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Higher Heat Transfer Efficiency in Laminar Structured Boundary Layers than in Turbulent Boundary Layers, Numerical and Experimental Approach LADAN MOMAYEZ, Assistant Professor, GUILLAUME DELACOURT, Ph.D student, PASCAL DUPONT, Associate Professor, HASSAN PEERHOSSAINI, Professor, UNIVERSITY OF MARINE SCIENCES AND TECHNOLOGY, KHORRAMSHAHR, IRAN COLLABORATION, LABORATOIRE DE THERMOCINÉTIQUE, CNRS, NANTES, FRANCE COLLABORATION — Unexpected behavior has been observed in heat transfer in a concave boundary layer at a low free-stream velocity, a configuration surprisingly ignored in the literature. The boundary layer is laminar with strong embedded Görtler vortices. Precise measurements of the wall heat transfer in this situation demonstrate that heat transfer enhancement was extremely large even compared to the turbulent flat-plate case. Analysis demonstrates that the boundary-layer transition is dominated by the centrifugal instability at a free-stream velocity below a critical value. Further results reinforce the discussion by analysis of the influence of forced upstream perturbations coupled with a set of flow visualizations. Numerical computation of the linear and nonlinear development of steady Görtler vortices and their most amplified primary instability have been developed and these results are compared with the experimental measurements.

Ladan Momayez
Assistant Professor

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