

Abstract Submitted
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Quantifying Hairpin Vortex Generation¹ RIJAN MAHARJAN², DANIEL SABATINO, Lafayette College — Hairpin vortices are artificially generated via fluid injection through a streamwise oriented slot into an otherwise laminar boundary layer in a free-surface water channel. Injection through the 32:1 aspect ratio slot is intended to approximate the behavior of a low speed streak along with its neighboring streamwise vortices that spawn naturally occurring hairpins in fully turbulent boundary layers. A parametric study is performed by varying the slot streamwise location, the average injection flow rate and injection duration. Hairpins are examined for boundary layer conditions between $485 < Re_{\delta^*} < 600$ and blowing ratios up to 0.2. Cross-stream 2D-PIV is primarily used to characterize the injection profile and the strength of the initial streamwise vortices as well as establish the strength and structure of the resulting hairpin for each condition. The role of the streamwise vorticity in the generation of the hairpin is examined. Threshold conditions which will yield hairpins that have sufficient strength to autogenerate secondary hairpins are also considered.

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²Now at Yale University

Daniel Sabatino
Lafayette College

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