Abstract Submitted
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DNS Study of Transient Disturbance Growth and Bypass Transition[1] KELLY STEPHANI, DAVID GOLDSTEIN, University of Texas at Austin — Direct numerical simulation was used to investigate the detailed flow past a periodic array of cylindrical roughness elements. The problem was constructed as channel flow over a flat plate surface with roughness elements formed using an immersed boundary technique with a spectral method approach. Solutions were obtained for two roughness heights corresponding to Reynolds numbers (Re_k) of 189 and 350, and results are presented for both cases. Cylindrical roughness elements with Re_k=189 produced minimal disturbances and the flow remained laminar in the wake downstream of the roughness elements. Flow past cylindrical roughness elements corresponding to Re_k=350 was found to transition as soon as 2-3 cylinder diameters downstream and had developed into fully turbulent flow by the end of the domain. Results were found to compare reasonably well with a similar set of DNS computations by Rizzetta and Visbal using a sixth-order-accurate centered compact finite difference scheme as well as experimental results obtained by Ergin and White using time-averaged hotwire measurements of the velocity components.

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