

Proper orthogonal decomposition applied to laminar thermal convection in a vertical two plate channel

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Electrochimica Acta. Volume 180, 20 October 2015, Pages 486–492

Abstract.

This work reports the thermal convection with imposed shear flow in a thin two-plate channel. Flow structures are investigated under heating asymmetric conditions and different laminar flow conditions. The dynamics of heat flow and the energy distribution were determined by visualization with the Schlieren technique and application of the proper orthogonal decomposition (POD) method. The obtained results from the POD mode analysis revealed that for some flow conditions the heat transfer is related to the energy of the POD modes and their characteristic numbers. It was possible to detect periodic motion in the two-plate channel flow from the POD mode analysis. It was also found that when the energy is distributed among many POD modes, the fluid flow is disorganized and unsteady.