

The Instability of a Viscoelastic Conducting Cylindrical Interface Supporting Free-surface Currents

Yusry O. El-Dib and Galal M. Moatimid

Department of Mathematics, Faculty of Education, Ain Shams University, Heliopolis, Cairo, Egypt

Reprint requests to Dr. G. M. M.; E-mail: galmoa@hotmail.com

Z. Naturforsch. **57 a**, 159–176 (2002); received October 19, 2001

The stability of a viscoelastic interface acted upon by an oscillating azimuthal magnetic field is studied. The interface separates two rigid magnetic fluid columns. Only azimuthal disturbance modes are considered in a linear perturbation technique. Weak viscoelastic effects are taken into consideration, so that their contributions are demonstrated in the boundary conditions. The presence or absence of free surface currents resulted in a dispersion equation with complex coefficients of the Mathieu type. It is found that the surface currents disappear when the stratified magnetic field becomes unity. The phenomenon of coupled resonance is observed. Several special cases are reported. A set of graphs are drawn to illustrate the influence of the various parameters on the stability of the considered system.

Key words: Hydrodynamic Interfacial Instability; Viscoelastic Fluids; Magnetic Fluids; Free-surface Currents.