

# Stabilization of Ion-Beam Electromagnetic Instabilities by Large Amplitude Alfvén Waves in a Proton-He<sup>++</sup> Plasma, Kinetic Effects

J. D. Avendaño<sup>1\*</sup>, R. E. Navarro<sup>1</sup>, J. A. Araneda<sup>1</sup>

<sup>1</sup> Departamento de Física, Facultad de Ciencias Físicas y Matemáticas, Universidad de Concepción, Concepción, Chile

E-mail: \*javendanov@udec.cl

**Abstract.** We consider a plasma consisting of massless electrons, proton core and alpha particle beam (He<sup>++</sup>) supporting a circularly polarized Alfvén wave. We review the stabilization of the linear right-hand polarized instability (r-instability) by large amplitude Alfvén waves and compare the solutions in the fluid model and the kinetic model. It is found that for all cases the threshold amplitude in the kinetic model is less than or similar to the threshold amplitude in the fluid model. Also, kinetic effects become more important in stabilizing r-instability as plasma  $\beta$  increases, indicating that the stabilization mechanism of this instability is through Landau damping.

**Acknowledgment:** This project has been financially supported by FONDECYT N°1161700 (J.A.A.), and CONICYT-PAI N°79170095 (R.E.N.). We also thank the national doctoral grant CONICYT N°21160833 (J.D.A.).

## Referencias

[Araneda et al., 2007] Araneda, J. A., Marsch, E., and Viñas, A. F. (2007). Collisionless damping of parametrically unstable Alfvén waves. *Journal of Geophysical Research: Space Physics*, 112(4):1–14.

[Gomberoff, 2006] Gomberoff, L. (2006). Effect of nonlinear circularly polarized waves on linear instabilities triggered by an alpha particle beam. *Journal of Geophysical Research: Space Physics*, 111(A2).

[Hollweg et al., 1993] Hollweg, J., Esser, R., and Jayanti, V. (1993). Modulational and Decay Instabilities of Alfvén Waves: Effects of Streaming He<sup>++</sup>. *Geophysical Research*, 98:3491–3500.

[Kauffmann and Araneda, 2008] Kauffmann, K. and Araneda, J. A. (2008). Parametric instabilities of Alfvén waves in a multispecies plasma: Kinetic effects. *Physics of Plasmas*, 15(6).

[Sonnerup and Su, 1967] Sonnerup, B. U. and Su, S. Y. (1967). Large amplitude whistler waves in a hot collision-free plasma. *Physics of Fluids*, 10(2):462–464.

**Session:** Space Plasma Physics and Nonlinear processes in Space Geophysics.

**Oral or Poster:** Oral