ACMS Applied Math Seminar

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154 Hurley Hall
3:30 PM – 4:30 PM

On A Numerical Artifact of Solving Shallow Water Equations With A Discontinuous Bottom

The nonlinear shallow water equations are used to model the free surface flow in rivers and coastal areas for which the horizontal length scale is much greater than the vertical length scale. They have wide applications in oceanic sciences and hydraulic engineering. In this talk, we study a numerical artifact of solving the shallow water equations over a discontinuous riverbed. For various first-order methods, we report that the numerical solution will form a spurious spike in the numerical momentum at the discontinuous point of the bottom. This artifact will cause the convergence to a wrong solution in many test cases. We present a convergence analysis to show that this numerical artifact is caused by the numerical viscosity imposed at the discontinuous point. Motivated by our analysis, we propose a numerical fix which works for the nontransonic problems.