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Field Aligned Potentials Associated with Alfvenic Double Layers at Non-Maxwellian Temperature Scales in Space Plasmas

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Abstract: Observations conducted by various satellite missions have validated the existence of double layers associated with substantial parallel electric fields [1, 2]. These field aligned structures play an important role not only in the dynamics of near-Earth plasmas but also at the boundary of other planets [3]. These findings prompted us to investigate double layers and the accompanying electric fields in low-β plasmas consisting of positive ions and two non-Maxwellian electron populations (hot and cold) modeled by (r, q) distribution function. We used fluid theory to model our system and employed a fully nonlinear Sagdeev potential approach to obtain arbitrary amplitude double layer solution. Specifically, we examined the parallel electric fields associated with Alfvenic double layers at non-Maxwellian temperature scale and analyzed our results in the light of observed data. Our results indicate that the properties of double layers linked to kinetic Alfvén waves are sensitive to nonthermal parameters r and q, propagation angle θ, and Alfvénic Mach number M_A.

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