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SOLAR WIND DRIVEN WHISTLER INSTABILITY IN EARTH'S CUSP REGION

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One of the fundamental questions in space plasmas still not fully understood is how the energy is transported from solar wind to the Earth's magnetosphere. In the present study, we observe electron velocity distribution (EVD) functions in the Earth's magnetosphere using the CLUSTER data. The EVD functions are observed at different times when the CLUSTER traversing the southern cusp region, such as when the electron density is very low typical of cusp values and when it suddenly increases due to some solar wind disturbances at the magnetopause. We found that the observed EVD functions are flat top distributions and have two populations; a cold bulk magnetospheric population and a hot solar wind tenuous population. Observed EVD functions are then fitted by generalized (r,q) distribution which is the generalized form of kappa and Maxwellian distribution functions and can be reduced to kappa and Maxwellian distributions in the limit r =0, q = k+1 and r =0, q goes to infinity, respectively. We derive the expressions of real frequency and damping/growth rates by employing generalized (r,q) distribution function and plot them using the observed plasma parameters and fitting values of spectral indices r and q. When solar wind electrons with flat top distribution enter into the Earth's magnetosphere, we obtain enhnced growth causing the Whistler waves to grow and hence responsible for the transport of energy from solar wind to the magnetosphere.

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