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A Theoretic Model for the Shock Observed in Geo-space

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Abstract: An electrostatic model for the shock observed in the earth's polar region is established by deriving the "Sagdeev potential" from the magnetohydrodynamic equations in a cylindrical coordinate system. The results show that the shock can develop from the ion acoustic wave or ion cyclotron wave in the polar region, and can exist when the Mach number M and the initial electric field E_0 satisfy the condition of $|(a/M^2-1)E_0|=1$. Also, some features of the shock wave are discussed. The result can interpret the electrostatic shock observed in the earth's polar region.

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