

Abstract

The Bénard–Marangoni thermal instability problem for a viscoelastic Jeffreys’ fluid layer bounded above by a realistic free deformable surface and by a plane surface below is investigated using a linear stability analysis. It has been shown that both the relaxation time and surface deflection have a destabilizing effect unlike the retardation time. A point of codimension 2 has been identified which means that instability here takes the form of a competition between stationary and oscillatory convections. When the lower boundary is free but plane, an analytic treatment has identified an oscillatory disturbance with zero critical wavenumber which is not found in the absence of surface deformation.

Keywords

- Thermal instability;
- Jeffreys;
- Viscoelastic;
- Bénard–Marangoni;
- Deformable surface