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Revisiting the analytical and numerical analysis of Bump on tail Instability by reduced Cairns distribution

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Using Vlasov-Poisson approach of the kinetic theory, the growth rate of bump-on tail instability has been revisited in the Cairns distributed plasma analytically and numerically using solar wind data. The effect of non-thermality parameter α has been observed on the growth rate of bump on tail instability using varying ratios of temperature and number density. Results suggest an increase in the growth rate at smaller values of α, while a decrease at the larger value of α. The non-thermality parameter α contributes towards the tail formation of instability. Large values of number density with smaller temperature ratios show an increase in growth rate of instability and vice versa. The damping rate as a function of non-thermality parameter has also been analyzed and shows a decrease with an increase in α.

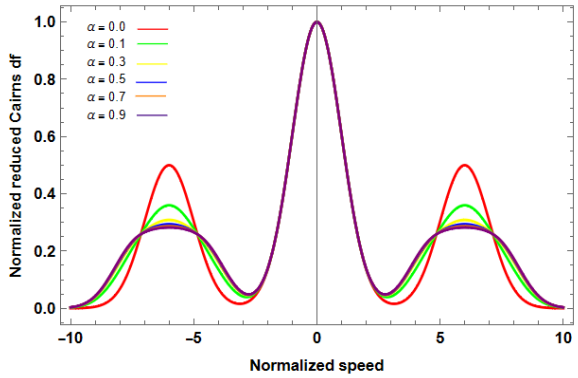

Fig 1: The modified 1D reduced Cairns distribution function for bump on tail instability.

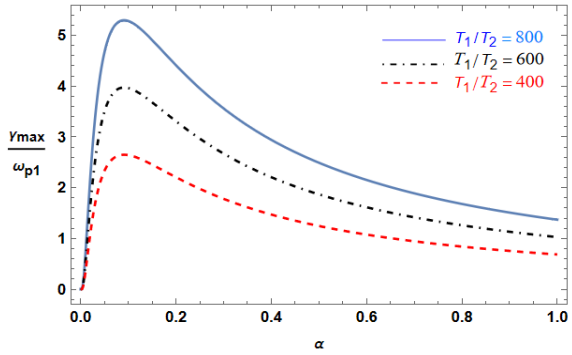

Fig 2: Maximum growth rate as a function of alpha at fixed ratio of number density and varying temperature.

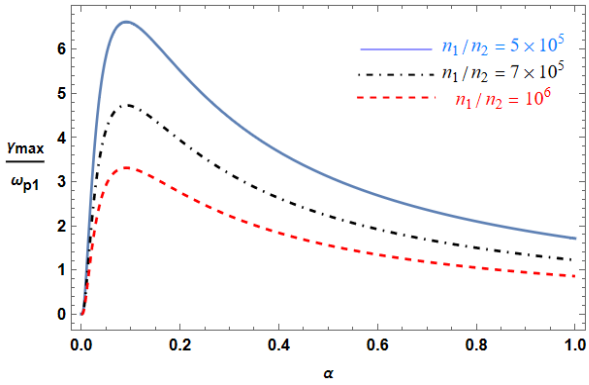

Fig 3: Maximum growth rate as a function of alpha at fixed ratio of temperature and varying number density.

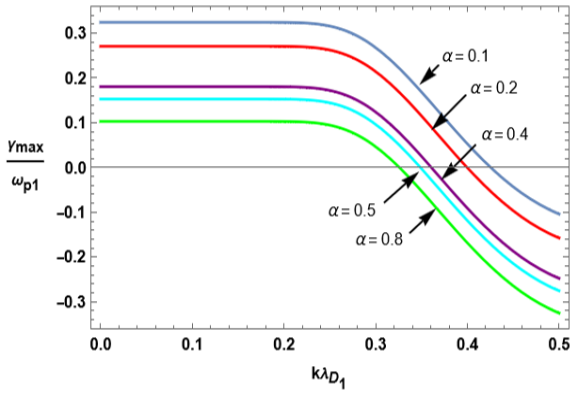

Fig 4: Damping rate as a function of wavenumber at various values of alpha.

References

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