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Computational Study of a Vortex-Ring Pair Interacting with a Constant-Temperature Heated Wall[1] HUSSAM JABBAR, AHMED NAGUIB, Michigan State University — Impinging jets are used widely in industrial and manufacturing processes because of their ability to increase the heat transfer rate from the impingement surface. The vortical structures of these jets have an important influence on the heat transfer; by affecting the thermal boundary layer (TBL) during their interaction with the wall. In order to better understand the physics of this interaction, particularly when pairing of two vortices happens near the wall, a simplified model problem of two isolated vortex rings interacting with a flat wall is investigated computationally using ANSYS FLUENT 17.1. Observations of the vorticity field, the temperature field, the wall shear stress, the TBL and the Nusselt number (Nu) provide insight into the association of local Nu maxima/minima with different flow features. The results provide physical understanding of the flow processes leading to enhancement/deterioration of Nu due to vortex-wall interaction. Additionally, the characteristics of the vortical structures are quantified, and possible correlations between the temporal development of these characteristics and the evolution of the maximum/minimum Nu are investigated. The results are compared to those involving a single vortex ring in order to understand the effect of vortex pairing.

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