6th Asia-Pacific Conference on Plasma Physics, 9-14 Oct, 2022, Remote e-conference

Propagation large amplitude oblique whistler wave in plasma.

Gayatri Barsagade[1,2], Devendra Sharma[1,2]
[1] Institute for Plasma Research. [2] Homi Bhabha National Institute, Training School Complex.
e-mail (gayatri.barsagade@ipr.res.in):

Whistler waves are Electron-Magnetohydrodynamic waves present in the Earth's inner magnetosphere with frequency varying in between electron cyclotron and ion cyclotron frequency range. It is generally accepted that the whistler waves are responsible for electron acceleration in space and astrophysical plasmas [4]. The literature shows that interaction between large amplitude oblique whistler waves and electrons is responsible for significant changes in plasma parameters [1,2]. To study these waves, we numerically solve fully nonlinear electron fluid equations with simulation parameters similar to the experiments conducted by C. Catell et.al.[3]. In the first part of systematic analysis of whistler waves, we have computationally verified the analytical dispersion relations. We have then performed the simulations for small and large wave amplitudes for different angle of propagation. It has been observed that for propagation angle up to $\boldsymbol{\theta} = 50°$, nonlinear effects are absent for both small and large amplitudes. However, for the propagation angle greater than $\theta = 50°$, nonlinearity is significantly noticeable for the large amplitude case. The nonlinearity further increases when propagation angle exceeds $\theta = 70°$. The amplitude and propagation angle are the two parameters which determine the dynamics of the wave in the plasma. Details of the effect of these factors on plasma parameters have been presented in the present poster.

References
[1] A. V. Artemyev, A. A. Vasiliev, D. Mourenas, O. V. Agapitov, and V. V.Krasnoselskikh, Phys. Plasmas 21, 102903 (2014).
[2] O. V. Agapitov, D. Mourenas, A. V. Artemyev, and F. S. Mozer, Geophys.Res. Lett. 43,112,https://doi.org/10.1002/2016GL071250 (2016).
[3] C. Cattell, J. Wygant, K. Goetz, K. Kersten, P. Kellogg, T. Von Rosenvinge, S. Bale, I.Roth, M. Temerin, M. Hudson, et al., Geophysical Research Letters 35, L01105 (2008).
[4]Artemyev, A.V., Vasiliev, A.A., Mourenas, D., Agapitov, O.V. and Krasnoselskikh, V.V., 2013. Nonlinear electron acceleration by oblique whistler waves: Landau resonance vs. cyclotron resonance. *Physics of Plasmas*, *20*(12), p.122901.

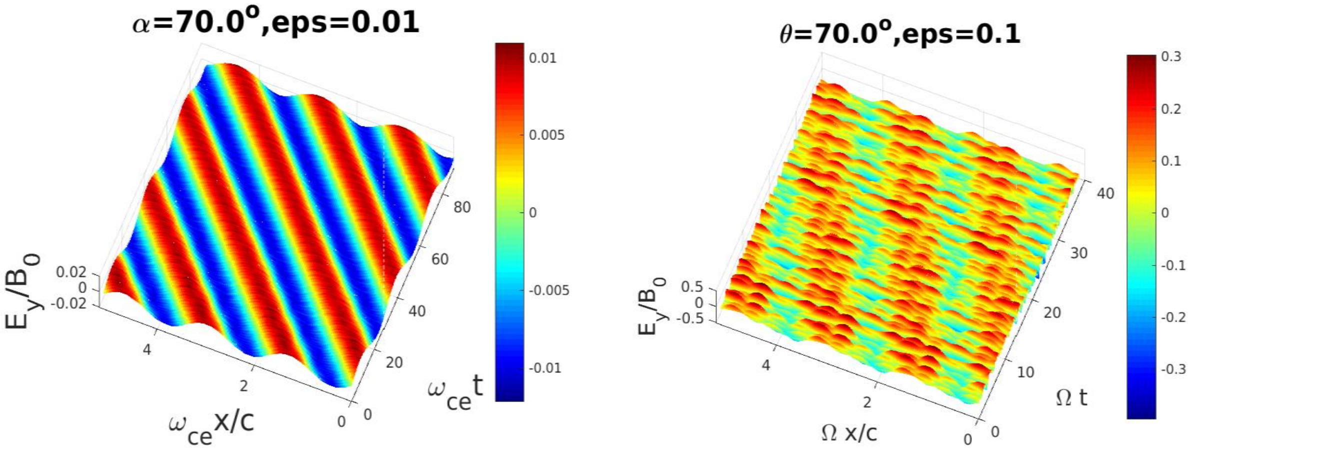

Figure 1. Show the electric field perturbation for an angle θ=70° at an amplitude eps = 0.01 and eps= 0.1.