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Transient Free Laminar Convection in the Vicinity of a Thermal Conductive Vertical Plate

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Abstract : In this paper, the influence of a vertical plate's thermal capacity is numerically investigated in order to evaluate the evolution of the thermal boundary layer structure, as well as the convective heat transfer coefficient and the velocity and temperature profiles. Whereas the heat flux of the heated vertical plate is evaluated under time depending boundary conditions. The main important feature of this problem is the unsteadiness of the physical phenomena. A 2D CFD model is developed with the Ansys Fluent 14.0 environment and is validated using unsteady data obtained for plasterboard studied under a dynamic temperature evolution. All the phenomena produced in the vicinity of the thermal conductive vertical plate (plasterboard) are analyzed and discussed. This work is the first stage of a holistic research on transient free convection that aims, in the future, to study the natural convection in the vicinity of a vertical plate containing Phase Change Materials (PCM).

Keywords : CFD modeling, natural convection, thermal conductive plate, time-depending boundary conditions
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