



Temperature Synchronization in Two Adjacent Cavities with Operating Heaters

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Abstract. The study of rising and falling temperature control by heaters in two adjacent cavities that share common wall has been numerically investigated. The temperature of each cavity is independently controlled with a localized heater that can only turn on or off. In each cavity, the heater, acting as part of the wall on the opposite side of the adjacent wall, induces the natural convection flow. Heat is removed through the ceiling wall by convection to the constant temperature surrounding. The other walls are insulated. The 2-D CFD simulation was developed considering a laminar flow and the transient conjugate natural convection at Rayleigh number of 10^5 and a Boussinesq fluid with Prandtl number of 0.71 (air). The model was validated by comparing with results from de Vahl Davis (1983) and Hortmann et al. (1990). The investigation focused on the initial condition when the temperature of cavity 1 is falling while the temperature of cavity 2 is rising. In the beginning, the operating of the heaters of both cavities are not synchronized. Eventually, the transient results show that the heaters are operating synchronously. Although at steady operation both heaters are synchronized, the temperatures of both cavities are not exactly the same as there are some shifts in the phase of the temperatures of both cavities.

Keywords: Adjacent Cavities; Natural Convection; Conjugate Heat Transfer; Synchronization