

Global characteristics of cold protons in the near-Earth magnetotail: MMS/HPCA observations

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We conduct a statistical study of cold protons in the near-Earth magnetotail under quiet magnetotail conditions. Performing two-component Maxwellian fits to velocity distributions, we extract densities and temperatures of cold protons. Cold protons are separated into three distinct populations in the density-plasma b space. We interpret that Population I, characterized by a positive correlation of density to b , is solar-wind origin plasma transported over the polar regions. Population II, seen only in the high- b (>0.1) and tailward region ($r > 20$ Re) particularly on the dusk side, is solar-wind origin plasma entering through the flank magnetopauses and remains cold. Population III, clearly identified in the near-Earth region ($r < 10$ Re), is of ionospheric origin. The results also suggest that plasma supply to the plasma sheet is dominated by Population I and that cold plasma in the near-Earth magnetotail is mostly of ionospheric origin.

Keywords: plasma transport in the magnetosphere, origin of plasma sheet populations, two-component plasma