GRADUATE STUDENT RESEARCH SEMINAR SERIES (2019)

EXPERIMENTAL INVESTIGATION OF POLYGONAL HYDRAULIC JUMPS

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Hydraulic jumps are characterized by an abrupt change in fluid height. Such phenomenon typically occur on large scales such as tidal basins, rivers, and dam spillways. We have developed a small-scale table top experiment consisting of an impinging fluid jet impacting a horizontal plate to systematically study the hydraulic jump structure. Striking polygonal shapes are observed in small regions of parameter space defined by the flow of the impinging jet, fluid properties, and weir geometry. These steady shapes are reflective of a balance of inertial, pressure, and surface tension forces. We systematically study the effect of weir geometry on jump structure and collapse our data upon scaling using the isoperimetric inequality, thus highlighting the role of surface tension. Hysteresis is observed during up-sweep and down-sweep in flow rate. Our results highlight the complex multiphysics involved in this phenomena.

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