the lunar plasma environment observed by Chang'E-1/SWIDs

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The Solar Wind Ion Detectors(SWIDs) are two electrostatic analyzers for ions onboard the Chinese lunar probe Chang'E-1 (CE-1). They can measure the directional energy spectrum of local ions. The energy sweeping range is 40eV~20keV, with an energy resolution of $\sim 7\%$. The data of SWIDs exhibit characteristic energy spectra of plasmas in the interplanetary space, in the magnetosheath and in the magnetic tail regions. New details of the plasma environment close to the Moon are detected. First phenomenon is the obvious acceleration of particles at the polar terminator regions. These particles are solar wind protons scattered at high-latitude region of the dayside lunar surface, accelerated by the convection electric field in the solar wind. Second, two new populations of ions with narrow energy distribution and a fixed energy ratio of 2 are discovered. The energies per charge of these two populations are always less than 8 and 4 times the solar wind proton energy, respectively. The pitch angle distribution of these ions is concentrated around 90 degrees, suggesting an origin of pickup ions. The distribution of these particles in the velocity space forms two rings, implying the existence of pickup protons and another ion species with an energy/charge ratio of 2. The molecular ion of hydrogen is the most probable source for this observation.