Geophysical Research Abstracts
Vol. 18, EGU2016-3952-1, 2016
EGU General Assembly 2016

Low frequency instabilities based on electron and ion temperature anisotropies with generalized (r,q) distribution function

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In this study we first observe Alfven waves in the solar wind using CLUSTER data and then analyze the ion distributions for the same time interval. We then fit the observed ion distributions using the generalized (r,q) distribution function which is the generalized form of kappa and Maxwellian distribution functions and apply this distribution to study the Alfven cyclotron instability using both the ion and electron temperature anisotropies for the first time, based on the observed parameters from the solar wind as well as from downstream region of bow shock. We studied the role of electron to ion temperature ratios and found that by increasing the anisotropy ratio $T_{\perp e}/T_{\parallel i}$ growth rate of Alfven cyclotron instability decreases whereas by increasing the ratio $T_{\parallel e}/T_{\parallel i}$ growth rate increases. We also found that left-hand circularly polarized wave becomes unstable not only when $T_{\perp i}>T_{\parallel i}$ as reported in the literature but also for $T_{\perp i}<T_{\parallel i}$. Theoretical values of frequency and growth rates are then compared with Maxwellian results as well as with the observations and found in good agreement with the data.