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Magnetic Drift Compressional Modes in High β Plasmas*

C. Crabtree[1], W. Horton[1], H.V. Wong[1], J. Van Dam[1], L. Chen[2]

[1] Institute for Fusion Studies, University of Texas at Austin,
Austin, Texas 78712
[2] University of California at Irvine,
Irvine, CA 92697

Abstract

Magnetic dipoles are ubiquitous in nature and have desirable properties for magnetic fusion [1]. The stability and non-linear consequences of low-frequency drift compressional waves in high β plasmas with dipole like magnetic configurations is investigated. It is found tht there are two different regions of parameter space where drift-compressional waves can be unstable: (1) when pressure gradients become sufficiently steep to reverse the magnetic-guiding center drift and (2) when the temperature gradient is in the opposite direction to the density gradient. Nonlocal bounce-averaged eigenmode equations are solved for different equilibrium configurations and the resulting growth rates, frequencies and eigenmode structures are reported. A model PDE is found and solved that describes the non-linear evolution of this mode. The coupling of drift compressionl waves to electrostatic drift waves is also discussed. The results of this work make it clear that scientific experiments and large-scale particle simulations to investigate the nature of drift-compressionl modes are necessary.

[1] A. Hasegawa, L. Chen, M.E. Mauel, "A D-^{3}He fusion reactor based on a dipole magnetic field", Nuclear Fusion, **30**, (1990), 2405.

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