

Abstract

Charged particle energization in the Earth's magnetosphere is one of the fundamental research topics in plasma physics. Observations show that the double layer structure plays an important role in the energization of cold electrons. Double layer was first observed by Cluster satellites in the separatrix region of the Earth's magnetosphere. Moreover, Magnetospheric Multiscale Mission satellites (MMS) also observed electric field fluctuations in the plasma sheet region. Motivated by the reported literature, in order to explain cold electron energization, we propose a model considering electron acoustic waves that comprise inertial cold electrons and flat-top distributed hot electrons. We derive the analytical results for double layer potential and electric field using Sagdeev potential technique. We will show that the spectral indices r , q and α (hot to cold density ratio) strongly influence the amplitude of the double layer and its associated electric field. Using MMS data, we will apply our results in the plasma sheet region of the Earth's magnetosphere and investigate how the cold electrons are energized.