Temperature Modulation of Double Diffusive Convection in a Horizontal Fluid Layer

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Linear stability analysis is performed for the onset of thermosolutal convection in a horizontal fluid layer with rigid-rigid boundaries. The temperature field between the walls of the fluid layer consists of two parts: a steady part and a time-dependent periodic part that oscillates with time. Only infinitesimal disturbances are considered. The effect of temperature modulation on the onset of thermosolutal convection has been studied using the Galerkin method and Floquet theory. The critical Rayleigh number is calculated as a function of frequency and amplitude of modulation, Prandtl number, diffusivity ratio and solute Rayleigh number. Stabilizing and destabilizing effects of modulation on the onset of double diffusive convection have been obtained. The effects of the diffusivity ratio and solute Rayleigh number on the stability of the system are also discussed.

Key words: Double Diffusive Convection; Thermal Modulation; Rayleigh Number; Diffusivity Ratio.