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Flow characteristics and heat transfer in wavy walled channels ZACHARY MILLS, TAPAN SHAH, VONTRAVIS MONTS, Georgia Institute of Technology, ALOK WAREY, SANDRO BALESTRINO, General Motors Global Research and Development, ALEXANDER ALEXEEV, Georgia Institute of Technology — Using lattice Boltzmann simulations, we investigated the effects of wavy channel geometry on the flow and heat transfer within a parallel plate heat exchanger. We observed three distinct flow regimes that include steady flow with and without recirculation and unsteady time-periodic flow. We determined the critical Reynolds numbers at which the flow transitions between different flow regimes. To validate our computational results, we compared the simulated flow structures with the structures observed in a flowing soap film. Furthermore, we examine the effects of the wavy channel geometry on the heat transfer. We find that the unsteady flow regime drastically enhances the rate of heat transfer and show that heat exchangers with wavy walls outperform currently used heat exchangers with similar volume and power characteristics. Results from our study point to a simple and efficient method for increasing performance in compact heat exchangers.

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