Acceleration of Scattered Solar Wind Protons at the Polar Terminator Region of the Moon: Chang'E-1/SWID Results

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The Solar Wind Ion Detectors (SWIDs) on Chang'E-1 spacecraft are two identical electrostatic analyzers to measure the energy spectrum of low-energy charged particles around the Moon. As the spacecraft crosses the terminator, a stream of ions with energy of ~200eV/q is detected. As the spacecraft moves to the anti-subsolar point of the Moon, the energy of these ions increase by 600~1500eV. This phenomenon occurs at north/south pole when IMF B_y component is dominant and negative/positive. It is proposed these particles are scattered solar wind protons, accelerated by the convection electric field of the solar wind and $E \times B$ drift in the ambipolar electric field at the flank of the lunar wake. This mechanism allows a new portion of solar wind protons to enter the central lunar wake, and provides a possibility to study the property of proton scattering at the dayside of the Moon.